Public Input No. 2424-NFPA 70-2023 [Global Input]

See Attached File - Which Includes multiple related changes, all under the purview of CMP 8.

Additional Proposed Changes

File Name	Description	Approved
PI_For_CMP_8_Voltage_Demarcation_.docx	Global PI for CMP 8 (Consistent Voltage Demarcation)	

Statement of Problem and Substantiation for Public Input

This Public Input is submitted on behalf of a Correlating Committee Task Group consisting of Robert Osborne (Chair), Paul Barnhart, Lou Grahor, Donny Cook, Scott Higgins, Mike Querry, Roger McDaniel, Dave Burns, Rod Belisle, Kevin Rogers, Tony Ricciuti, Paul Knapp, Paul Sullivan, George Smith, Eric Simmon, Kevin Arnold, Larry Wildermuth, and Kyle Krueger.

Changes related to the voltage demarcation have been grouped to assist the CMP with review and resolution, with each change, and it's corresponding substantiation, noted in the table below: (table provided in attachment)

Submitter Information Verification

Submitter Full Name: Robert Osborne
Organization: UL Solutions
Street Address:
City:
State:
Zip:

Submittal Date: Thu Aug 17 09:33:29 EDT 2023
Committee: NEC-P08

Committee Statement

Resolution: FR-7846-NFPA 70-2024

Statement: Title is revised to include the same voltage demarcation used in many places throughout the Code.

For consistency related to PI 2424

This Public Input is submitted on behalf of a Correlating Committee Task Group consisting of Robert Osborne (Chair), Paul Barnhart, Lou Grahor, Donny Cook, Scott Higgins, Mike Querry, Roger McDaniel, Dave Burns, Rod Belisle, Kevin Rogers, Tony Ricciuti, Paul Knapp, Paul Sullivan, George Smith, Eric Simmon, Kevin Arnold, Larry Wildermuth, and Kyle Krueger.

Changes related to the voltage demarcation have been grouped to assist the CMP with review and resolution, with each change, and it's corresponding substantiation, noted in the table below:

Reference	Suggested Revision	Substantiation
312.1	**Scope.** This article covers the installation and construction specifications of cabinets, cutout boxes, and meter socket enclosures. It does not apply to equipment operating at over 1000 volts ac, 1500 volts dc, nominal~~, except as specifically referenced elsewhere in the *Code*~~.	Requirements are revised to include the same voltage demarcation used in many places throughout the Code. Unable to identify instances of references to Article 312 for applications with equipment operating at over 1000 volts ac, 1500 volts dc.
312.101(A)(3)	**Live Parts.** … increased to at least 25.4 mm (1.00 in.) for voltages of 251 to 1000 ac, 1500 dc, nominal.	The Standard for Molded-Case Circuit Breakers, Molded-Case Switches and Circuit-Breaker Enclosures, UL 489, is an important document in the area of power distribution products for the US. This standard covers overcurrent devices in common use in NEC applications. The scope of the standard covers breakers rated not over 1000 volts ac, 1500 volts dc. Included in the standard is a spacings table that the Technical Committee for UL 489 modified in recent years to add spacings for the ranges above 600 volts, up to and including 1000 Vac, 1500 Vdc. Spacings (as covered in Table 6.1.6.1.1 of that Standard) establish the limits for 1500 Vdc to be the same as for 1000 Vac. This public input, using this concept from the product standard, revises the requirement to include installations at voltages up to 1500 Vdc.
314.30(A)	**Size.** Handhole enclosures shall be sized in accordance with **314.28(A)** for conductors operating at not over 1000 volts ac, 1500 volts dc, nominal ~~or below~~, and in accordance with **314.71** for conductors operating at over 1000 volts ac, 1500 volts dc, nominal. …	Requirements are revised to include the same voltage demarcation used in many places throughout the Code.

Public Input No. 3294-NFPA 70-2023 [New Article after 100]

Factory Elbow

A conduit elbow of any angle and trade size, produced at a factory and ready to install.

Statement of Problem and Substantiation for Public Input

"Factory elbow" is a term that is used, but never defined. Add definition to Article 100.

Submitter Information Verification

Submitter Full Name: Glen Edwards
Organization: Detector Electronics Corporati
Affiliation: International Society of Automation (ISA)
Street Address:
City:
State:
Zip:

Submittal Date: Thu Aug 31 16:46:39 EDT 2023
Committee: NEC-P08

Committee Statement

Resolution: The term "factory elbow" is only used 8 times associated with RTRC, EMT, IMC, RMC and PVC. The term "conduit" would exclude EMT as it is not a conduit, but a tubing. The applicable XXX.2 Section requires factory elbows to be listed. The applicable product standard would address the construction and marking of factory elbows. This will assist AHJ's and installers with the identification of factory elbows. The term "elbow" is used approximately 40 times with no definition. Short radius conduit bodies are sometimes referred to as "capped elbows". Surface metal and nonmetallic raceways reference elbows. Additionally, the term elbow is not limited to raceway applications, elbows are also associated with the electrical system such as load-break elbows.

Public Input No. 1070-NFPA 70-2023 [Definition: Cabinet.]

Cabinet.

~~An enclosure~~ Equipment that is designed for either surface mounting or flush mounting and is provided with a frame, mat, or trim in which a swinging door or doors are or can be hung. (CMP-9)

Statement of Problem and Substantiation for Public Input

Replace "an enclosure" with "equipment" since a cabinet itself is not an enclosure. Although the cabinet may become an enclosure once the doors, if any, are installed, it is not an enclosure as a cabinet itself. For example, a panelboard installed within a cabinet with doors installed becomes an enclosed panelboard per the definition of "enclosed panelboard." Note that within the definition of "enclosed panelboard" there is the phrase "...designed to be placed in a cabinet, enclosure, or cutout box..." that states that a cabinet is not an enclosure since it states "in a cabinet, enclose, or cutout box." If it would have stated cabinet or other enclosure then perhaps one could consider a cabinet a type of enclosure.

Submitter Information Verification

Submitter Full Name: Palmer Hickman

Organization: Electrical Training Alliance

Street Address:

City:

State:

Zip:

Submittal Date: Wed Jun 14 09:48:18 EDT 2023

Committee: NEC-P08

Committee Statement

Resolution: Both the terms "enclosure" and "cabinet" are defined in Article 100 "equipment" is a broad term which covers many product types. The definition of enclosure is that the intent is to prevent contact with live parts. The change from enclosure to equipment would not align with the current 110.28 on enclosure ratings. Equipment can be raceway, wiring, devices, etc.

Public Input No. 792-NFPA 70-2023 [Definition: Cabinet.]

Cabinet.

~~An enclosure~~ Equipment that is designed for either surface mounting or flush mounting and is provided with a frame, mat, or trim in which a swinging door or doors are or can be hung. (CMP-9)

Statement of Problem and Substantiation for Public Input

"Enclosure" is replaced with "equipment" to make the definition technically correct. A cabinet itself is not an enclosure until the provisions of 312.102 are applied which requires, in part, that cabinets shall be equipped with doors or covers.

Submitter Information Verification

Submitter Full Name: Palmer Hickman
Organization: Electrical Training Alliance
Street Address:
City:
State:
Zip:
Submittal Date: Wed May 10 11:51:27 EDT 2023
Committee: NEC-P08

Committee Statement

Resolution: Both the terms 'enclosure' and 'cabinet' are defined in Article 100. 'Equipment' is a broad term which covers many product types. The definition of 'enclosure' is to prevent contact with live parts. The change from 'enclosure' to 'equipment' would not align with the current 110.28 on enclosure ratings. Equipment can be raceway, wiring, devices, etc.

Public Input No. 725-NFPA 70-2023 [Definition: Cablebus.]

~~Cablebus~~ Cable bus .

An assembly of units or sections with insulated conductors having associated fittings forming a structural system used to securely fasten or support conductors and conductor terminations in a completely enclosed, ventilated, protective metal housing. This assembly is designed to carry fault current and to withstand the magnetic forces of such current. (CMP-8)

Informational Note: ~~Cablebus~~ Cable bus is ordinarily assembled at the point of installation from the components furnished or specified by the manufacturer in accordance with instructions for the specific job.

Statement of Problem and Substantiation for Public Input

"Cablebus" is not found in any American English dictionary (or any dictionary of any variant of English), so it is misspelled. Furthermore, manufacturers typically write "cable bus" instead of "cablebus".

Submitter Information Verification

Submitter Full Name:	Conrad Ko
Organization:	[Not Specified]
Street Address:	
City:	
State:	
Zip:	
Submittal Date:	Wed Apr 26 00:47:46 EDT 2023
Committee:	NEC-P08

Committee Statement

Resolution: The single word term "Cablebus" is retained to facilitate electronic searching and to align with its use in the associated product standard, CSA/ANSI C22.2 NO. 273:19 which is titled Cablebus.

Public Input No. 726-NFPA 70-2023 [Definitions (100): Conduit, Li... to Conduit, Li...]

Definitions (100): Conduit, Li... to Conduit, Li...

Conduit, ~~Liquidtight~~ Liquid-Tight Flexible Metal (LFMC). (~~Liquidtight~~ Liquid-Tight Flexible Metal Conduit)

A raceway of circular cross section having an outer liquidtight, nonmetallic, sunlight-resistant jacket over an inner flexible metal core with associated couplings, connectors, and fittings for the installation of electric conductors. (CMP-8)

Conduit, ~~Liquidtight~~ Liquid-Tight Flexible Nonmetallic (LFNC). (~~Liquidtight~~ Liquid-Tight Flexible Nonmetallic Conduit)

A raceway of circular cross section of various types as follows:

(1) A smooth seamless inner core and cover bonded together and having one or more reinforcement layers between the core and covers, designated as LFNC-A

(2) A smooth inner surface with integral reinforcement within the raceway wall, designated as LFNC-B

(3) A corrugated internal and external surface without integral reinforcement within the raceway wall, designated as LFNC-C

(CMP-8)

Informational Note: FNMC is an alternative designation for LFNC.

Statement of Problem and Substantiation for Public Input

"Liquidtight" is not found in any American English dictionary (or any dictionary for any variant of English), so it is not a word in English.

Submitter Information Verification

Submitter Full Name: Conrad Ko
Organization: [Not Specified]
Street Address:
City:
State:
Zip:

Submittal Date: Wed Apr 26 00:52:03 EDT 2023
Committee: NEC-P08

Committee Statement

Resolution: The single word term 'liquidtight' is retained to facilitate electronic searching and is a common industry term used by manufacturers.

Public Input No. 911-NFPA 70-2023 [New Definition after Definition: Conductor, Insulated. (Ins...]

TITLE OF NEW CONTENT

Type your content here ...

Additional Proposed Changes

File Name	Description	Approved
sodapdf-converted.pdf	Adding definition and description of a conduit nipple	

Statement of Problem and Substantiation for Public Input

Eliminate any confusion between inspectors and field personnel, ass well as streamlining teaching apprentices

Submitter Information Verification

Submitter Full Name: Joshua Youngwirth
Organization: Merit Electric
Street Address:
City:
State:
Zip:
Submittal Date: Wed May 31 19:33:45 EDT 2023
Committee: NEC-P08

Committee Statement

Resolution: 2023 NEC Style Manual 2.1.2.5 states definitions shall not contain requirements. There could be a listed nipple longer than 24 inches. UL 6 Standard for Safety for Electrical Rigid Metal Conduit – Steel defines a nipple as - A straight section of ERMC-S generally not more than 0.6 m (2 ft) long and threaded on each end. Chapter 9 Table 1 Note 4 permits the nipples not longer than 24 inches to be filled to 60%. It does not prohibit nipples longer than 24 inches but would limit the fill to the cross section percentages identified in Chapter 9 Table 1 based on the number of conductors.

Conduit Nipple
A length of EMT, RMC, PVC, etc. not exceeding 24" that shall not require a support

Public Input No. 1357-NFPA 70-2023 [New Definition after Definition: Neutral Point.]

TITLE OF NEW CONTENT

Nipple

Any tubing or raceway or conduit length 600mm (24") or less in length. Nipples may be factory or field made. Nipples shall be regarded as tubing, raceways, or conduits. Nipples shall not be regarded as fittings.

Statement of Problem and Substantiation for Public Input

Clarity on nipples is needed, prompting this public input and another public input at 300.18C. One dictionary definition for nipple is, "A pipe coupling consisting of a short piece of threaded tubing." Although being mentioned in Chapter 9 Tables, our NEC does not have an official definition for nipple. The definition proposed would include flexible or hard raceways, and it would include threaded and non-threaded raceways. Nipples are usually treated as raceways in practice but it needs to be stated they are regarded as raceways not fittings, even a chase nipple or a factory made offset nipple.

Adopting this public input allows:

1. Cables entering an enclosure may use a chase nipple as a raceway for protection instead of their 300.15 fitting (example: NM entering the back of a residential panelboard).
2. Easier enforcement of 250.80 and 250.92A metal service raceway bonding.
3. Aligns with Chapter 9 Notes to Tables (4). Here it is referred to as 'tubing nipple'.
4. Aligns with Chapter 9 Table 4 conduit fill tables.
5. Aligns with 310.15C1b regarding ampacity.
6. With the adoption of the 300.18C, gets rid of the mystery, "Do short sections of raceway require securing or supporting?" since it isn't sufficiently spelled out in the NEC. The .30s can be argued either way on this.
7. Mates nicely with articles 250.102C2 and 250.122F1b.
8. As proposed, smaller length nipples such as chase nipples and factory made offset nipples are also categorized as tubing/raceways/conduits.

Please see my new and related public input at 300.18C as well.

Related Public Inputs for This Document

Related Input	Relationship
Public Input No. 1360-NFPA 70-2023 [New Section after 300.18(B)]	
Public Input No. 1360-NFPA 70-2023 [New Section after 300.18(B)]	

Submitter Information Verification

Submitter Full Name: Norman Feck

Organization: State of Colorado

Affiliation: self

Street Address:

City:

State:

Zip:

Submittal Date: Mon Jul 10 17:33:48 EDT 2023

Committee: NEC-P08

Committee Statement

Resolution: 2023 NEC Style Manual 2.1.2.5 states definitions shall not contain requirements. There could be a listed nipple longer than 24 inches. UL 6 Standard for Safety for Electrical Rigid Metal Conduit – Steel defines a nipple as - A straight section of ERMC-S generally not more than 0.6 m (2 ft) long and threaded on each end. Chapter 9 Table 1 Note 4 permits the nipples not longer than 24 inches to be filled to 60%. It does not prohibit nipples longer than 24 inches but would limit the fill to the cross section percentages identified in Chapter 9 Table 1 based on the number of conductors.

Public Input No. 855-NFPA 70-2023 [New Definition after Definition: Nonautomatic.]

TITLE OF NEW CONTENT

Type your content here ...

Additional Proposed Changes

File Name	Description	Approved
Document_1_.pdf		

Statement of Problem and Substantiation for Public Input

No where do I see the definition of a nipple in the code book.

Submitter Information Verification

Submitter Full Name:	Vlad Ilinsky
Organization:	[Not Specified]
Street Address:	
City:	
State:	
Zip:	
Submittal Date:	Sun May 21 09:45:41 EDT 2023
Committee:	NEC-P08

Committee Statement

Resolution: 2023 NEC Style Manual 2.1.2.5 states definitions shall not contain requirements. There could be a listed nipple longer than 24 inches. UL 6 Standard for Safety for Electrical Rigid Metal Conduit – Steel defines a nipple as - A straight section of ERMC-S generally not more than 0.6 m (2 ft) long and threaded on each end. Chapter 9 Table 1 Note 4 permits the nipples not longer than 24 inches to be filled to 60%. It does not prohibit nipples longer than 24 inches but would limit the fill to the cross section percentages identified in Chapter 9 Table 1 based on the number of conductors.

Nipple.

A nipple is a short piece of conduit up to 24 inches long that’s used to extend a conduit system by coupling items together or connecting conduit to another element in the conduit system.

Public Input No. 3497-NFPA 70-2023 [New Section after 312.1]

312.2 Listing Requirements

Nonmetallic cabinets shall be listed, or they shall be submitted for approval prior to installation.

Statement of Problem and Substantiation for Public Input

This Public Input is being submitted on behalf of the NEC Correlating Committee Usability Task Group in order to provide correlation throughout the document. A new section is added to comply with the NEC Style Manual Section 2.2.1 regarding Listing Requirements.

2.2.1 Parallel Numbering Required. Technical committees shall use the following section numbers for the same purposes within articles. This requirement shall not apply to Articles 90, 100, and 110. If the article does not contain listing or reconditioning requirements, the subdivisions shall not be included in the article.

Required Parallel Numbering Format

XXX.1 Scope.

XXX.2 Listing Requirements.

XXX.3 Reconditioned Equipment.

XXX.3(A) Permitted to be Installed.

XXX.3(B) Not Permitted to be Installed.

The Usability Task Group members are: Derrick Atkins, David Hittinger, Richard Holub, Dean Hunter, Chad Kennedy and David Williams.

Submitter Information Verification

Submitter Full Name: David Williams

Organization: Delta Charter Township

Street Address:

City:

State:

Zip:

Submittal Date: Mon Sep 04 16:57:21 EDT 2023

Committee: NEC-P08

Committee Statement

Resolution: FR-7876-NFPA 70-2024

Statement: The language from existing 312.100(C) is relocated without change as a new 312.2. This revision complies with the NEC Style Manual Section 2.2.1 regarding Listing Requirements and provides correlation and parallel numbering throughout the document.

Public Input No. 1461-NFPA 70-2023 [Section No. 312.2]

312.2 Damp or Wet Locations.

In damp or wet locations, surface-type enclosures within the scope of this article shall be placed or equipped so as to prevent moisture or water from entering and accumulating within the cabinet or cutout box, and shall be mounted so there is at least 6-mm (¼-in.) airspace between the enclosure and the wall or other supporting surface. Enclosures installed in wet locations shall be weatherproof. For enclosures in wet locations, raceways or cables entering above the level of uninsulated live parts shall use <u>threaded hub</u> fittings listed for wet locations.

Exception: Nonmetallic enclosures shall be permitted to be installed without the airspace on a concrete, masonry, tile, or similar surface.

Informational Note: See 300.6 for protection against corrosion.

Statement of Problem and Substantiation for Public Input

The problem is threaded hub fittings are not always used above uninsulated parts and NEC users could use language that is more black and white to require threaded hub fittings to comply with 312.2. As written, it appears all listed raintight fittings are code compliant for this condition. For examples, if an installation solely used raintight EMT connectors or PVC male adapters with locknuts, instead of threaded hub fittings above the uninsulated parts level, that installation is code compliant as written but is also compromised by allowing water and moisture to enter the enclosure around the inferior fittings. They are inferior as far as sealing the penetrated opening. Either the shoulder of the fitting, the fitting's locknut, or both do not effectively seal the penetrated opening. Current NEC language doesn't directly show this to be a code violation.

Another problem unique to metal fittings with gaskets is their gaskets get squished out from underneath the fittings' shoulder when making the fittings wrench tight as required by their respective code article or 250.120. Degree of severity varies per fitting manufacturer.

The common practice in the field is to install threaded hub fittings when penetrating outdoor enclosures that are rated for the condition per 110.28 for raceways or cables. The current wording in the last sentence of 312.2 comes up just shy of requiring threaded hub fittings for these raceway and cable entries unless 110.3B covered it for a particular manufacturer according the their instructions.

For the most part, our Electrical Board enforces the NEC, no more and no less. NEC users could use this more specific code reference to help prevent water in the enclosures, corrosion on uninsulated live parts, or failure of components not listed for the damp or wet exposure. Mandating threaded hub fittings above uninsulated live parts should be considered by the CMP if it's not mandatory already. One goal of 312.2 is to prevent water, weather, and condensation from entering damp or wet located enclosures and the way to accomplish it is with threaded hub fittings. NEC language of 312.2 should reflect the mandate.

Submitter Information Verification

Submitter Full Name: Norman Feck
Organization: State of Colorado
Affiliation: self
Street Address:
City:
State:

Zip:
Submittal Date: Tue Jul 18 07:27:00 EDT 2023
Committee: NEC-P08

Committee Statement

Resolution: Enclosures in wet locations, raceways or cables entering above the level of uninsulated live parts shall use fittings listed for wet locations. The proposed language would limit the fitting type to only threaded connections and would prohibit other types. Evaluation of fittings is performed through the product standards under specified test conditions and is beyond the scope of this installation document.

Public Input No. 3969-NFPA 70-2023 [Section No. 312.2]

312.2 Damp or Wet Locations.

(A) Weatherproof Enclosure. In damp or wet locations, surface-type enclosures within the scope of this article shall be placed or equipped so as to prevent moisture or water from entering and accumulating within the cabinet or cutout box, and shall be mounted so there is at least 6-mm (¼ -in.) airspace between the enclosure and the wall or other supporting surface. Enclosures installed in wet locations shall be weatherproof.

(B) Raceways or Cables Above Live Parts. For enclosures in wet locations, raceways or cables entering above the level of uninsulated live parts shall use fittings listed for wet locations.

Exception: Nonmetallic enclosures shall be permitted to be installed without the airspace on a concrete, masonry, tile, or similar surface.

Informational Note: See 300.6 for protection against corrosion.

Statement of Problem and Substantiation for Public Input

Breaking up 312.2 into a list item format to facilitate understanding for Code users. In accordance with NFPA Style Manual section 3.5.1.2 additional subdivisions shall be used where multiple requirements can be broken into independent requirements.

Submitter Information Verification

Submitter Full Name: Mike Holt
Organization: Mike Holt Enterprises Inc
Street Address:
City:
State:
Zip:
Submittal Date: Wed Sep 06 11:36:45 EDT 2023
Committee: NEC-P08

Committee Statement

Resolution: FR-7886-NFPA 70-2024

Statement: Section 312.2 which contains multiple requirements is parsed into two list items without technical changes to the provisions. This change improves clarity and is in accordance with NFPA Style Manual section 3.5.1.2. The content is relocated from 312.2 to Section 312.4 for correlation with NEC Style Manual Section 2.2.1 regarding Listing Requirements being located as the xxx.2 section and reconditioning requirements located as xxx.3.

Public Input No. 3162-NFPA 70-2023 [Section No. 312.5]

312.5 Cabinets, Cutout Boxes, and Meter Socket Enclosures.

~~Cable~~ Raceways, cable assemblies, and insulated conductors entering enclosures within the scope of this article shall be protected from abrasion and shall comply with 312.5(A) through (C).

(A) Openings to Be Closed.

Openings through which raceways, cables, and conductors enter shall be closed in an approved manner.

(B) Metal Cabinets, Cutout Boxes, and Meter Socket Enclosures.

Where metal enclosures within the scope of this article 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 and firmly secured to the enclosure.

(C)~~–~~ **Raceways and** Cables.

(1) For complete raceway runs, each raceway shall be secured to the cabinet, cutout box, or meter socket enclosure.

Informational Note: See 300.18 for raceway installation requirements.

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

Exception No. 1: 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 (¼ 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 does not apply to this condition.

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

Exception No. 2: Single conductors and multiconductor cables shall be permitted to enter enclosures in accordance with 392.46(A) or (B).

Statement of Problem and Substantiation for Public Input

Added raceways to the section so that it's clear that raceways are also required to be secured. This proposed revision will improve clarity and usability for Code users.

Submitter Information Verification

Submitter Full Name: Mike Holt
Organization: Mike Holt Enterprises Inc
Street Address:
City:
State:
Zip:
Submittal Date: Tue Aug 29 20:27:31 EDT 2023
Committee: NEC-P08

Committee Statement

Resolution: Adding the proposed language to the charging text of 312.5 would have the unintended consequence of requiring raceways to be protected from abrasion. Some raceways can provide abrasion protection. The proposed addition to (C) is not necessary as these requirements are covered elsewhere in the Code.

Public Input No. 2377-NFPA 70-2023 [Section No. 312.5(A)]

(A)~~–~~ **Unused** Openings to Be Closed.

~~Openings~~ Unused openings through which conductors, cables, and raceways may enter shall ~~be closed in an approved manner.~~ comply with 110.12(A).

Statement of Problem and Substantiation for Public Input

Added cables and raceways for this requirement to apply to more than just conductors. Revised text to reference 110.12(A) to clarify that this requirement is about unused opening to be closed.

Submitter Information Verification

Submitter Full Name: Mike Holt
Organization: Mike Holt Enterprises Inc
Street Address:
City:
State:
Zip:

Submittal Date: Wed Aug 16 15:17:23 EDT 2023
Committee: NEC-P08

Committee Statement

Resolution: FR-7877-NFPA 70-2024

Statement: This revision clarifies that openings may be suitable for not only conductors, but also cables and raceways. Unused openings are addressed in 110.12(A) and are not duplicated here.

Public Input No. 2378-NFPA 70-2023 [Section No. 312.5(A)]

(A) Openings to Be Closed.

Openings through which conductors, cables, and raceways enter shall be ~~closed in an approved manner~~ terminated with listed fittings .

Statement of Problem and Substantiation for Public Input

Added cables and raceways for this requirement to apply to more than just conductors. Revised text to clarify this requirement is about using listed connectors for terminations at cabinets.

Submitter Information Verification

Submitter Full Name:	Mike Holt
Organization:	Mike Holt Enterprises Inc
Street Address:	
City:	
State:	
Zip:	
Submittal Date:	Wed Aug 16 15:18:47 EDT 2023
Committee:	NEC-P08

Committee Statement

Resolution: The existing language is clear. The various wiring method articles already address approved termination methods of raceways and cables.

Public Input No. 220-NFPA 70-2023 [Section No. 312.5(C)]

(C) Cables.

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

Exception No. 1: 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 (¼ 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 does not apply to this condition.

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

Exception No. 2: Single conductors and multiconductor cables shall be permitted to enter enclosures in accordance with 392.46(A) or (B).

Statement of Problem and Substantiation for Public Input

The current wording appears to cover cables that enter a cabinet through a complete raceway system from another enclosure. However I do not believe that is the intent; the analogous section for junction boxes, 314.17(B), exempts that case in subsection (3). The proposed revision clarifies that the requirement does not apply to raceway wiring methods.

Submitter Information Verification

Submitter Full Name: Wayne Whitney
Organization: [Not Specified]
Street Address:
City:
State:
Zip:

Submittal Date: Tue Jan 24 16:13:08 EST 2023
Committee: NEC-P08

Committee Statement

Resolution: FR-7879-NFPA 70-2024
Statement: This revision clarifies that the securing requirement does not apply to cables contained in a raceway wiring method.

Public Input No. 2202-NFPA 70-2023 [Section No. 312.5(C)]

(C) Cables.

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

Exception No. 1: 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 (¼ 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 does not apply to this condition.

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

Exception No. 2: Single conductors and multiconductor cables shall be permitted to enter enclosures in accordance with 392.46(A) or (B).

Statement of Problem and Substantiation for Public Input

If this installation is considered safe for surface mounted enclosures it should also be considered safe for recessed mounted enclosures. Removing ‘surface mounted’ would allow NM cables to be installed in a raceway sleeve for recessed mounted enclosures where the NM cables are subject to physical damage from penetration of screws or nails.

Submitter Information Verification

Submitter Full Name: Mike Holt

Organization: Mike Holt Enterprises Inc

Street Address:

City:

State:

Zip:

Submittal Date: Mon Aug 14 14:21:35 EDT 2023
Committee: NEC-P08

Committee Statement

Resolution: The existing Exception No. 1 provides conditions that permit nonmetallic sheathed cables to enter the top of a surface-mounted enclosure through one or more nonflexible raceway sleeves. Insufficient substantiation has been provided to expand the provisions of Exception No. 1 to include recessed applications and sacrifice the end fitting accessibility. See 300.4 for further information on protecting conductors, raceways, and cables from physical damage.

Public Input No. 2298-NFPA 70-2023 [Section No. 312.5(C)]

(C) Cables.

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

Exception No. 1: 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 (¼ 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 does not apply to this condition.

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

Exception No. 2: Single conductors and multiconductor cables shall be permitted to enter enclosures in accordance with 392.46(A) or (B).

Statement of Problem and Substantiation for Public Input

This rule is ambiguous as it does not specify how the cable needs to be secured. All of the cable articles require that the cable and associated fittings be listed. This change will reinforce the requirement that cables be secured using listed fittings.

Submitter Information Verification

Submitter Full Name: Don Ganiere

Organization: none

Street Address:

City:

State:

Zip:

Submittal Date: Tue Aug 15 17:47:40 EDT 2023

Committee: NEC-P08

Committee Statement

Resolution: The proposed language is not necessary. The x.2 section of the cable articles requires the cables and associated fittings to be listed.

Public Input No. 961-NFPA 70-2023 [Section No. 312.6(C)]

~~**(C)** Conductors 4 AWG or Larger.~~

~~Installation shall comply with 300.4(G) .~~

Statement of Problem and Substantiation for Public Input

There is no reason to reference the rule in 300.4(G) as it automatically applies to Article 312 installations.

Submitter Information Verification

Submitter Full Name:	Don Ganiere
Organization:	none
Street Address:	
City:	
State:	
Zip:	
Submittal Date:	Tue Jun 06 21:11:04 EDT 2023
Committee:	NEC-P08

Committee Statement

Resolution: FR-7880-NFPA 70-2024

Statement: 312.6(C) is removed as it is redundant with the requirements of 300.4(G) which apply where 4 AWG or larger insulated circuit conductors enter a cabinet, a box, an enclosure, or raceway. The charging text in 312.6 is modified for correlation with the removal of 312.6(C).

Public Input No. 2177-NFPA 70-2023 [Section No. 312.6 [Excluding any Sub-Sections]]

Conductors at terminals or conductors entering or leaving cabinets, cutout boxes, and meter socket enclosures shall comply with 312.6(A) through (C). (add language specifying the angle at which conductor deflection rules apply)

Exception: Wire-bending space in enclosures for motor controllers with provisions for one or two wires per terminal shall comply with 430.10(B).

Statement of Problem and Substantiation for Public Input

312.6 - add language specifying the angle at which conductor deflection rules apply. Article 312.6 is silent regarding the angle of conductor deflection which necessities consideration. While Articles 366.58 (A), 376.23 (A), 378.23 (A), for example require conductors with a deflection greater than 30 degrees to align with the one wire per terminal in Table 312.6(A); similar requirements should be provided in 312.6 “Deflection of Conductors” there are other instances in which conductors are deflected but do not fall under one of the afore referenced articles.

Submitter Information Verification

Submitter Full Name: Gary Hein
Organization: [Not Specified]
Street Address:
City:
State:
Zip:
Submittal Date: Mon Aug 14 12:30:31 EDT 2023
Committee: NEC-P08

Committee Statement

Resolution: This public input does not contain wording to be added, text to be revised, or text to be deleted. See section 4.3.4 of the Regulations Governing the Development of NFPA Standards for public input contents.

Public Input No. 3946-NFPA 70-2023 [Section No. 312.8]

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 subject to limitations for specific equipment as provided in 312.8(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 installed at any cross section of the wiring space does not exceed 75 percent of the cross-sectional area of that space.

(3) The bending space for conductors 4 AWG and larger complies with 314.28(A)(2).

(4) 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) Power Monitoring or Energy Management Equipment.

The wiring space of enclosures for switches or overcurrent devices shall be permitted to contain power monitoring or energy management equipment in accordance with 312.8(B)(1) through (B)(3).

(1) Identification.

Power monitoring or energy management equipment shall either be identified as a field installable accessory as part of the listed equipment or be a listed kit evaluated for field installation in switch or overcurrent device enclosures.

(2) Area.

The total area of all conductors, splices, taps, and equipment at any cross section of the wiring space shall not exceed 75 percent of the cross-sectional area of that space.

(3) Conductors.

Conductors used exclusively for control or instrumentation circuits shall comply with either 312.8(B)(3)(a) or (B)(3)(b).

(a) Conductors shall comply with 724.49.

(b) Conductors smaller than 18 AWG, but not smaller than 22 AWG for a single conductor and 26 AWG for a multiconductor cable, shall be permitted to be used where the conductors and cable assemblies meet all of the following conditions:

(1) Are enclosed within raceways or routed along one or more walls of the enclosure and secured at intervals that do not exceed 250 mm (10 in.)

(2) Are secured within 250 mm (10 in.) of terminations

(3) Are secured to prevent contact with current carrying components within the enclosure

(4) Are rated for the system voltage and not less than 600 volts

(5) Have a minimum insulation temperature rating of 90°C

Additional Proposed Changes

File Name	Description	Approved
PC_423_CMP_9.pdf	NEC_PC423	

Statement of Problem and Substantiation for Public Input

NOTE: This Public Input appeared as “Reject but Hold” in Public Comment No. 423 of the (A2022) Second Draft Report for NFPA 70 and per the Regs. at 4.4.8.3.1.

This Public Comment addresses an enforcement issue. Any legislative underlining within 312.8(B)(3)(b) list items are an insurrection conducted solely by domestic TerrorismView, and are NOT part of this Public
Comment.

Section 312.8 resides within Part I General of Article 312 and, as such, should encompass requirements
for meter socket enclosures as well as for cabinets and cutout boxes. Based on 110.3(A)(1), those installation considerations that are not addressed by explicit rules (mandatory, permissive, informational)
within the Code are considered inherently to be in conformity with the Code, unless the AHJ determines otherwise.

Presently, 312.8(A) explicitly addresses the permissibility of feed-through, splice, and tap conductors in cabinets and cutout boxes but is silent regarding such conductors in meter socket enclosures. Are feedthrough,
splice, and tap conductors in meter socket enclosures prohibited because they are not explicitly addressed in 312.8 or permitted implicitly because they are not mentioned. In the last Code cycle, CMP-9
addressed correctly such an issue in 312.6 by First Revision No. 7536-NFPA 70-2018 by explicitly including meter socket enclosures. The accepted changes of First Revision No. 7708-NFPA 70-2020 raise similar enforcement concerns. Are meter socket enclosures that normally contain both supply and load terminated service conductors also permitted to serve as junction boxes, pull-through boxes and cabinets. This does not seem to be a safe and prudent practice.

CMP-9 may wish to similarly modify 312.8(B) to be readable explicitly as permissively including or as prohibitively excluding meter socket enclosures. Due to my unfamiliarity with the nuances of connection of power monitoring and energy management equipment, I defer to CMP-9's expertise for that 312.8(B) decision.

Submitter Information Verification

Submitter Full Name:	CMP ON NEC-P09
Organization:	Code-Making Panel 9
Street Address:	
City:	
State:	
Zip:	
Submittal Date:	Wed Sep 06 11:02:56 EDT 2023
Committee:	NEC-P08

Committee Statement

Resolution: FR-7884-NFPA 70-2024

Statement: This revision modifies the requirements by adding a new list item (5) and adds additional language relative to meter socket wiring spaces. This change will preclude meter socket enclosures from containing non-service conductors and will clarify that service conductors are not permitted to run through other enclosures located prior to the service entrance enclosure. It is recognized that splicing of service conductors is permitted in meter socket enclosures and are not included in the new language.

Public Comment No. 423-NFPA 70-2021 [Section No. 312.8]

312.8 Switch and Overcurrent Device Enclosures.

The wiring space within enclosures for switches ~~and~~ , overcurrent devices, and meter sockets shall be permitted for other wiring and equipment subject to limitations for specific equipment as provided in 312.8(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 installed at any cross section of the wiring space does not exceed 75 percent of the cross-sectional area of that space.

(3) The bending space for conductors 4 AWG and larger complies with 314.28(A)(2).

(4) A warning label complying with 110.21(B) is applied to the enclosure that identifies the closest disconnecting means for any feed-through conductors.

The wiring space of enclosures for meter sockets shall not contain conductors feeding through, spliced, or tapping off to other enclosures, switches, or overcurrent devices. This requirement does not preclude conductors terminating to the meter socket.

(B) Power Monitoring or Energy Management Equipment.

The wiring space of enclosures for switches or overcurrent devices shall be permitted to contain power monitoring or energy management equipment in accordance with 312.8(B)(1) through (B)(3).

(1) Identification.

Power monitoring or energy management equipment shall either be identified as a field installable accessory as part of the listed equipment or be a listed kit evaluated for field installation in switch or overcurrent device enclosures.

(2) Area.

The total area of all conductors, splices, taps, and equipment at any cross section of the wiring space shall not exceed 75 percent of the cross-sectional area of that space.

(3) Conductors.

Conductors used exclusively for control or instrumentation circuits shall comply with either 312.8(B)(3)(a) or (B)(3)(b).

(a) Conductors shall comply with 725.49.

(b) Conductors smaller than 18 AWG, but not smaller than 22 AWG for a single conductor and 26 AWG for a multiconductor cable, shall be permitted to be used where the conductors and cable assemblies meet all of the following conditions:

(3) Are enclosed within raceways or routed along one or more walls of the enclosure and secured at intervals that do not exceed 250 mm (10 in.)

(4) Are secured within 250 mm (10 in.) of terminations

(5) Are secured to prevent contact with current carrying components within the enclosure

(6) Are rated for the system voltage and not less than 600 volts

(7) Have a minimum insulation temperature rating of 90°C

Statement of Problem and Substantiation for Public Comment

This Public Comment addresses an enforcement issue. Any legislative underlining within 312.8(B)(3)(b) list items are an insurrection conducted solely by domestic TerrorismView, and are NOT part of this Public Comment.

Section 312.8 resides within Part I General of Article 312 and, as such, should encompass requirements for meter socket enclosures as well as for cabinets and cutout boxes. Based on 110.3(A)(1), those installation considerations that are not addressed by explicit rules (mandatory, permissive, informational) within the Code are considered inherently to be in conformity with the Code, unless the AHJ determines otherwise.

Presently, 312.8(A) explicitly addresses the permissibility of feed-through, splice, and tap conductors in cabinets and cutout boxes but is silent regarding such conductors in meter socket enclosures. Are feed-through, splice, and tap conductors in meter socket enclosures prohibited because they are not explicitly addressed in 312.8 or permitted implicitly because they are not mentioned. In the last Code cycle, CMP-9 addressed correctly such an issue in 312.6 by First Revision No. 7536-NFPA 70-2018 by explicitly including meter socket enclosures. The accepted changes of First Revision No. 7708-NFPA 70-2020 raise similar enforcement concerns. Are meter socket enclosures that normally contain both supply and load terminated service conductors also permitted to serve as junction boxes, pull-through boxes and cabinets. This does not seem to be a safe and prudent practice.

CMP-9 may wish to similarly modify 312.8(B) to be readable explicitly as permissively including or as prohibitively excluding meter socket enclosures. Due to my unfamiliarity with the nuances of connection of power monitoring and energy management equipment, I defer to CMP-9's expertise for that 312.8(B) decision.

Related Item

• First Revision No. 7708-NFPA 70-2020 • First Revision No. 7536-NFPA 70-2018

Submitter Information Verification

Submitter Full Name: Brian Rock
Organization: Hubbell Incorporated
Street Address:
City:

State:	
Zip:	
Submittal Date:	Tue Jul 27 13:48:39 EDT 2021
Committee:	NEC-P09

Committee Statement

Committee Action:	Rejected but held
Resolution:	CMP 9 agrees with the concept that this rule needs to address applications involving meter socket enclosures. However, the concept was not considered in the First Draft Report, so it is considered to be new material at this stage. The public comment is held for re-consideration during the next revision cycle.

Public Input No. 3003-NFPA 70-2023 [Section No. 312.8(A)]

(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 installed at any cross section of the wiring space does not exceed 75 percent of the cross-sectional area of that space.

(3) The bending space for conductors 4 AWG and larger complies with 314.28(A)(2).

(4) A warning label complying with 110.21(B) is applied to the enclosure that identifies the closest disconnecting means for any feed-through conductors.

(5) <u>The conductors are not service conductors.</u>

Additional Proposed Changes

File Name	Description	Approved
Service_Conductors_Passing_Through_Panelboard_AL_AHJ.jpg	Service conductors spliced and passing through a panelboard to an ATS that is now the service disconnect.	

Statement of Problem and Substantiation for Public Input

An existing residential service was being modified with an automatic transfer switch (ATS) now becoming the service disconnect. The contractor spliced and extended the existing service conductors, leaving them in the existing enclosure. Now when the main breaker is switched to the off position, it may be assumed that all equipment and conductors within the downstream equipment is de-energized. This would be an unsafe assumption. Additionally, since these are service conductors, there is no way to de-energize short of a scheduled utility shutdown or the utility meter is pulled. Currently, the installer may just apply a 312.8(A)(4) warning label that identifies “To disconnect the service conductors, pull the utility meter”.

Pulling the meter is not a safe manner with which to remove power due to a possible arc flash concern. A person may cut the service conductors believing them to be de-energized since the main disconnect is in the off position. Cutting energized conductors can introduce large amounts of energy in the immediate vicinity of the person and potentially create an arc flash with no overcurrent device that could minimize the arc flash energy by opening the circuit.

Submitter Information Verification

Submitter Full Name: Jeffrey Fecteau

Organization: UL Solutions

Street Address:

City:
State:
Zip:
Submittal Date: Mon Aug 28 15:40:38 EDT 2023
Committee: NEC-P08

Committee Statement

Resolution: FR-7884-NFPA 70-2024

Statement: This revision modifies the requirements by adding a new list item (5) and adds additional language relative to meter socket wiring spaces. This change will preclude meter socket enclosures from containing non-service conductors and will clarify that service conductors are not permitted to run through other enclosures located prior to the service entrance enclosure. It is recognized that splicing of service conductors is permitted in meter socket enclosures and are not included in the new language.

Public Input No. 626-NFPA 70-2023 [New Section after 314.1]

314.2 Reconditioned Equipment

Boxes, Conduit Bodies, and Handhole Enclosures shall not be reconditioned.

Statement of Problem and Substantiation for Public Input

Boxes, Conductors, Raceways, Strut-type Channel Raceways, Fixture Wires, Cablebus, Cables, Conduits, Tubings, Flexible Cords, Flexible Cables, Cable Trays, MV Cables, Wireways, etc. etc. are not permitted to be reconditioned per the NEMA Technical Position on Reconditioned Equipment (NEMA CS 100-2020, Appendix B.1)

Submitter Information Verification

Submitter Full Name: Russ Leblanc

Organization: Leblanc Consulting Services

Street Address:

City:

State:

Zip:

Submittal Date: Sun Apr 16 09:09:18 EDT 2023

Committee: NEC-P08

Committee Statement

Resolution: FR-7638-NFPA 70-2024

Statement: The panel is not aware of any established programs that provide an acceptable approach to reconditioning for this type of equipment and maintain its listing. Section 110.20 indicates that equipment is permitted to be reconditioned unless otherwise prohibited.

Public Input No. 1769-NFPA 70-2023 [Section No. 314.3]

314.3 Nonmetallic Boxes.

Nonmetallic boxes shall be permitted only with open wiring on insulators, concealed knob-and-tube wiring, cabled wiring methods with entirely nonmetallic sheaths, flexible cords, and nonmetallic raceways.

Exception No. 1: Where ~~internal bonding means are provided between all entries, nonmetallic boxes shall be permitted to be used with metal raceways or metal-armored cables. Exception No. 2: Where integral bonding means with a provision for attaching an equipment bonding jumper inside the box are provided between all threaded entries in nonmetallic boxes listed for the purpose, nonmetallic boxes shall be permitted to be used with metal raceways or metal-armored cables.~~ installed in accordance with 250.109(B) and exceptions.

Statement of Problem and Substantiation for Public Input

A public input has been submitted to 250.109 to establish grounding and bonding requirements applicable to all nonmetallic boxes and enclosures. Article 250 is the proper place for these provisions. This companion public input is submitted to correlate these changes. The two exceptions presently provided in 314.3 are no longer needed with the addition of the provisions of 250.109(B). Exception 1 has been revised to point the user to 250.109(B) and exceptions where metallic wiring methods are allowed for nonmetallic boxes.

Note: The revised text in Exception No. 1 is correct. Not too sure why Terra View moved text from Exception No. 2 in the middle of the added text.

Submitter Information Verification

Submitter Full Name: Rudy Garza

Organization: IAEI

Street Address:

City:

State:

Zip:

Submittal Date: Tue Aug 01 14:38:05 EDT 2023

Committee: NEC-P08

Committee Statement

Resolution: FR-7519-NFPA 70-2024

Statement: This revision revises two exceptions into one and clarifies the exception that nonmetallic boxes are permitted to be used with metal conduit as permitted by 250.109(B) which specifies the method for an effective ground fault path.

Public Input No. 3639-NFPA 70-2023 [Section No. 314.3]

314.3 Nonmetallic Boxes.

Nonmetallic boxes shall be permitted only with open wiring on insulators, concealed knob-and-tube wiring, cabled wiring methods with entirely nonmetallic sheaths, flexible cords, and nonmetallic raceways.

~~*Exception No. 1: Where internal bonding means are provided between all entries, nonmetallic*~~

Exception: Nonmetallic boxes shall be permitted to be

~~*used*~~

installed with metal

~~*raceways*~~

conduit or metal

~~*-armored cables. Exception No. 2: Where integral bonding means with a provision for attaching an equipment bonding jumper inside the box are provided between all threaded entries in nonmetallic boxes listed for the purpose, nonmetallic boxes shall be permitted to be used with metal raceways or metal-armored cables.*~~

armored cable in accordance with 250.109(B) and exceptions.

Additional Proposed Changes

File Name	Description	Approved
314._3_Proposed_Text_Submittal_r1.docx	Proposed code change text due to Terra errors in edits to the exiting text.	
250.109_Proposed_Text_Submittal.docx	Public Input with proposed text for 250.109	
PI_250.109_Photos.pdf	Example photos of issues submitted with Public Input for 250.109	

Statement of Problem and Substantiation for Public Input

A public input has been submitted to 250.109 to establish grounding and bonding requirements applicable to all nonmetallic boxes and enclosures. Article 250 is the proper place for these provisions. This companion public input is submitted to correlate these changes. The two exceptions presently provided in 314.3 are no longer needed with the addition of the provisions of 250.109(B). Exception 1 has been revised to point the user to 250.109(B) and exceptions where metallic wiring methods are allowed for nonmetallic boxes. A copy of the proposed changed to 250.109 are attached for reference.

Related Public Inputs for This Document

Related Input	Relationship
Public Input No. 3470-NFPA 70-2023 [Section No. 250.109]	
Public Input No. 3470-NFPA 70-2023 [Section No. 250.109]	

Submitter Information Verification

Submitter Full Name: Charles Mello

Organization: Cdcmello Consulting Llc
Affiliation: Self
Street Address:
City:
State:
Zip:
Submittal Date: Tue Sep 05 11:12:46 EDT 2023
Committee: NEC-P08

Committee Statement

Resolution: FR-7519-NFPA 70-2024

Statement: This revision revises two exceptions into one and clarifies the exception that nonmetallic boxes are permitted to be used with metal conduit as permitted by 250.109(B) which specifies the method for an effective ground fault path.

314,3 Proposed revised text

Revisions for 314.3

314.3 Nonmetallic Boxes.

Nonmetallic boxes shall be permitted only with open wiring on insulators, concealed knob-and-tube wiring, cabled wiring methods with entirely nonmetallic sheaths, flexible cords, and nonmetallic raceways.

~~Exception No. 1: Where internal bonding means are provided between all entries, nonmetallic boxes shall be permitted to be used with metal raceways or metal-armored cables.~~

~~Exception No. 2: Where integral bonding means with a provision for attaching an equipment bonding jumper inside the box are provided between all threaded entries in nonmetallic boxes listed for the purpose, nonmetallic boxes shall be permitted to be used with metal raceways or metal-armored cables.~~

Exception: Nonmetallic boxes shall be permitted to be installed with metal conduit or metal armored cable in accordance with 250.109(B) and exceptions.

Photo 1 – Common Alternate Energy Installation

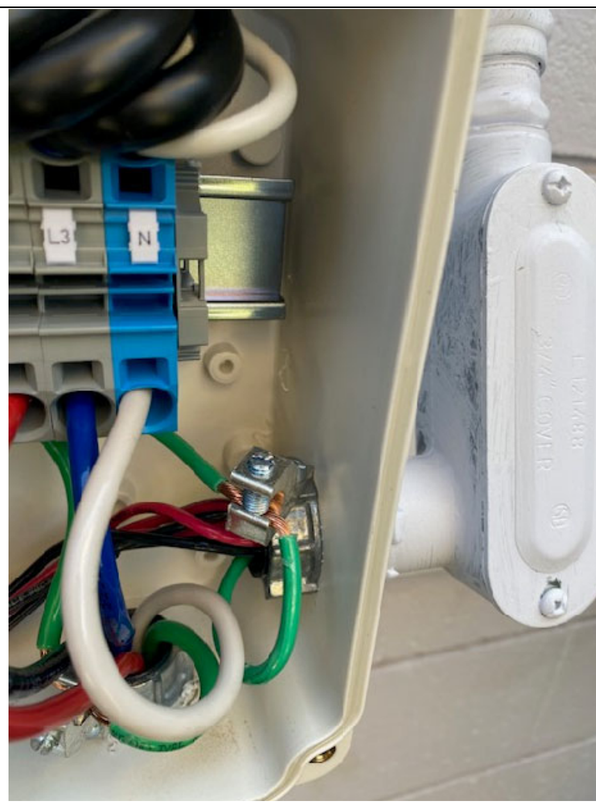


Photo 2 – Proper Bonding Completed but Not Clearly Required

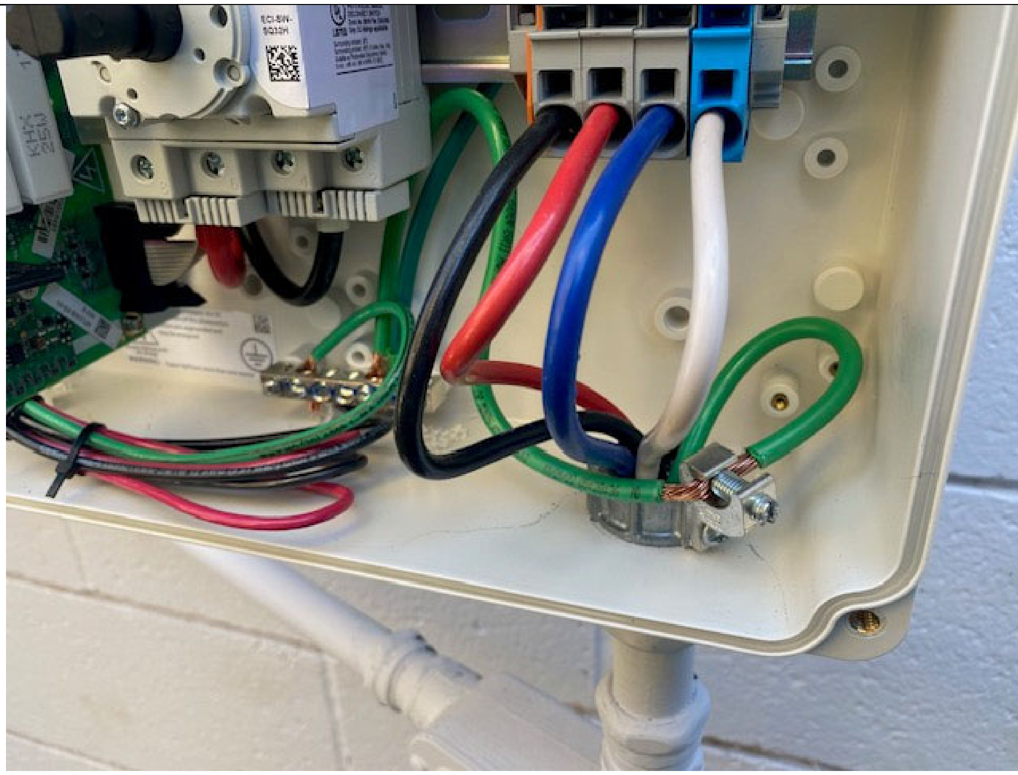


Photo 3 – EMT Into Non-metallic Enclosure

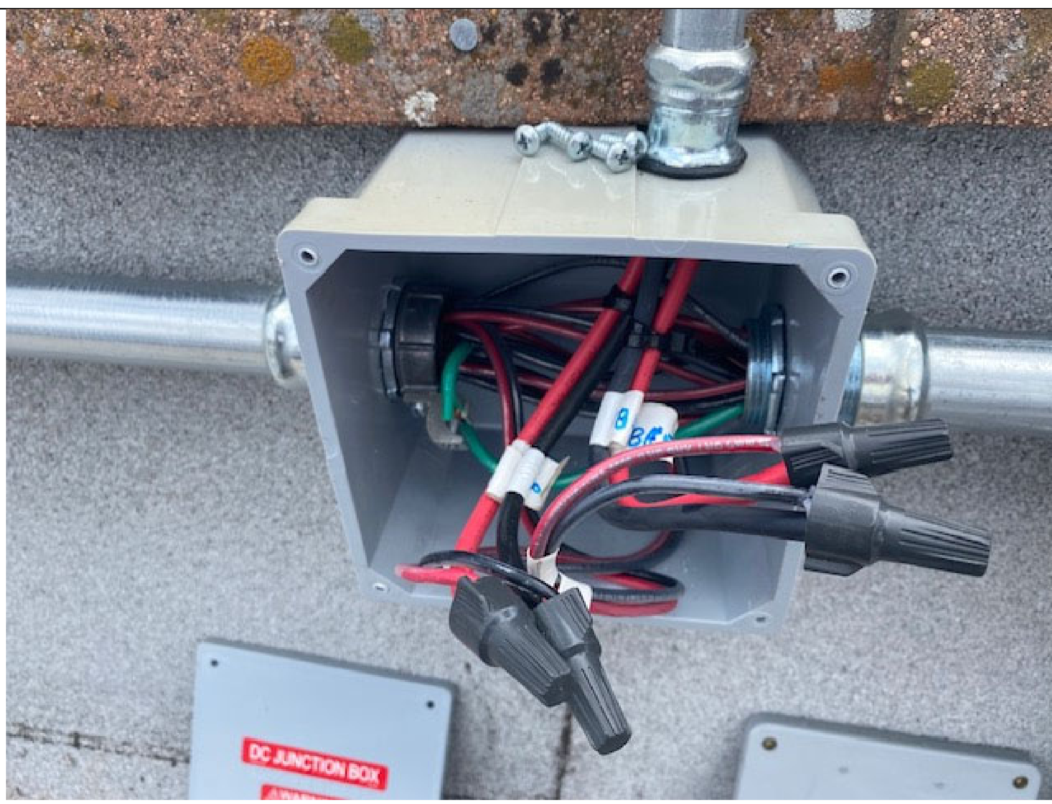


Photo 4 – Non-metallic DC Junction Box with EMT Raceways

Photo 5 – Non-metallic Junction Box with EMT Raceway

250.109 Proposed revised text

250.109 Metal and Nonmetal Enclosures.

Metal enclosures shall be permitted as part of the effective ground fault current path in accordance with 250.109(A). Nonmetallic boxes and enclosures installed with metallic wiring methods shall be installed in accordance with 250.109(B).

(A) Metal Enclosures

Metal enclosures shall be permitted to be used to connect bonding jumpers or equipment grounding conductors, or both, together to become a part of an effective ground-fault current path. If installed, metal covers, plaster rings, extension rings, and metal fittings shall be attached to these metal enclosures to ensure an effective ground-fault current path or shall be connected with bonding jumpers or equipment grounding conductors, or both.

Informational Note: See 250.97 for bonding requirements for over 250 volts to ground.

(B) Nonmetallic Boxes and Enclosures Installed with Metallic Wiring Methods

Nonmetallic boxes and enclosures installed with metal raceways or metal armored cable shall comply with 250.109(B)(1) and 250.109(B)(2).

(1) Nonmetallic boxes and enclosures installed with metallic wiring methods shall have bonding means and equipment bonding jumpers installed for each metal raceway or metal armored cable entry to ensure continuity of the metal wiring method and effective ground fault current path.

(2) Metal covers installed on nonmetallic enclosures shall have an equipment bonding jumper or other bonding means installed from the metal cover to the bonding means provided for the metal raceway or cable armor.

Exception No.1. A listed nonmetallic box or enclosure with integral bonding means to interconnect all metallic raceway or cable armor entries and provide bonding for any metal cover installed shall not be required to have additional bonding means or equipment bonding jumpers installed.

Exception No 2. A nonmetallic box or enclosure that is supplied by a single metal raceway or single metal armored cable shall not be required to have bonding where all the following conditions are met:

1. No other metal raceways, or metal armored type cables enter the box or enclosure.
2. The supply end of the metal raceway or metal armored cable is bonded meeting the requirements of 250.86.
3, A wire type equipment grounding conductor sized in accordance with 250.122 is installed in the metal raceway or armored cable connected to the equipment or device to complete the effective ground fault current path.
4. The conductors installed in the metal raceway or armored cable are not service conductors, grounding electrode conductors, or bonding jumpers interconnecting grounding electrodes.

Public Input No. 2658-NFPA 70-2023 [Section No. 314.4]

314.4 Metal Boxes.

Metal boxes shall be grounded and bonded in accordance with Article 250, Parts I, IV, V, VI, VII, and ~~X of Article 250 as~~ X as applicable, except as permitted in 250.112(I).

Statement of Problem and Substantiation for Public Input

This Public Input is being submitted on behalf of the NEC Correlating Committee Usability Task Group in order to provide correlation throughout the document. The text is revised to to comply with the NEC Style Manual Section 4.1.4, regarding the use of Parts.
4.1.4 References to an Entire Article. References shall not be made to an entire article, except for the Article 100 or where referenced to provide the necessary context. References to specific parts within articles shall be permitted. References to all parts of an article shall not be permitted. The article number shall precede the part number.
The Usability Task Group members are: Derrick Atkins, David Hittinger, Richard Holub, Dean Hunter, Chad Kennedy and David Williams.

Submitter Information Verification

Submitter Full Name: David Williams
Organization: Delta Charter Township
Street Address:
City:
State:
Zip:
Submittal Date: Thu Aug 24 08:06:34 EDT 2023
Committee: NEC-P08

Committee Statement

Resolution: FR-7521-NFPA 70-2024
Statement: Updated text to comply with NEC Style Manual Section 4.1.4, regarding the use of Parts.

Public Input No. 2314-NFPA 70-2023 [Section No. 314.15]

314.~~15~~ 15 Underground, and Damp or Wet Locations.

(A) 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 (⅛ in.) and not larger than 6 mm (¼ 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.

(B) Underground.

Boxes directly buried in the earth shall be identified for use in underground systems and shall be designed and installed to withstand all loads likely to be imposed on them.

Informational Note No. 1: See 314.27(B) for boxes in floors.

Informational Note No. 2: See 300.6 for protection against corrosion.

Informational Note No. 3: See ANSI/ SCTE 77-2013, *Specification for Underground Enclosure Integrity* , for additional information on deliberate and nondeliberate traffic loading that can be expected to bear on underground enclosures.

Additional Proposed Changes

File Name	Description	Approved
IMG_6603.jpeg	Buried 6P rated PVC junction box per 314.29(B) exception	
009.JPG	This buried box was not designed for this purpose!	

Statement of Problem and Substantiation for Public Input

These revisions are necessary to address boxes that are directly buried in the earth in the same manner handhole enclosures are buried in the earth. Section 314.29(B) permits buried boxes to be covered by gravel, light soil, etc.
It is imperative that boxes directly buried in the earth be designed for this purpose. These boxes must also be capable of handling any loads imposed on them such as a person stepping on top of it, or a lawnmower riding over it, or whatever other weight may be imposed on the enclosure. These revisions seek to mimic the requirements in 314.30 for handhole enclosures.
Info. note 3 also mimics the info note in 314.30.
See photo examples showing a 6P rated PVC box rated for direct burial and a buried cast aluminum weatherproof box listed for wet locations, but NOT rated for direct burial. The correct type of boxes must be used in these direct-burial applications.

Submitter Information Verification

Submitter Full Name: Russ Leblanc

Organization: Leblanc Consulting Services

Street Address:

City:

State:

Zip:

Submittal Date: Wed Aug 16 10:44:03 EDT 2023

Committee: NEC-P08

Committee Statement

Resolution: The concerns of the submitter are already covered in 110.3(B) for use in accordance with listing and 314.30 for loading.

Public Input No. 2921-NFPA 70-2023 [Section No. 314.15]

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 (⅛ in.) and not larger than 6 mm (¼ 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: See 314.27(B) for boxes in floors.

Informational Note No. 2: See 300.6 for protection against corrosion.

Statement of Problem and Substantiation for Public Input

Delete '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.' because 314.15 already requires boxes, conduit bodies, outbox hoods and fitting to be listed for a wet location. We have rules in 404.4 relating to enclosure and covers for switches in damp location, and 406.9 requires enclosure and covers for receptacles located in damp locations.

Submitter Information Verification

Submitter Full Name: Mike Holt

Organization: Mike Holt Enterprises Inc

Street Address:

City:

State:

Zip:

Submittal Date: Mon Aug 28 11:28:59 EDT 2023

Committee: NEC-P08

Committee Statement

Resolution: The submitter wants to remove a requirement that is not covered in 404.4 or 406.9. Current text clarifies damp and wet location applies to Outlet, Device, Pull, and Junction Boxes; Conduit Bodies; Fittings; and Handhole Enclosures.

Public Input No. 2922-NFPA 70-2023 [Section No. 314.15]

314.15 Damp or Wet Locations.

(1) Prevent Moisture. 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.

(2) Listed. Boxes, conduit bodies, outlet box hoods, and fittings installed in wet locations shall be listed for use in wet locations.

(3) Drainage. Approved drainage openings not smaller than 3 mm (⅛ in.) and not larger than 6 mm (¼ 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: See 314.27(B) for boxes in floors.

Informational Note No. 2: See 300.6 for protection against corrosion.

Statement of Problem and Substantiation for Public Input

Breaking this section into a list item format because there are multiple requirements. These proposed revisions will bring clarity for Code users.
In accordance with NFPA Style Manual section 3.5.1.2 additional subdivisions shall be used where multiple requirements can be broken into independent requirements.

Submitter Information Verification

Submitter Full Name: Mike Holt
Organization: Mike Holt Enterprises Inc
Street Address:
City:
State:
Zip:
Submittal Date: Mon Aug 28 11:49:46 EDT 2023
Committee: NEC-P08

Committee Statement

Resolution: FR-7522-NFPA 70-2024
Statement: Created subdivisions in accordance with NEC 2023 Style Manual Section 3.5.1.2.

Public Input No. 3972-NFPA 70-2023 [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).

(1) Barriers.

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 (½ $in.^3$) if metal, and 16.4 cm^3 (1.0 $in.^3$) if nonmetallic.

(~~1~~ 2) Standard Boxes.

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

(~~2~~ 3) 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

Box Trade Size			Minimum Volume		Maximum Number of Conductors* (arranged by AWG size)							
mm	in.	-		cm^3	$in.^3$	18	16	14	12	10	8	6
100 × 32	(4 × 1¼)	round/octagonal	205	12.5	8	7	6	5	5	4	2	
100 × 38	(4 × 1½)	round/octagonal	254	15.5	10	8	7	6	6	5	3	
100 × 54	(4 × 2⅛)	round/octagonal	353	21.5	14	12	10	9	8	7	4	
100 × 32	(4× 1¼)	square	295	18.0	12	10	9	8	7	6	3	
100 × 38	(4 × 1½)	square	344	21.0	14	12	10	9	8	7	4	
100 × 54	(4 × 2⅛)	square	497	30.3	20	17	15	13	12	10	6	
120 × 32	(4¹¹⁄₁₆ × 1 ¼)	square	418	25.5	17	14	12	11	10	8	5	
120 × 38	(4¹¹⁄₁₆ × 1 ½)	square	484	29.5	19	16	14	13	11	9	5	
120 × 54	(4¹¹⁄₁₆ × 2 ⅛)	square	689	42.0	28	24	21	18	16	14	8	
75 × 50 × 38	(3 × 2 × 1 ½)	device	123	7.5	5	4	3	3	3	2	1	
75 × 50 × 50	(3 × 2 × 2)	device	164	10.0	6	5	5	4	4	3	2	
75× 50 × 57	(3× 2 × 2 ¼)	device	172	10.5	7	6	5	4	4	3	2	
75 × 50 × 65	(3 × 2 × 2 ½)	device	205	12.5	8	7	6	5	5	4	2	
75 × 50 × 70	(3 × 2 × 2 ¾)	device	230	14.0	9	8	7	6	5	4	2	
75 × 50 × 90	(3 × 2 × 3 ½)	device	295	18.0	12	10	9	8	7	6	3	
100 × 54 × 38	(4 × 2⅛ × 1½)	device	169	10.3	6	5	5	4	4	3	2	
100 × 54 × 48	(4 × 2⅛ × 1⅞)	device	213	13.0	8	7	6	5	5	4	2	
100 × 54 × 54	(4 × 2⅛ × 2⅛)	device	238	14.5	9	8	7	6	5	4	2	
95 × 50 × 65	(3¾ × 2 × 2½)	masonry box/gang	230	14.0	9	8	7	6	5	4	2	
95 × 50 × 90	(3¾ × 2 × 3½)	masonry box/gang	344	21.0	14	12	10	9	8	7	4	
min. 44.5 depth	FS — single cover/gang (1 ¾)		221	13.5	9	7	6	6	5	4	2	
min. 60.3 depth	FD — single cover/gang (2 ⅜)		295	18.0	12	10	9	8	7	6	3	
min. 44.5 depth	FS — multiple cover/gang (1 ¾)		295	18.0	12	10	9	8	7	6	3	

Box Trade Size			Minimum Volume		Maximum Number of Conductors* (arranged by AWG size)						
mm	in.	-	cm3	in.3	18	16	14	12	10	8	6
min. 60.3 depth	FD — multiple cover/gang (2 ⅜)		395	24.0	16	13	12	10	9	8	4

*Where no volume allowances are required by 314.16(B)(2) through (B)(6).

Statement of Problem and Substantiation for Public Input

Breaking up 314.16(A) into a list item format to facilitate understanding for Code users. In accordance with NFPA Style Manual section 3.5.1.2 additional subdivisions shall be used where multiple requirements can be broken into independent requirements.

Submitter Information Verification

Submitter Full Name: Mike Holt
Organization: Mike Holt Enterprises Inc
Street Address:
City:
State:
Zip:
Submittal Date: Wed Sep 06 11:43:13 EDT 2023
Committee: NEC-P08

Committee Statement

Resolution: Proposed PI does not add clarity and is not a violation of the Style Manual as breaking out barriers into its own subdivision is not an independent requirement.

Public Input No. 1452-NFPA 70-2023 [Section No. 314.16(B)(4)]

(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)(1) 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.GFCI and Smart Devices shall shall have a triple volume allowance based on the largest size conductor attached to the device.

Table 314.16(B)(1) Volume Allowance Required per Conductor

Size of Conductor (AWG)	Free Space Within Box for Each Conductor	
	cm^3	$in.^3$
18	24.6	1.50
16	28.7	1.75
14	32.8	2.00
12	36.9	2.25
10	41.0	2.50
8	49.2	3.00
6	81.9	5.00

Statement of Problem and Substantiation for Public Input

GFCI and smart devices take up more than standard devices 3 volume allowance is a conservative amount. Some devices will not fit correctly and possible create excessive heat.
Box fill needs a redo and has for a while the 25 % for added equipment grounding conductors and terminal blocks is not helping. The devices keep getting larger and larger.

Submitter Information Verification

Submitter Full Name: George Tidden

Organization: IES Residential

Affiliation: IEC

Street Address:

City:

State:

Zip:

Submittal Date: Mon Jul 17 11:47:17 EDT 2023

Committee: NEC-P08

Committee Statement

Resolution: The panel is retaining the double allowance for devices generally. For 50 years, from 1940 to 1990, devices, regardless of size, merited a single allowance. In the 1987 cycle, CMP 9 entertained a proposal (9-17) to increase the allowance for large devices. That change was held because of public comments (see 9-12) that questioned enforceability because the type of device would not necessarily be evident at the time of a rough inspection. In the 1990 cycle, CMP 9 increased the allowance to two for all devices to avoid this problem. The PI lacks substantiation to justify a further increase. The rules have never been intended to create a direct correspondence between a certain volume and a certain number of allowances. PIs similar to this one have been repeatedly submitted by members of the public unfamiliar with this history. The double allowance, in fact, accommodates large devices, and makes it possible for these to be installed without creating enforceability conflicts at the time of rough inspections. The requirements of 314.24(B) for the dimension of boxes apply to ensure sufficient depth. Additionally, “Smart Device” is an undefined term.

Public Input No. 1485-NFPA 70-2023 [Section No. 314.16(B)(4)]

(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)(1) 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. GFCI and Smart Devices shall shall have a triple volume allowance based on the largest size conductor attached to the device.

Table 314.16(B)(1) Volume Allowance Required per Conductor

Size of Conductor (AWG)	Free Space Within Box for Each Conductor	
	cm^3	in.^{3}
18	24.6	1.50
16	28.7	1.75
14	32.8	2.00
12	36.9	2.25
10	41.0	2.50
8	49.2	3.00
6	81.9	5.00

Statement of Problem and Substantiation for Public Input

GFCI and smart devices take up more than standard devices 3 volume allowance is a conservative amount. Some devices will not fit correctly and possible create excessive heat. Box fill needs a redo and has for a while the 25 % for added equipment grounding conductors and terminal blocks is not helping. The devices keep getting larger and larger.

Submitter Information Verification

Submitter Full Name: IEC National

Organization: IEC

Affiliation: George Tidden

Street Address:

City:

State:

Zip:

Submittal Date: Fri Jul 21 09:49:39 EDT 2023

Committee: NEC-P08

Committee Statement

Resolution: The panel is retaining the double allowance for devices generally. For 50 years, from 1940 to 1990, devices, regardless of size, merited a single allowance. In the 1987 cycle, CMP 9 entertained a proposal (9-17) to increase the allowance for large devices. That change was held because of public comments (see 9-12) that questioned enforceability because the type of device would not necessarily be evident at the time of a rough inspection. In the 1990 cycle, CMP 9 increased the allowance to two for all devices to avoid this problem. The PI lacks substantiation to justify a further increase. The rules have never been intended to create a direct correspondence between a certain volume and a certain number of allowances. PIs similar to this one have been repeatedly submitted by members of the public unfamiliar with this history. The double allowance, in fact, accommodates large devices, and makes it possible for these to be installed without creating enforceability conflicts at the time of rough inspections. The requirements of 314.24(B) for the dimension of boxes apply to ensure sufficient depth. Additionally, “Smart Device” is an undefined term.

Public Input No. 3374-NFPA 70-2023 [Section No. 314.16(B)(4)]

(4) Device or Equipment Fill.

For each yoke or strap containing one or more devices or equipment, a ~~double~~ multiplier of four ~~volume allowance in accordance with~~ ~~Table 314.16(B)~~ ~~(1) shall~~ 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 in accordance with Table 314 . 16(B)(1) . 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~~ a multiplier or four provided for each gang required for mounting based on the largest conductor entering the box .

Table 314.16(B)(1) Volume Allowance Required per Conductor

Size of Conductor (AWG)	Free Space Within Box for Each Conductor	
	cm^3	$in.^3$
18	24.6	1.50
16	28.7	1.75
14	32.8	2.00
12	36.9	2.25
10	41.0	2.50
8	49.2	3.00
6	81.9	5.00

Additional Proposed Changes

File Name	Description	Approved
PI-3374-NFPA_70-2023_Chris_A_Valtierra_314.16_B_4_Revision_language.pdf	PI-3374-NFPA 70-2023 314.16(B)(4) Revision Chris A Valteirra examples	

Statement of Problem and Substantiation for Public Input

CMP 09 resolved Public Input No. 4258-NFPA 70-2020 [Section No. 314.16(B)(4)]. Please consider the following information to allow accommodating larger volume allowances based upon:

Common devices:
- Occupancy Sensor – 2.75 x 1.75 x 1.875 = 9.02 cubic inches
- GFCI Receptacle – 2.75 x 1.75 x 1.5 = 7.22 cubic inches
- Decora Switch – 2.75 x 0.75 x 1.0 = 2.06 cubic inches
- Dacora Receptacle – 2.62 x 1.25 x 0.75 = 2.45 cubic inches
- Spec Grade Switch - 2.25 x 1.25 x 1 = 2.81 cubic inches

However, per NEC Section 314.16(B)(4), stipulates these all are the same volume deduction of two conductors based on the largest conductor connected.
Assuming a #14 AWG:
- Occupancy Sensor – 2 x 2.0 = 4 cubic inches vs. actual 9.02 cubic inches
- GFCI Receptacle – 2 x 2.0 = 4 cubic inches vs. actual 7.22 cubic inches

- Decora Switch – 2 x 2.0 = 4 cubic inches vs. actual 2.06 cubic inches
- Decora Receptacle – 2 x 2.0 = 4 cubic inches vs. actual 2.45 cubic inches
- Spec Grade Switch - 2 x 2.0 = 4 cubic inches vs. actual 2.81 cubic inches

We now have new technology that under current NEC Section 314.16(B)(4), the last sentence only requires a double volume for each gang required for mounting. As such, the device in the attached photos (Outlet Box Insert and Fill) is only code calculated at 2 x 2 x 2.0 (assuming 14 AWG) = 8 cubic inches which is slightly larger than the GFCI and slightly smaller than the occupancy sensors. Making some assumptions based on the physical size of the GFCI and similarities of the photos of the inlet:
- 2.75 tall x 3.5 wide x 1.5 deep = 14.44 cubic inches vs. a current code requirement of only 8 cubic inches.

This section of the code needs some updating to keep in line with todays and tomorrow's devices. Marking this device with a cubic inch volume will not help as it is not available at rough in inspection where box fill is generally inspected. Currently the standard for devices does not require a volume displacement marking.

Acceptance of this change to the NEC on how device volume is calculated is overdue. Everyone acknowledges that GFCI, AFCI and dimmer devices are much larger than the conventional switch or receptacle, now may be the time to address this issue.

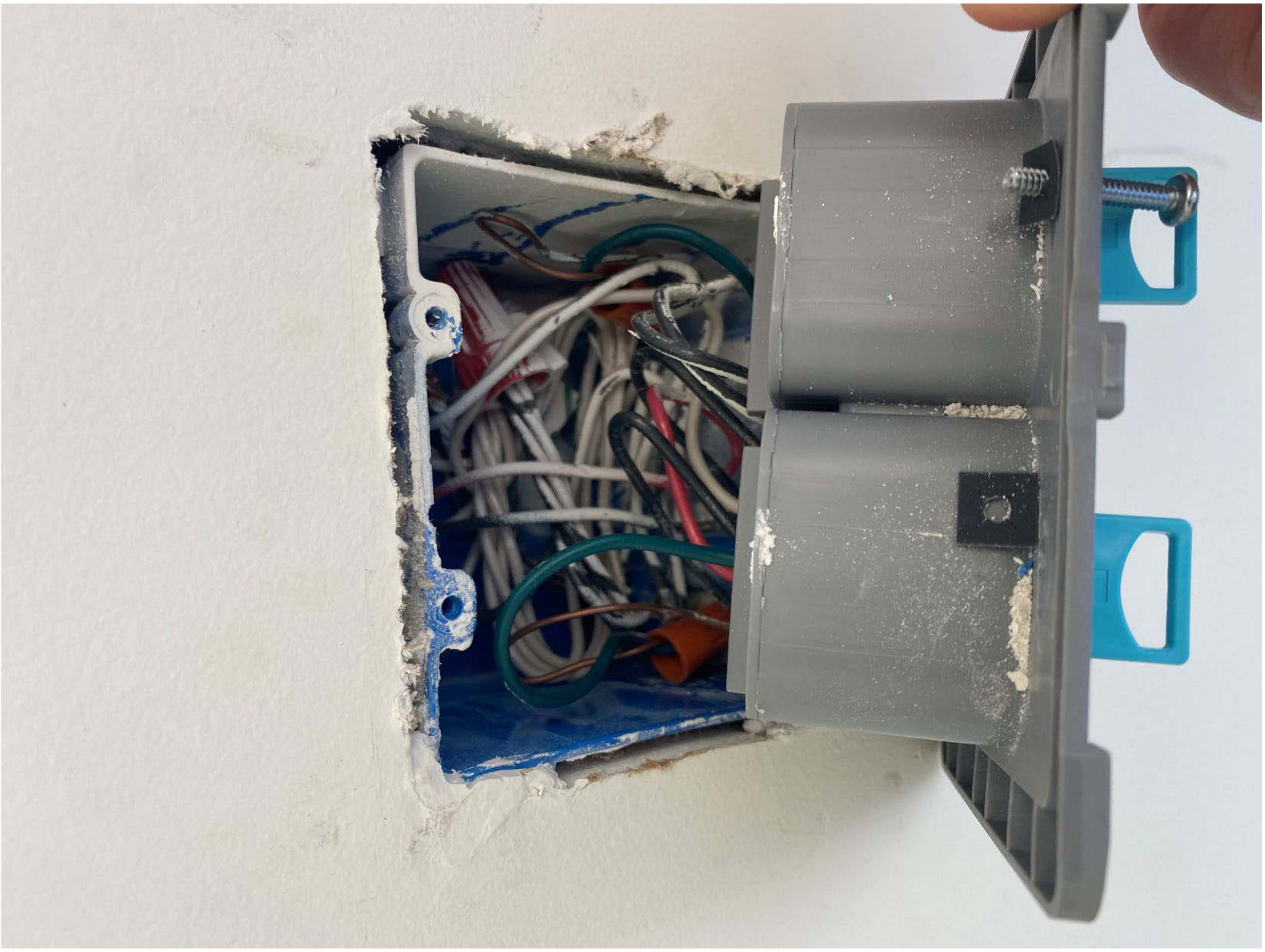
Submitter Information Verification

Submitter Full Name: Chris Valtierra
Organization: Valtierra Sign Electrician Learning Services LLC
Affiliation: N/A
Street Address:
City:
State:
Zip:
Submittal Date: Fri Sep 01 15:35:24 EDT 2023
Committee: NEC-P08

Committee Statement

Resolution: The panel is retaining the double allowance for devices generally. For 50 years, from 1940 to 1990, devices, regardless of size, merited a single allowance. In the 1987 cycle, CMP 9 entertained a proposal (9-17) to increase the allowance for large devices. That change was held because of public comments (see 9-12) that questioned enforceability because the type of device would not necessarily be evident at the time of a rough inspection. In the 1990 cycle, CMP 9 increased the allowance to two for all devices to avoid this problem. The PI lacks substantiation to justify a further increase. The rules have never been intended to create a direct correspondence between a certain volume and a certain number of allowances. PIs similar to this one have been repeatedly submitted by members of the public unfamiliar with this history. The double allowance, in fact, accommodates large devices, and makes it possible for these to be installed without creating enforceability conflicts at the time of rough inspections. The requirements of 314.24(B) for the dimension of boxes apply to ensure sufficient depth. Additionally, "Smart Device" is an undefined term.


QC
PASS
HOT/COM



Public Input No. 1466-NFPA 70-2023 [Section No. 314.16(B)(5)]

(5) Equipment Grounding Conductor Fill.

Where up to four equipment grounding conductors enter a box, a single volume allowance in accordance with Table 314.16(B)(1) shall be made based on the largest equipment grounding conductor entering the box. A ¼ volume allowance shall be made for each additional equipment grounding conductor that enters the box, based on the largest equipment grounding conductor entering the box.

Additional Proposed Changes

File Name	Description	Approved
Screenshot_2023-07-19_at_9.31.17_AM.png	Here is a screenshot of the error message I keep getting	
PERNAL_-_2026_public_input_form_.pdf	I uploaded this file because I kept getting a Javascript error where I would normally insert the NEC language. I hope this works.	

Statement of Problem and Substantiation for Public Input

Substantiation: Calculating ¼ of a volume allowance at times results in four-digit decimals of cubic inches, which is very cumbersome to calculate for both installers and inspectors in the field. This revision will accomplish the same desired goal of allowing additional space (even more so) for equipment grounding conductors, while making the end calculation much easier.

Submitter Information Verification

Submitter Full Name: Tom Pernal
Organization: Tom Pernal Electrical Seminars, LLC
Street Address:
City:
State:
Zip:
Submittal Date: Wed Jul 19 09:32:26 EDT 2023
Committee: NEC-P08

Committee Statement

Resolution: There was insufficient technical substantiation to increase the volume allowance. The difficulty of the calculation does not rise to the level that it impedes the code user from performing the calculation.

2026 IAEI Public Input Form

Name: Tom Pernal Email: [redacted]	2023 NEC Section Number: 314.16(B)(5)	Proposed NEW 2026 Section Number: 314.16(B)(5)

Type of Change: (New, revision, etc.)

Revision

2023 NEC – Existing Code Language

314.16(B)(5) Equipment Grounding Conductor Fill.

Where up to four equipment grounding conductors enter a box, a single volume allowance in accordance with Table 314.16(B) shall be made based on the largest equipment grounding conductor entering the box. ~~A 1⁄4 volume allowance shall be made for each additional equipment grounding conductor or equipment bonding jumper~~ that enters the box, based on the largest equipment grounding conductor entering the box.

2026 Proposed Code Language:

314.16(B)(5) Equipment Grounding Conductor Fill.

Where up to four equipment grounding conductors enter a box, a single volume allowance in accordance with Table 314.16(B) shall be made based on the largest equipment grounding conductor entering the box. A full volume allowance shall be made for each additional four equipment grounding conductors, or fraction thereof, that enters the box, based on the largest equipment grounding conductor entering the box.

Substantiation for Change:

Substantiation: Calculating ¼ of a volume allowance at times results in four-digit decimals of cubic inches, which is very cumbersome to calculate for both installers and inspectors in the field. This revision will accomplish the same desired goal of allowing additional space (even more so) for equipment grounding conductors, while making the end calculation much easier.

Notes:

I have spoken to many Electrical Contractors and Inspectors about this. Jack Lyons from NEMA strongly supports this P.I. as does Tony Neibert, Chair of the New Jersey Electrical Sub-code Committee, of which I am a member. Most contractors and inspectors I've spoken to say there is no way they will take the time to perform this calculation in the field, as currently worded in the 2023 NEC.

Public Input No. 1580-NFPA 70-2023 [Section No. 314.16(B)(5)]

(5) Equipment Grounding Conductor Fill.

Where up to four equipment grounding conductors enter a box, a single volume allowance in accordance with Table 314.16(B)(1) shall be made based on the largest equipment grounding conductor entering the box. A ¼ volume allowance shall be made for each additional equipment grounding conductor that enters the box, based on the largest equipment grounding conductor entering the box.

Additional Proposed Changes

File Name	Description	Approved
314.16.docx	314.16 (B)(5)	

Statement of Problem and Substantiation for Public Input

I feel we should count every equipment grounding conductor that is installed in a box. Each equipment grounding conductor takes up the same volume as any other current carrying conductor. We count all equipment grounding conductors that are present when we perform conduit fill calculations, why is box fill any different?

Submitter Information Verification

Submitter Full Name:	Michael McLaughlin
Organization:	Iowa Central Community College
Affiliation:	International Association of Electrical Inspectors - Iowa Chapter
Street Address:	
City:	
State:	
Zip:	
Submittal Date:	Wed Jul 26 09:43:24 EDT 2023
Committee:	NEC-P08

Committee Statement

Resolution: There was insufficient technical substantiation to increase the volume allowance. No evidence was provided to demonstrate a safety problem with the current fill calculations.

Article 314.16 (B)(5) –

Where there are equipment grounding conductors present in a box, a single volume allowance in accordance with Table 314.16 (B)(1) shall be made for each equipment grounding conductor originating outside the box based on the largest equipment grounding conductor in the box.

Public Input No. 1617-NFPA 70-2023 [Section No. 314.16(B)(6)]

(6) – **Grounding** Terminal Block Fill~~.~~

Where a grounding terminal block is present in a box, a single volume allowance in accordance with Table 314.16(B)(1) shall be made for each grounding terminal block assembly based on the largest conductor(s) terminated

~~tothe assembly.~~

to the grounding terminal block.

Informational note No.1 An example of the grounding terminal block is in Article. 680.23 (F)(2)(a)

Statement of Problem and Substantiation for Public Input

Giving the existing Article where this grounding terminal block is being used gives the user an example of what the terminal is and how it may be used.

Submitter Information Verification

Submitter Full Name: George Tidden
Organization: IES Residential
Affiliation: IEC
Street Address:
City:
State:
Zip:

Submittal Date: Thu Jul 27 13:15:55 EDT 2023
Committee: NEC-P08

Committee Statement

Resolution: Fill allowance for terminal blocks applies to all terminal blocks not just terminal blocks for equipment grounding conductors.

Public Input No. 1785-NFPA 70-2023 [Section No. 314.16(B)(6)]

(6) – Grounding Terminal Block Fill .

Where a grounding terminal block is present in a box, a single volume allowance in accordance with Table 314.16(B)(1) shall be made for each grounding terminal block assembly based on the largest conductor(s) terminated

~~tothe assembly.~~

to the grounding terminal block.

Informational note No.1 An example of the grounding terminal block is in Article. 680.23 (F)(2)(a)

Statement of Problem and Substantiation for Public Input

Giving the existing Article where this grounding terminal block is being used gives the user an example of what the terminal is and how it may be used.

Submitter Information Verification

Submitter Full Name: IEC National

Organization: IEC

Affiliation: IES Residential - George Tidden

Street Address:

City:

State:

Zip:

Submittal Date: Wed Aug 02 10:31:30 EDT 2023

Committee: NEC-P08

Committee Statement

Resolution: Fill allowance for terminal blocks applies to all terminal blocks not just terminal blocks for equipment grounding conductors.

Public Input No. 325-NFPA 70-2023 [Section No. 314.16(B)(6)]

(6) Terminal Block Fill.

Where a terminal block is present in a box, a single volume allowance in accordance with Table 314.16(B)(1) shall be made for each terminal block assembly based on the largest conductor(s) terminated ~~tothe~~ to the assembly.

Statement of Problem and Substantiation for Public Input

Proper grammar

Submitter Information Verification

Submitter Full Name:	TREYTON HATCH
Organization:	[Not Specified]
Street Address:	
City:	
State:	
Zip:	
Submittal Date:	Fri Feb 10 10:10:26 EST 2023
Committee:	NEC-P08

Committee Statement

Resolution: FR-7527-NFPA 70-2024

Statement: Editorial change was made to address consolidated words.

Public Input No. 1961-NFPA 70-2023 [Section No. 314.16(B) [Excluding any Sub-Sections]]

The volumes in 314.16(B)(1) through (B)(6), as applicable, shall be added together. No allowance shall be required for small fittings such as ~~locknuts~~ splicing wire connectors, locknuts and bushings. Each space within a box installed with a barrier shall be calculated separately.

Statement of Problem and Substantiation for Public Input

Greetings CMP Members - it is common knowledge that wirenuts, a tradename of Ideal or as UL Guide ZMVV calls them "Splicing Wire Connectors" are not counted in terms of box fill. However, when references small fittings we have to determine if a "wirenut", again a tradename of Ideal, is actually a fitting. Based on the definition of "fitting" in Article 100, the Splicing Wire Connector does perform a mechanical role in the electrical connection to faciliate the intimacy of the conductors being spliced.

So, I propose to bring clarity to the fact these Splicing Devices DO NOT require a box volume or if the intent of the CMP is to think otherwise go ahead and add one to the language.

Submitter Information Verification

Submitter Full Name: Paul Abernathy
Organization: Electrical Code Academy,Inc.
Affiliation: FastTraxSystem.com
Street Address:
City:
State:
Zip:

Submittal Date: Tue Aug 08 17:08:27 EDT 2023
Committee: NEC-P08

Committee Statement

Resolution: FR-7529-NFPA 70-2024

Statement: The term 'splicing connectors' was added to the section to clarify it is not required to be counted for box fill calculation. While not defined in article 100, the term 'splicing connectors' is used in 110.14 and should be commonly understood.

Public Input No. 2379-NFPA 70-2023 [Section No. 314.17(A)]

(A) ~~–~~ **Unused** Openings to Be Closed.

~~Openings~~ Unused openings through which conductors ~~enter shall be closed in an approved manner.~~ , cables, and raceways may enter shall comply with 110.12(A).

Statement of Problem and Substantiation for Public Input

Added cables and raceways for this requirement to apply to more than just conductors. Revised text to reference 110.12(A) to clarify what this requirement is about.

Submitter Information Verification

Submitter Full Name: Mike Holt
Organization: Mike Holt Enterprises Inc
Street Address:
City:
State:
Zip:
Submittal Date: Wed Aug 16 15:20:28 EDT 2023
Committee: NEC-P08

Committee Statement

Resolution: An opening in a box or enclosures for which cables or conductors enter is not unused. Section 110.12(A) already covers closing of unused openings.

Public Input No. 2380-NFPA 70-2023 [Section No. 314.17(A)]

(A) Openings to Be Closed.

Openings through which conductors, cables, and raceways enter shall be ~~closed in an approved manner~~ terminated with listed fittings .

Statement of Problem and Substantiation for Public Input

Added cables and raceways for this requirement to apply to more than just conductors. Revised text to reference 110.12(A) to clarify that this requirement is about unused opening to be closed.

Submitter Information Verification

Submitter Full Name: Mike Holt
Organization: Mike Holt Enterprises Inc
Street Address:
City:
State:
Zip:

Submittal Date: Wed Aug 16 15:22:06 EDT 2023
Committee: NEC-P08

Committee Statement

Resolution: FR-7960-NFPA 70-2024

Statement: This first revision clarifies that openings may be suitable for not only conductors, but also cables and raceways. Unused openings are addressed in 110.12(A) and are not duplicated here.

Public Input No. 1265-NFPA 70-2023 [Section No. 314.17(B)(3)]

(3) Conductors and Cables Entering Through Raceways.

Where conductors and/or cable enter a box, conduit body, or fitting, it shall comply with 314.17(B)(3)(a) or (b).

(a) Where the raceway is complete between boxes, conduit bodies, or both and encloses individual conductors or nonmetallic cable assemblies or both, the conductors or cable assemblies shall not be required to be additionally secured. Where raceways enclose cable assemblies as covered in 300.15(C), the cable assembly shall not be required to be additionally secured within the box or conduit body.

(b) Where cable is used, each cable shall be secured to the box, conduit body, or fitting. Exception to (b): 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 (¼ 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 does not apply to this condition.

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

Exception No. 2: Single conductors and multiconductor cables shall be permitted to enter enclosures in accordance with 392.46(A) or (B).

Statement of Problem and Substantiation for Public Input

The provision/exception for cables entering through a raceway to an enclosure can be found in NEC 312.5(C) Exception. However, the industry has long used this exception at locations other than cabinets, cutouts, and meter socket enclosures. This has left some jurisdiction tasked with generating field notes or bulletins to address this common installation. Adding this exception to NEC 314.17 allows for the industry to use the Code for guidance when installing in this manner.

Submitter Information Verification

Submitter Full Name: Rodney Turco
Organization: City of San Jose

Affiliation: City of San Jose
Street Address:
City:
State:
Zip:
Submittal Date: Mon Jul 03 14:53:09 EDT 2023
Committee: NEC-P08

Committee Statement

Resolution: There was insufficient technical substantiation to add a more restrictive installation than presently permitted.

Public Input No. 2279-NFPA 70-2023 [Section No. 314.20]

314.20 Flush-Mounted Installations.

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, wall plate spaces, or listed extender will not be set back of the finished surface more than 6 mm (1/4 in.).

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.

Additional Proposed Changes

File Name	Description	Approved
Ideal_Wall_plate_spacer.png		
Gardener_Bender_Wall_plate_spacer.png		

Statement of Problem and Substantiation for Public Input

Adding wall plate spacers would allow installers an easy inexpensive solution no different than plastic extenders to mount devices where the box is not flush with the finished surface in noncombustible materials. Both ideal and gardener bender have this product available. See website and photos.

Website: Gardner Bender 4-Pack 0.75-in W x 4-in L Green Plastic Wall Plate Spacers in the Wall Plate Spacers department at Lowes.com
Website: IDEAL 10-Pack 1-in W x 0.5-in L Plastic Wall Plate Spacer in the Wall Plate Spacers department at Lowes.com

Submitter Information Verification

Submitter Full Name: Mike Holt
Organization: Mike Holt Enterprises Inc
Street Address:
City:
State:
Zip:
Submittal Date: Tue Aug 15 15:20:33 EDT 2023
Committee: NEC-P08

Committee Statement

Resolution: Excess use of wall spacers would allow for greater exposure of live parts than presently prohibited by this section of code.

Public Input No. 3976-NFPA 70-2023 [Section No. 314.20]

314.20 Flush-Mounted Installations.

(A) Noncombusitble Material. 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 (¼ in.).

(B) Combusitble Material. 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.

Statement of Problem and Substantiation for Public Input

Breaking up 314.20 into a list item format to facilitate understanding for Code users. In accordance with NFPA Style Manual section 3.5.1.2 additional subdivisions shall be used where multiple requirements can be broken into independent requirements.

Submitter Information Verification

Submitter Full Name: Mike Holt
Organization: Mike Holt Enterprises Inc
Street Address:
City:
State:
Zip:
Submittal Date: Wed Sep 06 11:49:51 EDT 2023
Committee: NEC-P08

Committee Statement

Resolution: FR-7531-NFPA 70-2024
Statement: Created subdivisions in accordance with NEC 2023 Style Manual Section 3.5.1.2.

Public Input No. 2659-NFPA 70-2023 [Section No. 314.22]

314.22 Surface Extensions.

Surface extensions shall be made by mounting and mechanically securing an extension ring over the box. Equipment grounding shall be in accordance with ~~Part VI of~~ Article 250 , Part VI .

Exception: A surface extension shall be permitted to be made from the cover of a box where the cover is designed so it is unlikely to fall off or be removed if its securing means becomes loose. The wiring method shall be flexible for an approved length that permits removal of the cover and provides access to the box interior and shall be arranged so that any grounding continuity is independent of the connection between the box and cover.

Statement of Problem and Substantiation for Public Input

This Public Input is being submitted on behalf of the NEC Correlating Committee Usability Task Group in order to provide correlation throughout the document. The text is revised to to comply with the NEC Style Manual Section 4.1.4, regarding the use of Parts.
4.1.4 References to an Entire Article. References shall not be made to an entire article, except for the Article 100 or where referenced to provide the necessary context. References to specific parts within articles shall be permitted. References to all parts of an article shall not be permitted. The article number shall precede the part number.
The Usability Task Group members are: Derrick Atkins, David Hittinger, Richard Holub, Dean Hunter, Chad Kennedy and David Williams.

Submitter Information Verification

Submitter Full Name:	David Williams
Organization:	Delta Charter Township
Street Address:	
City:	
State:	
Zip:	
Submittal Date:	Thu Aug 24 08:07:31 EDT 2023
Committee:	NEC-P08

Committee Statement

Resolution: FR-7532-NFPA 70-2024

Statement: Updated to comply with the NEC 2023 Style Manual Section 4.1.4.

Public Input No. 4413-NFPA 70-2023 [Section No. 314.22]

314.22 Surface Extensions.

Surface extensions shall be made by mounting and mechanically securing ~~an~~ a single extension ring over the box. Multiple extension rings shall not be permitted. Equipment grounding shall be in accordance with Part VI of Article 250.

Exception: A surface extension shall be permitted to be made from the cover of a box where the cover is designed so it is unlikely to fall off or be removed if its securing means becomes loose. The wiring method shall be flexible for an approved length that permits removal of the cover and provides access to the box interior and shall be arranged so that any grounding continuity is independent of the connection between the box and cover.

Statement of Problem and Substantiation for Public Input

The section as presently written permits a "single" extension ring to be installed. Misinterpretation of this section often results in multiple extension rings stacked on top of one another, at times bordering on the extreme. This proposed revision will provide clarification, helping designers, installers and inspectors alike.

Submitter Information Verification

Submitter Full Name: Peter Noval Jr
Organization: [Not Specified]
Street Address:
City:
State:
Zip:
Submittal Date: Thu Sep 07 14:44:42 EDT 2023
Committee: NEC-P08

Committee Statement

Resolution: There was insufficient technical substantiation to add a more restrictive installation than presently permitted. Although multiple extension rings may not appear aesthetically pleasing, as long as they are installed in accordance with applicable requirements, installation of multiple extension rings does not present a safety hazard.

Public Input No. 2199-NFPA 70-2023 [Section No. 314.23(A)]

(A) Surface Mounting.

(1) An enclosure mounted on a building or other surface shall be rigidly and securely fastened in place. If the surface does not provide rigid and secure support, additional support in accordance with this section shall be provided.

(2) Boxes shall not be permitted to be supported to vegetation.

Additional Proposed Changes

File Name	Description	Approved
314.23C0_02_PHSG.png	Photo of Box mounted on tree.	

Statement of Problem and Substantiation for Public Input

Boxes and enclosures secured to vegetation are subject to plant trunk growth which create an unstable surface for the box to be supported. See attached photo.

Submitter Information Verification

Submitter Full Name: Mike Holt
Organization: Mike Holt Enterprises Inc
Street Address:
City:
State:
Zip:
Submittal Date: Mon Aug 14 14:13:47 EDT 2023
Committee: NEC-P08

Committee Statement

Resolution: Article 410.36(G) specifically allows trees to support luminaires and associated equipment. Associated equipment may include outlet boxes.

Public Input No. 384-NFPA 70-2023 [New Section after 314.23(E)]

Exception No. 1

The following wiring methods shall be permitted to support a conduit body of any size, including a conduit body constructed with only one conduit entry, provided that the trade size of the conduit body is not larger than the largest size of the conduit or tubing:

(1) Intermediate metal conduit, Type IMC

(2) Rigid metal conduit, Type RMC

(3) Rigid polyvinyl chloride conduit, Type PVC

(4) Reinforced thermosetting resin conduit, Type RTRC

(5) Electrical Metallic Tubing, Type EMT

Exception No. 2

For the purposes of Exception No. 1, an FS or FD device box, or an explosionproof conduit outlet box, shall be considered a conduit body, provided it does not contain any devices, other than splicing devices, or support any other equipment

Additional Proposed Changes

File Name	Description	Approved
GUA_Fittings.docx		

Statement of Problem and Substantiation for Public Input

Some FS and FD boxes, and type GUAE explosionproof conduit outlet boxes, only have one conduit entry and therefore cannot be properly supported per the current code. Also, FSC and FSD boxes and GUAC explosionproof conduit outlet boxes may have a flexible cord opposite the RMC and therefore cannot be properly supported per the current code.

Submitter Information Verification

Submitter Full Name: Jeff Ross

Organization: The Dow Chemical Company

Street Address:

City:

State:

Zip:

Submittal Date: Thu Mar 02 15:57:46 EST 2023

Committee: NEC-P08

Committee Statement

Resolution: FR-7539-NFPA 70-2024

Statement: Single gang FS and FD boxes, and explosionproof conduit outlet boxes were added to the exception to allow support by a single raceway, based on their robust construction and internal thread design.

GUAE

GUAC

Public Input No. 1682-NFPA 70-2023 [Section No. 314.23(H)(1)]

(1) Flexible Cord.

A box shall be supported from a multiconductor cord or cable in an approved manner that protects the conductors against strain. A connection shall be made to a box equipped with a hub ~~shall be made~~ at both the upper and lower ends of the flexible cord with a listed cord grip attachment fitting marked for use with a threaded hub, or at the upper end, the cord may be knotted according to 400 .14.

Statement of Problem and Substantiation for Public Input

The upper end of the flexible cord may be routed or knotted on significant structure where no strain would be placed on the upper end box or enclosure. Without being knotted, another form of strain relief should be required at the upper end, too.

Submitter Information Verification

Submitter Full Name: Norman Feck
Organization: State of Colorado
Affiliation: self
Street Address:
City:
State:
Zip:

Submittal Date: Fri Jul 28 17:44:16 EDT 2023
Committee: NEC-P08

Committee Statement

Resolution: There was insufficient technical substantiation to add a requirement of a hub at the upper end of the cord or cable. A hub on the upper end supply is not required on all configurations.

Public Input No. 3420-NFPA 70-2023 [Section No. 314.23(H)(1)]

(1) Flexible Cord.

A box shall be supported from a multiconductor cord or cable in an approved manner that protects the conductors against strain. A connection to a box equipped with a hub shall be made with a listed cord grip attachment fitting ~~marked~~ identified for use with a threaded hub.

Statement of Problem and Substantiation for Public Input

This Public Input revises "marked" to "identified" since the product would not have the physical marking on the fitting. The approval for the fitting to be threaded into a hub would be a part of the listing.

Submitter Information Verification

Submitter Full Name: Megan Hayes
Organization: NEMA
Street Address:
City:
State:
Zip:

Submittal Date: Sat Sep 02 18:40:41 EDT 2023
Committee: NEC-P08

Committee Statement

Resolution: FR-7544-NFPA 70-2024

Statement: The text was revised from "marked" to "identified" to clarify where the physical marking may not be on the fitting. Identified is also a defined term.

Public Input No. 2464-NFPA 70-2023 [Section No. 314.25(A)]

(A) Nonmetallic or Metal Covers and Plates.

Nonmetallic or metal covers and plates shall be permitted. Where metal covers or plates are used, they shall be connected to the equipment grounding conductor in accordance with 250.~~110~~ 109 .

Informational Note: See 410.42 for metal luminaire canopies and 404.~~12~~ 9(B) and 406.6(B) for metal faceplates for additional requirements for connecting the equipment grounding ~~requirements~~ conductor .

Statement of Problem and Substantiation for Public Input

The correct reference is 250.109 not 250.110 in first level subdivision (A). The correct reference is 404.9(B) not 404.12 in the informational note. Changed grounding to ‘connecting the equipment grounding conductor’ for technical accuracy.

Submitter Information Verification

Submitter Full Name: Mike Holt
Organization: Mike Holt Enterprises Inc
Street Address:
City:
State:
Zip:
Submittal Date: Thu Aug 17 13:53:01 EDT 2023
Committee: NEC-P08

Committee Statement

Resolution: FR-7553-NFPA 70-2024

Statement: Updated text from “grounding” to “equipment grounding conductor” as defined term. CMP-8 confirmed the references in the existing text and determined they are correct.

Public Input No. 1095-NFPA 70-2023 [Section No. 314.27]

314.27 Outlet Boxes.

(A) Boxes at Luminaire or Lampholder Outlets.

Outlet boxes or fittings designed for the support of luminaires and lampholders, and installed as required by 314.23, shall be permitted to support a luminaire or lampholder.

(1) Vertical Surface Outlets.

Boxes used at luminaire or lampholder outlets in or on a vertical surface shall be identified and marked on the interior of the box to indicate the maximum weight of the luminaire that is permitted to be supported by the box if other than 23 kg (50 lb).

Exception: A vertically mounted luminaire or lampholder weighing not more than 3 kg (6 lb) shall be permitted to be supported on other boxes or plaster rings that are secured to other boxes, provided that the luminaire or its supporting yoke, or the lampholder, is secured to the box with no fewer than two No. 6 or larger screws.

(2) Ceiling Outlets.

At every outlet used exclusively for lighting, the box shall be designed or installed so that a luminaire or lampholder can be attached. Boxes shall be required to support a luminaire weighing a minimum of 23 kg (50 lb). A luminaire that weighs more than 23 kg (50 lb) shall be supported independently of the outlet box, unless the outlet box is listed for not less than the weight to be supported. The interior of the box shall be marked by the manufacturer to indicate the maximum weight the box shall be permitted to support.

Outlet boxes mounted in the ceilings of living and sleeping areas in dwelling occupancies and in a location typical for the installation of a ceiling-suspended (paddle) fan shall be installed in accordance with 314.27(C).

Informational Note: A typical location for a ceiling-suspended (paddle) fan is in the center of a room or space or centered over a sitting area.

(B) Floor Boxes.

Boxes listed specifically for this application shall be used for receptacles located in the floor.

Exception: Where the authority having jurisdiction judges them free from likely exposure to physical damage, moisture, and dirt, boxes located in elevated floors of show windows and similar locations shall be permitted to be other than those listed for floor applications. Receptacles and covers shall be listed as an assembly for this type of location.

(C) Boxes at Ceiling-Suspended (Paddle) Fan Outlets.

Outlet boxes or outlet box systems used as the sole support of a ceiling-suspended (paddle) fan shall be listed, shall be marked by their manufacturer on the interior of the box as suitable for this purpose, and shall not support ceiling-suspended (paddle) fans that weigh more than 32 kg (70 lb). For outlet boxes or outlet box systems designed to support ceiling-suspended (paddle) fans that weigh more than 16 kg (35 lb), the required marking shall include the maximum weight to be supported.

~~Outlet boxes mounted in the ceilings of habitable rooms of dwelling occupancies in a location acceptable for the installation of a~~
Where a ceiling-suspended (paddle) fan is not installed, the outlet box shall comply with one of the following:

(1) Listed for the sole support of ceiling-suspended (paddle) fans

(2) Installed so as to allow direct access through the box to structural framing capable of supporting a ceiling-suspended (paddle) fan without removing the box

(D) Utilization Equipment.

Boxes used for the support of utilization equipment other than ceiling-suspended (paddle) fans shall meet the requirements of 314.27(A) for the support of a luminaire that is the same size and weight.

Exception: Utilization equipment weighing not more than 3 kg (6 lb) shall be permitted to be supported on other boxes or plaster rings that are secured to other boxes, provided the equipment or its supporting yoke is secured to the box with no fewer than two No. 6 or larger screws.

(E) Weight-Supporting Ceiling Receptacles (WSCR) and Weight-Supporting Attachment Fittings (WSAF).

Outlet boxes required in 314.27 shall be permitted to support listed weight-supporting ceiling receptacles (WSCR). A WSCR shall be used in combination with compatible weight-supporting attachment fittings (WSAF)that are identified for the support of equipment within the weight and mounting orientation limits of the listing. Where the WSCR is installed, it shall be included in the box fill calculation covered in 314.16(B)(4).

Listed WSCR used in combination with compatible WSAF shall be permitted to be installed in outlet boxes for the sole support of ceiling-suspended (paddle) fans, in accordance with 314.27(C).

Informational Note: See ANSI/NEMA WD-6, *American National Standard for Wiring Devices–Dimensional Specifications*, for standard configurations of weight-supporting ceiling receptacles and weight-supporting attachment fittings.

Additional Proposed Changes

File Name	Description	Approved
PI_1095_Reason_Statement.pdf		

Statement of Problem and Substantiation for Public Input

Please see the attached reason statement.

Submitter Information Verification

Submitter Full Name: Daniel Buuck
Organization: National Association of Home Builders
Street Address:
City:
State:
Zip:
Submittal Date: Thu Jun 15 15:30:13 EDT 2023
Committee: NEC-P08

Committee Statement

Resolution: FR-7555-NFPA 70-2024

Statement: Relocated 314.27(C) to 314.27(B) for usability with Boxes at Ceiling-Suspended (Paddle) Fan Outlets. Revised location requirements for ceiling-suspended (paddle) fan rated box or access through the box to structural framing to include the typical locations in lieu of mandating all locations. Exempted listed recessed luminaires from the requirements on 314.27(A)(2). Split 314.27(A)(2) to comply with the style manual for usability.

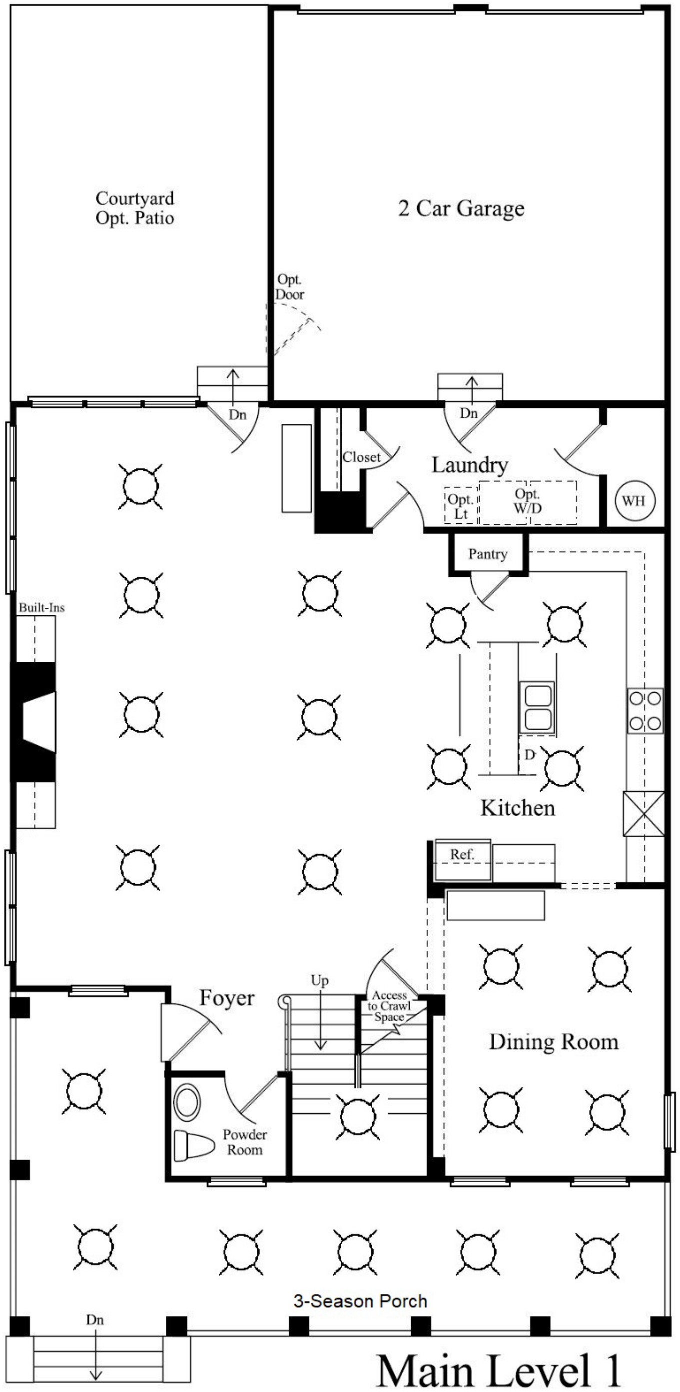
Section 314.27(C) has been cited to require multiple fan-rated boxes in one room, even in rooms which do not typically have a single ceiling fan installed, such as a kitchen or dining room. In some cases the lights were arranged in a rectangle around the ceiling with none near the middle of the ceiling. One problem with the language is using the vague phrasing "in a location acceptable for the installation of a ceiling-suspended (paddle) fan." There are many locations where a ceiling fan could conceivably be installed, but no one would ever put one there. Unfortunately, as written, this language allows such a broad interpretation that even those locations are being required for compliance.

Electricians who work in PA, NJ and DE brought this to our attention. They are installing fan-rated boxes around the kitchen and in off-center lighting locations around various rooms based as a result of the electrical inspector's interpretation at a cost of $15-$20 per location. A home being built with 20 or so "acceptable" locations is now paying an additional $400 which is being passed along to the homeowner with no added benefit.

Generally, the light in the center of a bedroom, family room, living room and rooms with similar uses is a location where a fan could be installed, and fan-rated boxes are often provided. The rooms or areas where a fan-rated outlet would be required are limited by this change to exclude kitchens and dining areas, since ceiling fans are not common in these areas.

A second issue with the current model code language is its location in the code. The requirement for installing outlet boxes rated for ceiling fans applies to ceiling light locations, so there should be a pointer to the requirement provided under 314.27(A)(2) which provides the more general requirement for ceiling outlets. The heading of 314.27(C) implies that the section only applies to ceiling outlets where a fan is intended to be installed so it is easily overlooked if there is no intent to install a ceiling fan. The result can be a surprise added cost to the homeowner through no fault of their own.

Below is a sample plan with 22 ceiling lights laid out in the living spaces. According to the current language, it seems that all 22 locations could be considered "acceptable for the installation of a ceiling-suspended (paddle) fan." Therefore, the requirements of 314.27(C) would apply. I believe this is overly restrictive based on the reasons given above. The proposed word "typical" may allow a broad interpretation, but, together with the informational note, it is less broad than the current wording.


Courtyard
Opt. Patio
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Closet
Laundry
Opt.
Lt
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WH
Pantry
Built-Ins
D
Kitchen
Ref.
Foyer
Up
Access
to Crawl
Space
Dining Room
Powder
Room
3-Season Porch
Dn

Main Level 1

Public Input No. 3977-NFPA 70-2023 [Section No. 314.27(A)(2)]

(2) Ceiling Outlets.

(a) Luminiare Less than 50 lb. At every outlet used exclusively for lighting, the box shall be designed or installed so that a luminaire or lampholder can be attached. Boxes shall be required to support a luminaire weighing a minimum of 23 kg (50 lb).

(b) Luminiare More than 50 lb. A luminaire that weighs more than 23 kg (50 lb) shall be supported independently of the outlet box, unless the outlet box is listed for not less than the weight to be supported. The interior of the box shall be marked by the manufacturer to indicate the maximum weight the box shall be permitted to support.

Statement of Problem and Substantiation for Public Input

Breaking up 314.27(A)(2) into a list item format to facilitate understanding for Code users. In accordance with NFPA Style Manual section 3.5.1.2 additional subdivisions shall be used where multiple requirements can be broken into independent requirements.

Submitter Information Verification

Submitter Full Name: Mike Holt
Organization: Mike Holt Enterprises Inc
Street Address:
City:
State:
Zip:
Submittal Date: Wed Sep 06 11:53:50 EDT 2023
Committee: NEC-P08

Committee Statement

Resolution: FR-7555-NFPA 70-2024

Statement: Relocated 314.27(C) to 314.27(B) for usability with Boxes at Ceiling-Suspended (Paddle) Fan Outlets. Revised location requirements for ceiling-suspended (paddle) fan rated box or access through the box to structural framing to include the typical locations in lieu of mandating all locations. Exempted listed recessed luminaires from the requirements on 314.27(A)(2). Split 314.27(A)(2) to comply with the style manual for usability.

Public Input No. 4093-NFPA 70-2023 [New Section after 314.27(C)]

(C) Boxes at Ceiling-Suspended (Paddle) Fan Outlets.
Outlet boxes or outlet box systems used as the sole support of a ceiling-suspended (paddle) fan shall be listed, shall be marked by their manufacturer on the interior of the box as suitable for this purpose, and shall not support ceiling-suspended (paddle) fans that weigh more than 32 kg (70 lb). For outlet boxes or outlet box systems designed to support ceiling-suspended (paddle) fans that weigh more than 16 kg (35 lb), the required marking shall include the maximum weight to be supported.

Outlet boxes mounted in the ceilings of habitable rooms of dwelling occupancies in a location acceptable for the installation of a ceiling-suspended (paddle) fan shall comply with one of the following:

(1) Listed for the sole support of ceiling-suspended (paddle) fans

(2) Installed so as to allow direct access through the box to structural framing capable of supporting a ceiling-suspended (paddle) fan without removing the box

Exception: Multiple outlet boxes installed over an island for pendants lights shall not be required to comply with 314.27(C).

Additional Proposed Changes

File Name	Description	Approved
PI-4093-NFPA_70-2023_Chris_A_Valtierra_Section_314.27_C_Exception.pdf	PI-4093-NFPA 70-2023 Chris A Valtierra Section 314.27(C) Exception	

Statement of Problem and Substantiation for Public Input

Consideration should be given that frequently pendant luminaires are installed over islands with a design layout recommendation that the width of the pendant should be used between multiple pendants, and they are not far enough apart to reasonably accept that someone would replace one with a fan. The AHJ though is tasked with determining compliance with 314.27(C) without any further guidance.

Submitter Information Verification

Submitter Full Name: Chris Valtierra
Organization: Valtierra Sign Electrician Learning Services LLC
Affiliation: Owner
Street Address:
City:
State:
Zip:
Submittal Date: Wed Sep 06 16:24:13 EDT 2023
Committee: NEC-P08

Committee Statement

Resolution: FR-7555-NFPA 70-2024

Statement: Relocated 314.27(C) to 314.27(B) for usability with Boxes at Ceiling-Suspended (Paddle) Fan Outlets. Revised location requirements for ceiling-suspended (paddle) fan rated box or access through the box to structural framing to include the typical locations in lieu of mandating all locations. Exempted listed recessed luminaires from the requirements on 314.27(A)(2). Split 314.27(A)(2) to comply with the style manual for usability.

PI-4093-NFPA 70-2023 Chris A Valtierra Section 314.27(C) Exception

Public Input No. 1783-NFPA 70-2023 [Section No. 314.27(C)]

(C) Boxes at Ceiling-Suspended (Paddle) Fan Outlets.

Outlet boxes or outlet box systems used as the sole support of a ceiling-suspended (paddle) fan shall be listed, shall be marked by their manufacturer on the interior of the box as suitable for this purpose, and shall not support ceiling-suspended (paddle) fans that weigh more than 32 kg (70 lb). For outlet boxes or outlet box systems designed to support ceiling-suspended (paddle) fans that weigh more than 16 kg (35 lb), the required marking shall include the maximum weight to be supported.

~~Outlet boxes~~ At least one outlet box mounted in the ceilings of habitable rooms of dwelling occupancies in a location acceptable for the installation of a ceiling-suspended (paddle) fan shall comply with one of the following:

(1) Listed for the sole support of ceiling-suspended (paddle) fans

(2) Installed so as to allow direct access through the box to structural framing capable of supporting a ceiling-suspended (paddle) fan without removing the box

Statement of Problem and Substantiation for Public Input

Existing language created a problem, it went from zero requirement to 100 % (all boxes mounted in the ceilings). the problem is that most habitable areas in dwelling units have multiple boxes installed in ceilings, normally one for a fan installation, one for a smoke detector and the rest are for LED disc type lighting fixtures.
with existing language, all these boxes in ceilings with enough space can be acceptable for a fan installation. Most kitchens have multiple boxes installed for disc type LED lights, especially above islands.
If three boxes are placed above these islands, technically all three are acceptable for fan installation if small fans are installed.
this requirement has created too many confusions to the point that inspectors are not enforcing it, and many contractors are not installing these fan boxes, existing language can create legal and liability issues for contractors.

Submitter Information Verification

Submitter Full Name: Armando Lozano
Organization: MSF Electric, Inc.
Street Address:
City:
State:
Zip:

Submittal Date: Wed Aug 02 09:24:50 EDT 2023
Committee: NEC-P08

Committee Statement

Resolution: FR-7555-NFPA 70-2024

Statement: Relocated 314.27(C) to 314.27(B) for usability with Boxes at Ceiling-Suspended (Paddle) Fan Outlets. Revised location requirements for ceiling-suspended (paddle) fan rated box or access through the box to structural framing to include the typical locations in lieu of mandating all locations. Exempted listed recessed luminaires from the requirements on 314.27(A)(2). Split 314.27(A)(2) to comply with the style manual for usability.

Public Input No. 2029-NFPA 70-2023 [Section No. 314.27(C)]

(C) Boxes at Ceiling-Suspended (Paddle) Fan Outlets.

Outlet boxes or outlet box systems used as the sole support of a ceiling-suspended (paddle) fan shall be listed, shall be marked by their manufacturer on the interior of the box as suitable for this purpose, and shall not support ceiling-suspended (paddle) fans that weigh more than 32 kg (70 lb). For outlet boxes or outlet box systems designed to support ceiling-suspended (paddle) fans that weigh more than 16 kg (35 lb), the required marking shall include the maximum weight to be supported.

Outlet boxes mounted in the ceilings of habitable rooms of dwelling occupancies in a location acceptable for the installation of a ceiling-suspended (paddle) fan shall comply with one of the following:

(1) Listed for the sole support of ceiling-suspended (paddle) fans

(2) Installed so as to allow direct access through the box to structural framing capable of supporting a ceiling-suspended (paddle) fan without removing the box

Exception: Multiple fan rated boxes shall not be required in habitable room(s) that have a fan rated box in a location that as been designated by the owner, installer, or designer.

Statement of Problem and Substantiation for Public Input

This public input is being submitted on behalf of the Minnesota Department of Labor and Industry. Currently, the Department’s inspection staff includes 14-office/field staff, 12-state field inspectors, 2-virtual inspectors and 50 plus contract electrical inspectors that complete over 170,000 electrical inspections annually.

This exception helps to clarify which box(es) located in a ceiling of habitable rooms would need to be fan rated. In many cases, multiple LED luminaires, or small flush mount luminaires may be mounted in a room. The idea that a paddle fan would be mounted at each luminaire location is not a realistic. The need for a fan rated box or structural member in close proximity is not reasonable when a location has been designated by the owner, installer or designer. The suggested language would be similar to what is allowed for receptacle placement in a meeting room. Section 210.65 states, “These receptacle outlets shall be permitted to be located as determined by the installer, designer, or building owner.”

Submitter Information Verification

Submitter Full Name: Dean Hunter

Organization: Minnesota Department of Labor

Street Address:

City:

State:

Zip:

Submittal Date: Fri Aug 11 10:32:34 EDT 2023

Committee: NEC-P08

Committee Statement

Resolution: FR-7555-NFPA 70-2024

Statement: Relocated 314.27(C) to 314.27(B) for usability with Boxes at Ceiling-Suspended (Paddle) Fan Outlets. Revised location requirements for ceiling-suspended (paddle) fan rated box or access through the box to structural framing to include the typical locations in lieu of mandating all locations. Exempted listed recessed luminaires from the requirements on 314.27(A)(2). Split 314.27(A)(2) to comply with the style manual for usability.

Public Input No. 2511-NFPA 70-2023 [Section No. 314.27(C)]

(C) Boxes at Ceiling-Suspended (Paddle) Fan Outlets.

Outlet boxes or outlet box systems used as the sole support of a ceiling-suspended (paddle) fan shall be listed, shall be marked by their manufacturer on the interior of the box as suitable for this purpose, and shall not support ceiling-suspended (paddle) fans that weigh more than 32 kg (70 lb). For outlet boxes or outlet box systems designed to support ceiling-suspended (paddle) fans that weigh more than 16 kg (35 lb), the required marking shall include the maximum weight to be supported.

Outlet boxes mounted in the ceilings of habitable rooms of dwelling ~~occupancies~~ units in a location acceptable for the installation of a ceiling-suspended (paddle) fan shall comply with one of the following:

(1) Listed for the sole support of ceiling-suspended (paddle) fans

(2) Installed so as to allow direct access through the box to structural framing capable of supporting a ceiling-suspended (paddle) fan without removing the box

Statement of Problem and Substantiation for Public Input

This change seeks to use the defined term "dwelling unit" instead of the existing, undefined, "dwelling occupancy." If the occupance type really is the intent, it should be changed to "residential occupancies" to correlate with the terminology used in the IBC.

Submitter Information Verification

Submitter Full Name: Ryan Jackson
Organization: Self-employed
Street Address:
City:
State:
Zip:
Submittal Date: Fri Aug 18 13:48:13 EDT 2023
Committee: NEC-P08

Committee Statement

Resolution: FR-7555-NFPA 70-2024

Statement: Relocated 314.27(C) to 314.27(B) for usability with Boxes at Ceiling-Suspended (Paddle) Fan Outlets. Revised location requirements for ceiling-suspended (paddle) fan rated box or access through the box to structural framing to include the typical locations in lieu of mandating all locations. Exempted listed recessed luminaires from the requirements on 314.27(A)(2). Split 314.27(A)(2) to comply with the style manual for usability.

Public Input No. 3642-NFPA 70-2023 [Section No. 314.27(C)]

(C) Boxes at Ceiling-Suspended (Paddle) Fan Outlets.

Outlet boxes or outlet box systems used as the sole support of a ceiling-suspended (paddle) fan shall be listed, shall be marked by their manufacturer on the interior of the box as suitable for this purpose, and shall not support ceiling-suspended (paddle) fans that weigh more than 32 kg (70 lb). For outlet boxes or outlet box systems designed to support ceiling-suspended (paddle) fans that weigh more than 16 kg (35 lb), the required marking shall include the maximum weight to be supported.

~~Outlet boxes~~ <u>At least one box</u> mounted in the ceilings of habitable rooms of dwelling occupancies in a location acceptable for the installation of a ceiling-suspended (paddle) fan shall comply with one of the following:

(1) Listed for the sole support of ceiling-suspended (paddle) fans

(2) Installed so as to allow direct access through the box to structural framing capable of supporting a ceiling-suspended (paddle) fan without removing the box

Statement of Problem and Substantiation for Public Input

Existing language created a problem, it went from zero requirements to 100 % (all boxes mounted in the ceilings). The problem is that most habitable areas in dwelling units have multiple boxes installed in ceilings. Typically, one is for a fan installation, one is for a smoke detector and the rest are for LED disc type fixtures. Since there is sufficient space around these boxes, technically all are acceptable for a fan installation.

Submitter Information Verification

Submitter Full Name: IEC National

Organization: IEC

Affiliation: Armando Lozano

Street Address:

City:

State:

Zip:

Submittal Date: Tue Sep 05 11:26:09 EDT 2023

Committee: NEC-P08

Committee Statement

Resolution: <u>FR-7555-NFPA 70-2024</u>

Statement: Relocated 314.27(C) to 314.27(B) for usability with Boxes at Ceiling-Suspended (Paddle) Fan Outlets. Revised location requirements for ceiling-suspended (paddle) fan rated box or access through the box to structural framing to include the typical locations in lieu of mandating all locations. Exempted listed recessed luminaires from the requirements on 314.27(A)(2). Split 314.27(A)(2) to comply with the style manual for usability.

Public Input No. 3792-NFPA 70-2023 [Section No. 314.27(C)]

(C) Boxes at Ceiling-Suspended (Paddle) Fan Outlets.

Outlet boxes or outlet box systems used as the sole support of a ceiling-suspended (paddle) fan shall be listed, shall be marked by their manufacturer on the interior of the box as suitable for this purpose, and shall not support ceiling-suspended (paddle) fans that weigh more than 32 kg (70 lb). For outlet boxes or outlet box systems designed to support ceiling-suspended (paddle) fans that weigh more than 16 kg (35 lb), the required marking shall include the maximum weight to be supported.

Outlet boxes mounted in the ceilings of habitable rooms of dwelling occupancies where 1.5 m (5 ft) or greater from a wall in a location acceptable for the installation of a ceiling-suspended (paddle) fan shall comply with one of the following:

(1) Listed for the sole support of ceiling-suspended (paddle) fans

(2) Installed so as to allow direct access through the box to structural framing capable of supporting a ceiling-suspended (paddle) fan without removing the box

Additional Proposed Changes

File Name	Description	Approved
PI-3792-NFPA_70-2023_Chris_A_Valtierra_Section_314.27_C_.pdf	PI-3792-NFPA 70-2023 Chris A Valtierra Section 314.27(C)	

Statement of Problem and Substantiation for Public Input

Habitable room designs are now incorporating wafer-thin led luminaires (puck lights) connected to an outlet box rather than recessed can lights. There may be multiple luminaires/outlet boxes in habitable rooms and this code section now requires the AHJ to determine how many or which ones are required to meet 314.27(C). There are 22-inch available ceiling fan models that would now make the puck lights location acceptable and required to comply with 314.27(C). Please see example picture of rooms that have multiple outlet boxes. As the AHJ, we are now tasked with this determination daily at rough inspection.

One example was a single-family dwelling that had 45 outlet boxes throughout the habitable rooms in a location acceptable for the installation of a ceiling-suspended (paddle) that are now required to comply with 314.27(C) and were changed out. The consideration of a distance measurement from walls will provide guidance to AHJs, designers, and installers.

Submitter Information Verification

Submitter Full Name: Chris Valtierra
Organization: City of Waco
Affiliation: N/A
Street Address:
City:
State:
Zip:
Submittal Date: Tue Sep 05 16:31:02 EDT 2023

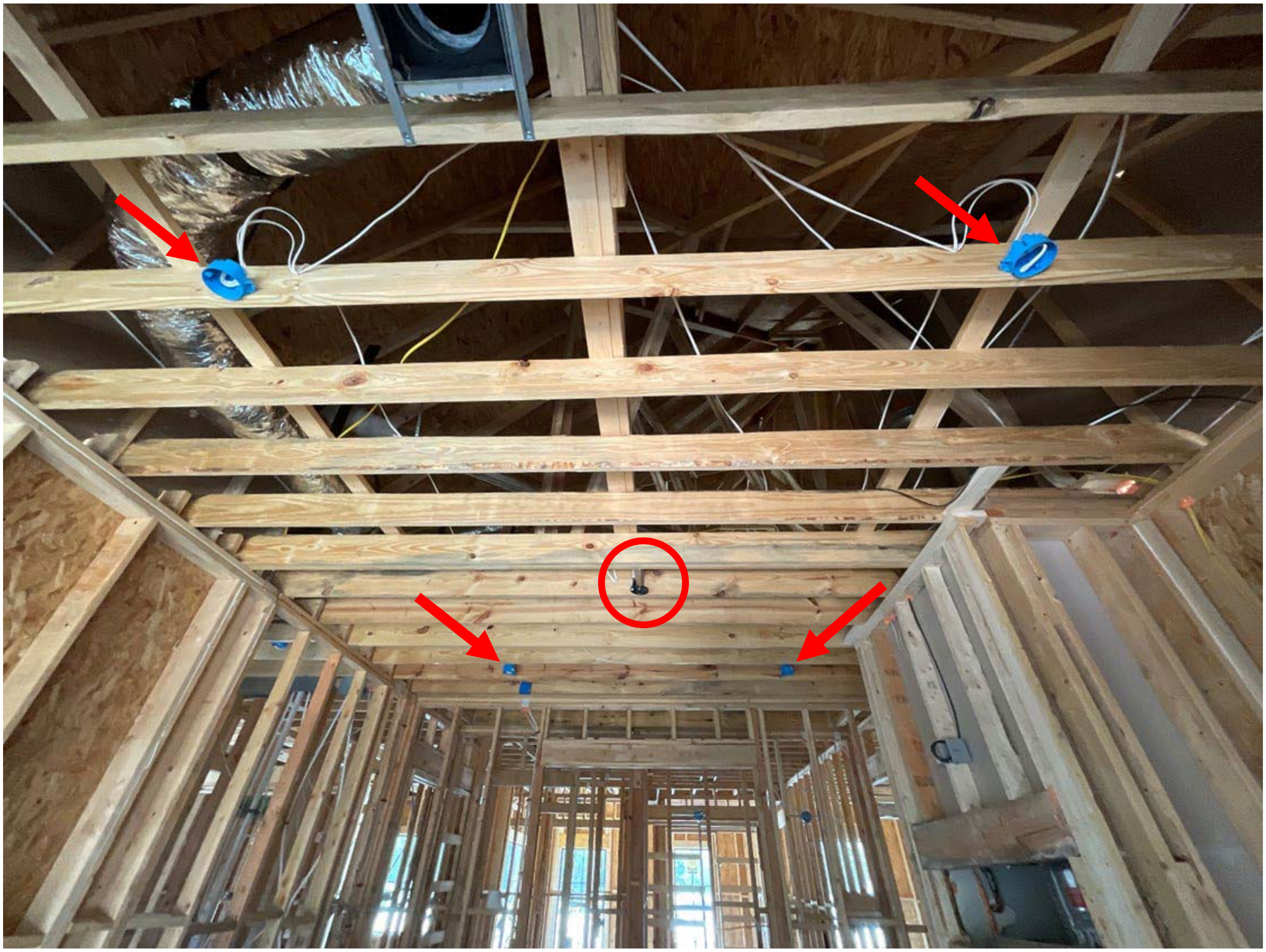
Committee: NEC-P08

Committee Statement

Resolution: FR-7555-NFPA 70-2024

Statement: Relocated 314.27(C) to 314.27(B) for usability with Boxes at Ceiling-Suspended (Paddle) Fan Outlets. Revised location requirements for ceiling-suspended (paddle) fan rated box or access through the box to structural framing to include the typical locations in lieu of mandating all locations. Exempted listed recessed luminaires from the requirements on 314.27(A)(2). Split 314.27(A)(2) to comply with the style manual for usability.

PI-3792-NFPA 70-2023 Chris A Valtierra Section 314.27(C)



AHJ is now required to determine that the other 4 outlet boxes are required to comply with 314.27(C).

Public Input No. 3981-NFPA 70-2023 [Section No. 314.27(C)]

(C) Boxes at Ceiling-Suspended (Paddle) Fan Outlets.

(1) Marking. Outlet boxes or outlet box systems used as the sole support of a ceiling-suspended (paddle) fan shall be listed, shall be marked by their manufacturer on the interior of the box as suitable for this purpose, and shall not support ceiling-suspended (paddle) fans that weigh more than 32 kg (70 lb). For outlet boxes or outlet box systems designed to support ceiling-suspended (paddle) fans that weigh more than 16 kg (35 lb), the required marking shall include the maximum weight to be supported.

(2) Dwelling. Outlet boxes mounted in the ceilings of habitable rooms of dwelling occupancies in a location acceptable for the installation of a ceiling-suspended (paddle) fan shall comply with one of the following:
(a) Listed for the sole support of ceiling-suspended (paddle) fans

(b) Installed so as to allow direct access through the box to structural framing capable of supporting a ceiling-suspended (paddle) fan without removing the box

Statement of Problem and Substantiation for Public Input

Breaking up 314.27(C) into a list item format to facilitate understanding for Code users. In accordance with NFPA Style Manual section 3.5.1.2 additional subdivisions shall be used where multiple requirements can be broken into independent requirements.

Submitter Information Verification

Submitter Full Name: Mike Holt

Organization: Mike Holt Enterprises Inc

Street Address:

City:

State:

Zip:

Submittal Date: Wed Sep 06 11:59:54 EDT 2023

Committee: NEC-P08

Committee Statement

Resolution: FR-7555-NFPA 70-2024

Statement: Relocated 314.27(C) to 314.27(B) for usability with Boxes at Ceiling-Suspended (Paddle) Fan Outlets. Revised location requirements for ceiling-suspended (paddle) fan rated box or access through the box to structural framing to include the typical locations in lieu of mandating all locations. Exempted listed recessed luminaires from the requirements on 314.27(A)(2). Split 314.27(A)(2) to comply with the style manual for usability.

Public Input No. 4359-NFPA 70-2023 [Section No. 314.27(C)]

(C) Boxes at Ceiling-Suspended (Paddle) Fan Outlets.

Outlet boxes or outlet box systems used as the sole support of a ceiling-suspended (paddle) fan shall be listed, shall be marked by their manufacturer on the interior of the box as suitable for this purpose, and shall not support ceiling-suspended (paddle) fans that weigh more than 32 kg (70 lb). For outlet boxes or outlet box systems designed to support ceiling-suspended (paddle) fans that weigh more than 16 kg (35 lb), the required marking shall include the maximum weight to be supported.

Outlet boxes mounted in the ceilings of habitable rooms of dwelling occupancies in a location acceptable for the installation of a ceiling-suspended (paddle) fan shall comply with one of the following:

(1) Listed for the sole support of ceiling-suspended (paddle) fans

(2) Installed so as to allow direct access through the box to structural framing capable of supporting a ceiling-suspended (paddle) fan without removing the box

Exception: Outlet boxes that are integral to listed recessed luminaires are not required to comply with Section 314.27(C).

Statement of Problem and Substantiation for Public Input

The way Section 314.27(C) currently reads AHJs may (and in some cases have), interpreted this to mean ALL outlet boxes, even those that are part of a recessed luminaire, installed in a dwelling unit ceiling where a fan could legally be installed to be rated for fan support. The definiton of "Outlet" could be extended to these termination compartments on recessed luminaires, and as such adding an exception will make it clear to contractors and AHJs that the termination compartments on recessed luminaires are not subject to the requirements in Section 314.27(C).

Submitter Information Verification

Submitter Full Name:	Kyle Krueger
Organization:	NECA
Affiliation:	NECA
Street Address:	
City:	
State:	
Zip:	
Submittal Date:	Thu Sep 07 12:43:02 EDT 2023
Committee:	NEC-P08

Committee Statement

Resolution: FR-7555-NFPA 70-2024

Statement: Relocated 314.27(C) to 314.27(B) for usability with Boxes at Ceiling-Suspended (Paddle) Fan Outlets. Revised location requirements for ceiling-suspended (paddle) fan rated box or access through the box to structural framing to include the typical locations in lieu of mandating all locations. Exempted listed recessed luminaires from the requirements on 314.27(A)(2). Split 314.27(A)(2) to comply with the style manual for usability.

Public Input No. 204-NFPA 70-2023 [Section No. 314.28(A)(2)]

(2) Angle or U Pulls, or Splices.

Where splices or where angle or U pulls are made, the distance between each raceway entry inside the box or conduit body and the opposite wall of the box or conduit body shall not be less than six times the metric designator (trade size) of the largest raceway in a row. This distance shall be increased for additional entries by the amount of the sum of the diameters of all other raceway entries in the same row on the same wall of the box. Each row shall be calculated individually, and the single row that provides the maximum distance shall be used.

Exception: Where a raceway or cable entry is in the wall of a box or conduit body opposite a removable cover or hinged cover , the distance from that wall to the cover shall be permitted to comply with the distance required for one wire per terminal in Table 312.6(A).

The distance between raceway entries enclosing the same conductor shall not be less than six times the metric designator (trade size) of the larger raceway.

When transposing cable size into raceway size in 314.28(A)(1) and (A)(2), the minimum metric designator (trade size) raceway required for the number and size of conductors in the cable shall be used.

Statement of Problem and Substantiation for Public Input

The exception is for removable covers. SOme boxes have a hindged cover that can be swung out of the way to facilitate the installation of the conductors. A hinged cover is not removable from the box.

Submitter Information Verification

Submitter Full Name: Dennis Querry
Organization: Trinity River Authority
Street Address:
City:
State:
Zip:
Submittal Date: Fri Jan 20 14:17:15 EST 2023
Committee: NEC-P08

Committee Statement

Resolution: FR-7556-NFPA 70-2024

Statement: Deleted the “removable” descriptor so the exception applies to all boxes and conduit bodies regardless of how the cover is attached.

Public Input No. 3983-NFPA 70-2023 [Section No. 314.28(A)(2)]

(2) Angle or U Pulls, or Splices.

~~Where splices or where angle or U~~ (a) Angle Pulls. Where angle pulls are made, the distance between each raceway entry inside the box or conduit body and the opposite wall of the box or conduit body shall not be less than six times the metric designator (trade size) of the largest raceway in a row. This distance shall be increased for additional entries by the amount of the sum of the diameters of all other raceway entries in the same row on the same wall of the box. ~~Each row shall be calculated individually, and the single row that provides the maximum distance shall be used.~~

~~Exception: Where a raceway or cable entry is in the wall of a box or conduit body opposite a removable cover, the distance from that wall to the cover shall be permitted to comply with the distance required for one wire per terminal in Table 312.6(A) .~~

(b) U Pulls. Where U pulls are made, the distance between each raceway entry inside the box or conduit body and the opposite wall of the box or conduit body shall not be less than six times the metric designator (trade size) of the largest raceway in a row. This distance shall be increased for additional entries by the amount of the sum of the diameters of all other raceway entries in the same row on the same wall of the box.

(c) Splices. Where splices are made, the distance between each raceway entry inside the box or conduit body and the opposite wall of the box or conduit body shall not be less than six times the metric designator (trade size) of the largest raceway in a row. This distance shall be increased for additional entries by the amount of the sum of the diameters of all other raceway entries in the same row on the same wall of the box.

(d) Rows. Each row shall be calculated individually, and the single row that provides the maximum distance shall be used.

(e) Distance Between Raceways. The distance between raceway entries enclosing the same conductor shall not be less than six times the metric designator (trade size) of the larger raceway.

(f) Trade Size. When transposing cable size into raceway size in 314.28(A)(1) and (A)(2), the minimum metric designator (trade size) raceway required for the number and size of conductors in the cable shall be used.

Exception: Where a raceway or cable entry is in the wall of a box or conduit body opposite a removable cover, the distance from that wall to the cover shall be permitted to comply with the distance required for one wire per terminal in Table 312.6(A) .

Statement of Problem and Substantiation for Public Input

Breaking up 314.28(A)(2) into a list item format to facilitate understanding for Code users. In accordance with NFPA Style Manual section 3.5.1.2 additional subdivisions shall be used where multiple requirements can be broken into independent requirements.

Submitter Information Verification

Submitter Full Name: Mike Holt
Organization: Mike Holt Enterprises Inc
Street Address:
City:

State:

Zip:

Submittal Date: Wed Sep 06 12:01:48 EDT 2023

Committee: NEC-P08

Committee Statement

Resolution: The language should remain as is. Having additional subdivisions does not provide clarity and usability to the user.

Public Input No. 892-NFPA 70-2023 [Section No. 314.28(B)]

(B) Conductors in Pull or Junction Boxes.

In pull boxes or junction boxes having any dimension over 1.8 m (6 ft), all conductors shall be ~~cabled or racked up~~ secured in an approved manner.

Statement of Problem and Substantiation for Public Input

The terms "cabled" and "racked up" are not defined and seem to be slang terms. This PI seeks to replace those terms with the word "secured," which is well understood.

Submitter Information Verification

Submitter Full Name: Ryan Jackson
Organization: Self-employed
Street Address:
City:
State:
Zip:
Submittal Date: Thu May 25 11:59:42 EDT 2023
Committee: NEC-P08

Committee Statement

Resolution: FR-7557-NFPA 70-2024

Statement: Revised the undefined terms ‘cabled’ and ‘racked-up’ to 'secured’ which is a recognized term and the wiring method articles provide requirements for securing and supporting.

Public Input No. 1595-NFPA 70-2023 [Section No. 314.29]

314.29 Boxes, Conduit Bodies, and Handhole Enclosures to Be Accessible.

Boxes, conduit bodies, and handhole enclosures shall be installed so that wiring and devices contained in the boxes, conduit bodies, or handhole enclosures can be rendered accessible in accordance with 314.29(A) and (B).

(A) In Buildings and Other Structures.

Boxes and conduit bodies shall be installed so the contained wiring and devices are accessible. Boxes and conduit bodies that are recessed into or behind finished surfaces of buildings shall have access to their internal contents maintained by openings in their covers and in the building finish that comply with 314.29(A)(1), (A)(2), or (A)(3) as applicable. Removable finished covers and faceplates that maintain this access shall be permitted.

(1) Boxes 1650 cm^3 (100 $in.^3$) or Less in Size.

The openings in the building surfaces, if reduced from the outer walls of the box, shall be centered not more than 25 mm (1 in.) from the centerline of the box, and shall not extend beyond the walls of the box. If rectangular, the opening shall be not less than 73 mm (2⅞ in.) by 45 mm (1¾ in.) in size. If circular, the opening shall not be less than 90 mm (3½ in.) in diameter.

Exception: Smaller openings in building surfaces that accommodate one or more individual devices shall be permitted if all of the following conditions are met:

(1) The outlet box that supplies the device(s) is nonmetallic.

(2) The branch circuit wiring that supplies each device consists of a separate nonmetallic cable assembly originating outside the box, or individual sets of conductors in a single nonmetallic raceway, all of which originate outside the box. Other than the connections to a single device, these conductors are not spliced in the box or continued to another device, and no other wiring or raceways enter the box.

(3) Each device is capable of removal from the building surface opening without being damaged. If a special tool is required for this purpose, the applicable circuit directory for the device records the location of the tool, together with a product code/QR code for acquiring a replacement if necessary.

(4) All connections for each device to the branch circuit wiring are made with listed clamping-type wire connectors, which are supplied with the devices. The branch-circuit conductors are arranged to permit the connector(s) to be exposed after the device has been fully removed.

(5) The device assemblies are listed for this application.

(2) Boxes Larger Than 1650 cm^3 (100 $in.^3$) in Size.

The openings shall not be smaller than the outer walls of the box.

(3) Conduit Bodies.

The openings shall not be smaller than outer walls of the conduit body.

(B) Underground.

Underground boxes and handhole enclosures shall be installed so they are accessible without excavating sidewalks, paving, earth, or other substance that is to be used to establish the finished grade.

Exception: Listed boxes and handhole enclosures shall be permitted where covered by gravel, light aggregate, or noncohesive granulated soil if their location is effectively described and accessible for excavation. The location description shall be available to those authorized to access, maintain, or inspect the wiring.

Additional Proposed Changes

File Name	Description	Approved
TIA_1690_70_23_10.pdf	NEC TIA 23-10 Log 1690	

Statement of Problem and Substantiation for Public Input

NOTE: This public input originates from Tentative Interim Amendment No. 23-10 (Log 1690) issued by the Standards Council on March 21, 2023 and per the NFPA Regs., needs to be reconsidered by the Code-Making Panel for the next edition of the Document.

Substantiation: CMP 9 has recently become aware of devices designed to mount in front of the outlet boxes that contain their electrical supply. The outlet boxes are recessed entirely behind the building surfaces, with a cylindrical hole cut into the building surface to match the hole in a mounting plate that attaches to the box. The hole diameters are 36.5 mm (1 7/16 in.), sized to receive the actual devices. The device exteriors consist of nonmetallic barrels that engage mating surfaces manufactured as part of the mounting plates. The devices can be removed through the use of a cylindrical extraction tool that closely envelops the outer margin of the cylindrical device, and that in so doing spreads the interior locking tabs, which in turn enables the extraction of the devices, one at a time, after it is pushed into position.

This means that there is little meaningful access to the box interior after the surface material is applied. As noted, the devices can be removed, but the box interior is only viewable to the minimal extent that it can be seen through the finished hole. The surface treatments supported by the system run from 6 mm (1/4 in.) through 19 mm (3/4 in.) and up to 32 mm (1¼ in.), which results in a significant reduction in visibility into the box, especially relative to required equipment grounding connections to the box and also the mechanism for branch-circuit cable and/or raceway securement to the box itself.

An installation video provided by one manufacturer, however inadvertently, demonstrated these shortcomings convincingly. It showed the application of the special tool that allows for the extraction of the wiring device from the wall, with the device bringing with it branch circuit conductors attached to the wire leads from the device with twist-on wire connectors. As the device was drawn away from the wall, the branch-circuit conductors followed it, eventually bringing into view what appeared to be an NM cable sheath. The entire cable assembly then began to move out of the wall. This intersected with the installation advice (advice, not a requirement) that only one wire (obviously intended as meaning one cable assembly) be present in the box. It was also apparent that that cable assembly was not secured to the box, and that a significant amount of cable slack had been arranged ahead of the box, in order to support the withdrawal from the wall that allows for inspection and maintenance to be done as required to the supply connections. The video also implied (but does not state) that wiring methods other than Type NM cable should not be used. In fact, the intact cable assembly exiting the box showed no sign of the required equipment grounding connection to the box having been made, although the installation guidance from one manufacturer for single device applications specifies a steel outlet box.

The NEC has required access to boxes for about 100 years. What is now 314.29(A) originally only applied to junction boxes, however, the access rule was extended to outlet boxes 60 years ago, in the 1962 NEC. These devices and their mounting provisions obstruct access to and the ability to inspect boxes behind surface treatments. This approach eviscerates the six-decade requirement for access to outlet boxes, because a box in an admittedly known location whose contents cannot be viewed short of removing the building surface is one that effectively contravenes key safety objectives in the access rules. Electrical components that cannot be viewed cannot be maintained.

CMP 1 has rewritten the definition for accessible for the 2023 edition to further strengthen its terms, now including the word “blocked” along with the prior wording “closed in by the structure or finish of the building.” This system clearly blocks access to the box, and therefore even more certainly fails the accessibility test.

In its original form, this TIA, docketed as Log 1649, was presented without any exception. CMP 9, Task Group 2 had the opportunity, during the comment period on its original form, to engage with a major manufacturer of a system addressed in the TIA. The task group continues to believe that the TIA has general merit, in that the present content of 314.29(A) may allow for more latitude than CMP 9 ever intended. However, it also became clear that within strict limits, such a device system can be utilized within the policy objectives of CMP 9 and without sacrificing safety. The limitations are accomplished through the use of a carefully crafted exception into the originally circulated TIA. Devices that operate under this system number in excess of 75,000.

The TIA as originally worded would have forced this system out of the market.
It has become clear that if the product is used as at least one manufacturer intends it to be used, everything that one would need to see inside a box can be withdrawn from the box and into view. The one exception would be the connection of the branch-circuit wiring to the box, and that is plainly viewable on the rough inspection. At the time of the original submittal, the installation instructions had many gaps and errors that could not guarantee this outcome. The manufacturer expressed a willingness to go back to UL and revise the installation instructions and manufacturing/shipping practices accordingly.

Because of these developments, by a public comment circulated to address the original TIA (log 1649), the Task Group recommended to the CMP 9 membership that the votes cast to date be withdrawn. The understanding was that the TIA would reissue with the Exception herein included to 314.29(A)(1). That recommendation was successful, and the original version of this TIA was rejected by CMP 9. This TIA submittal includes the anticipated exception, and it should go forward accordingly.

The TIA now proposed differs, therefore, from the original principally by the inclusion of the exception. A detailed analysis of the exception provisions follows:

(a) Requires a nonmetallic box. Such boxes do not require an equipment grounding connection, and therefore there will be no grounding connections to the box interior for review, maintenance, or inspection after the building finish is in place.

(b) Requires a nonmetallic branch circuit wiring method, for the same reasons as the nonmetallic box. The other provisions assure that each device is directly connected to a branch circuit conductor that is not otherwise spliced in the box. No splices or other wiring will be present to inspect or maintain, beyond the device connections that are withdrawable [see (d)]. Clarifying language is included that prohibits the continuation of wiring beyond the box.

(c) The devices must be designed for removal. The location of the tool must be entered in the circuit directory, which could be placed once at the bottom and referenced with asterisks or similar to reduce real estate. This rule also addresses what happens when the building changes hands or whatever. The wording also creates enforceable text relative to the field wiring being folded into the box in a way conducive to removal and reinsertion. To a great extent this will be self-enforcing, because the devices cannot be installed ahead of the building finish.

(d) With the manufacturer supplying the connectors, the manufacture and the testing laboratory will have control over their size, and therefore be in a position to assure that the connections can be withdrawn through the building surface specified opening diameter (currently 1 7/16 in.) when the device is removed. The point is that these connections must be inspectable and maintainable.

(e) This is the listing requirement, and it is to be specific to the application. This wording will assure that the evaluation will take into account the code context and not simply the general product standard requirements for receptacles.

Emergency Nature: The proposed TIA intends to correct a previously unknown existing hazard.

The existence of this product line, now bolstered by a product listing, raises serious safety and enforcement concerns, particularly as it directly conflicts with new wording in Art. 100. CMP 9 has amended 314.29 for the 2023 NEC by removing former language that duplicated some of the Art. 100 definition, in favor of a straightforward requirement for accessibility. This makes the full application of that definition crucial for proper enforcement. The product listing complicates the ability of the inspection community to regulate these devices. This TIA provides clear and easily enforceable statements as to how large an opening is considered to afford the required interior access, together with allowances for different shapes and a moderate degree of centerline offset, all of which accommodate long-standing standard plaster ring and related cover designs. The exception creates an appropriately limited allowance that still meets the intended the policy objectives of the Code.

Submitter Information Verification

Submitter Full Name:	CMP on NEC-P09
Organization:	Code-Making Panel 9
Street Address:	
City:	
State:	
Zip:	
Submittal Date:	Thu Jul 27 08:55:01 EDT 2023
Committee:	NEC-P08

Committee Statement

Resolution: FR-7516-NFPA 70-2024

Statement: This revision clarifies that the requirements apply to the exterior and interior of buildings and structures.

The panel has reviewed the text revisions issued under TIA-1690 which became PI1595. Further revisions to the text are in the exception to permit metal boxes and wiring methods with the reduced opening devices.

Tentative Interim Amendment

NFPA® 70®

National Electrical Code®

2023 Edition

Reference: 314.29(A)
TIA 23-10
(SC 23-3-10 / TIA Log #1690)

Pursuant to Section 5 of the NFPA *Regulations Governing the Development of NFPA Standards*, the National Fire Protection Association has issued the following Tentative Interim Amendment to NFPA 70®, *National Electrical Code®*, 2023 edition. The TIA was processed by the NEC Code-Making Panel 9 and the NEC Correlating Committee, and was issued by the Standards Council on March 21, 2023, with an effective date of April 10, 2023.

1. Revise paragraph 314.29(A) to read as follows:

314.29 Boxes, Conduit Bodies, and Handhole Enclosures to Be Accessible. Boxes, conduit bodies, and handhole enclosures shall be installed so that wiring and devices contained in the boxes, conduit bodies, or handhole enclosures can be rendered accessible in accordance with 314.29(A) and (B).

(A) In Buildings and Other Structures. Boxes and conduit bodies shall be installed so the contained wiring and devices are accessible. Boxes and conduit bodies that are recessed into or behind finished surfaces of buildings shall have access to their internal contents maintained by openings in their covers and in the building finish that comply with 314.29(A)(1), (A)(2), or (A)(3) as applicable. Removable finished covers and faceplates that maintain this access shall be permitted.

(1) Boxes 1650 cm^3 (100 $in.^3$) or Less in Size. The openings in the building surfaces, if reduced from the outer walls of the box, shall be centered not more than 25 mm (1 in.) from the centerline of the box, and shall not extend beyond the walls of the box. If rectangular, the opening shall be not less than 73 mm (2 7/8 in.) by 45 mm (1 3/4 in.) in size. If circular, the opening shall not be less than 90 mm (3½ in.) in diameter.

Exception: Smaller openings in building surfaces that accommodate one or more individual devices shall be permitted if all of the following conditions are met:

(1) The outlet box that supplies the device(s) is nonmetallic.
(2) The branch circuit wiring that supplies each device consists of a separate nonmetallic cable assembly originating outside the box, or individual sets of conductors in a single nonmetallic raceway, all of which originate outside the box. Other than the connections to a single device, these conductors are not spliced in the box or continued to another device, and no other wiring or raceways enter the box.
(3) Each device is capable of removal from the building surface opening without being damaged. If a special tool is required for this purpose, the applicable circuit directory for the device records the location of the tool, together with a product code/QR code for acquiring a replacement if necessary.
(4) All connections for each device to the branch circuit wiring are made with listed clamping-type wire connectors, which are supplied with the devices. The branch-circuit conductors are arranged to permit the connector(s) to be exposed after the device has been fully removed.
(5) The device assemblies are listed for this application.

(2) Boxes Larger Than 1650 cm^3 (100 $in.^3$) in Size. The openings shall not be smaller than the outer walls of the box.

(3) Conduit Bodies. The openings shall not be smaller than outer walls of the conduit body.

(B) Underground. Underground boxes and handhole enclosures shall be installed …

Issue Date: March 21, 2023

Effective Date: April 10, 2023

(Note: For further information on NFPA Codes and Standards, please see www.nfpa.org/docinfo)

Public Input No. 1750-NFPA 70-2023 [Section No. 314.29(A)]

(A) ~~In~~ At Buildings and Other Structures.

Boxes and conduit bodies shall be installed at the interiors and exteriors of buildings and other structures so the contained wiring and devices are accessible. Boxes and conduit bodies that are recessed into or behind finished surfaces of buildings and structures shall have access to their internal contents maintained by openings in their covers and in the building finish that comply with 314.29(A)(1), (A)(2), or (A)(3) as applicable. Removable finished covers and faceplates that maintain this access shall be permitted.

(1) Boxes 1650 cm^3 (100 in.^{3}) or Less in Size.

The openings in the building surfaces, if reduced from the outer walls of the box, shall be centered not more than 25 mm (1 in.) from the centerline of the box, and shall not extend beyond the walls of the box. If rectangular, the opening shall be not less than 73 mm (2⅞ in.) by 45 mm (1¾ in.) in size. If circular, the opening shall not be less than 90 mm (3½ in.) in diameter.

Exception: Smaller openings in building surfaces that accommodate one or more individual devices shall be permitted if all of the following conditions are met:

(1) The outlet box that supplies the device(s) is nonmetallic.

(2) The branch circuit wiring that supplies each device consists of a separate nonmetallic cable assembly originating outside the box, or individual sets of conductors in a single nonmetallic raceway, all of which originate outside the box. Other than the connections to a single device, these conductors are not spliced in the box or continued to another device, and no other wiring or raceways enter the box.

(3) Each device is capable of removal from the building surface opening without being damaged. If a special tool is required for this purpose, the applicable circuit directory for the device records the location of the tool, together with a product code/QR code for acquiring a replacement if necessary.

(4) All connections for each device to the branch circuit wiring are made with listed clamping-type wire connectors, which are supplied with the devices. The branch-circuit conductors are arranged to permit the connector(s) to be exposed after the device has been fully removed.

(5) The device assemblies are listed for this application.

(2) Boxes Larger Than 1650 cm^3 (100 in.^{3}) in Size.

The openings shall not be smaller than the outer walls of the box.

(3) Conduit Bodies.

The openings shall not be smaller than outer walls of the conduit body.

Additional Proposed Changes

File Name	Description	Approved
314.29A_conduit_body_outdoors.jpg	Exterior conduit body access blocked by exterior finish material (bricks and mortar).	

Statement of Problem and Substantiation for Public Input

The enforceability of 314.29 on the exterior of buildings and structures was unwarrantedly negated by the changes in 2020 and 2023 NEC® by the CMP's choice of the wrong preposition [First Revision No.

7745-NFPA 70-2018].
.
Prior to 2020 NEC®, 314.29 required that the wiring and devices of boxes and conduit bodies be accessible, regardless of whether those boxes and conduit bodies were located on the interior or exterior of buildings and structures. As reworded in 2020 and 2023 NEC®, however, this requirement now technically addresses solely boxes and conduit bodies installed INSIDE OF buildings and structures but NO LONGER those installed at the OUTSIDE of the same buildings and structures.
.
As shown in the accompanying photo, the conduit body installed on the building's »EXTERIOR« is not »IN« the building, yet accessibility can be blocked by surrounding finish materials applied at the building or structure exterior. Consequently, such a lack of accessibility to this example conduit body CAN NO LONGER BE ENFORCED AS A VIOLATION per 2020 or 2023 NEC® 314.29(A) as presently worded.
.
This Public Input is the result of collaboration on the Electrical Code Discussion Facebook Group by Scott Sanville of Eden Prairie, Minnesota, Don Garniere of Ottawa, Illinois, and Brian Rock (CMP-2, CMP-15, fmr CMP-17) of Madison, Connecticut.

Submitter Information Verification

Submitter Full Name:	Brian Rock
Organization:	Hubbell Incorporated
Street Address:	
City:	
State:	
Zip:	
Submittal Date:	Mon Jul 31 17:13:41 EDT 2023
Committee:	NEC-P08

Committee Statement

Resolution: FR-7516-NFPA 70-2024

Statement: This revision clarifies that the requirements apply to the exterior and interior of buildings and structures.

The panel has reviewed the text revisions issued under TIA-1690 which became PI1595. Further revisions to the text are in the exception to permit metal boxes and wiring methods with the reduced opening devices.

Public Input No. 1554-NFPA 70-2023 [Section No. 314.29(B)]

(B) Underground.

Underground boxes ~~and~~ , conduit bodies and handhole enclosures shall be installed so they are accessible without excavating sidewalks, paving, earth, or other substance that is to be used to establish the finished grade.

Exception: Listed boxes, conduit bodies and handhole enclosures shall be permitted where covered by gravel, light aggregate, or noncohesive granulated soil if their location is effectively described and accessible for excavation. The location description shall be available to those authorized to access, maintain, or inspect the wiring.

Additional Proposed Changes

File Name	Description	Approved
IMG_6410.jpeg	buried conduit body	

Statement of Problem and Substantiation for Public Input

This revision is needed to include conduit bodies too. Access to wiring in buried conduit bodies is needed in the same way it's needed for buried boxes and handholes.

Submitter Information Verification

Submitter Full Name: Russ Leblanc
Organization: Leblanc Consulting Services
Street Address:
City:
State:
Zip:
Submittal Date: Tue Jul 25 11:03:10 EDT 2023
Committee: NEC-P08

Committee Statement

Resolution: The panel is unaware of any conduit body listed as suitable for underground applications. Additional technical substantiation would be required to add conduit bodies for underground applications.

Public Input No. 1861-NFPA 70-2023 [Section No. 314.29(B)]

(B) Underground.

Underground boxes, conduit bodies, and handhole enclosures shall be installed so they are accessible without excavating sidewalks, paving, earth, or other substance that is to be used to establish the finished grade.

Exception: Listed boxes and handhole enclosures shall be permitted where covered by gravel, light aggregate, or noncohesive granulated soil if their location is effectively described and accessible for excavation. The location description shall be available to those authorized to access, maintain, or inspect the wiring.

Additional Proposed Changes

File Name	Description	Approved
conduit_body.jpg	accessible?	

Statement of Problem and Substantiation for Public Input

The change in the language in 314.29 between 2017 and 2023 removed that language that would prohibit the installation shown in the attached image. This change will restore the requirements from 2017 that were inadvertently removed when the section was split into two first level subdivisions, one for on a building or structure and the second for underground. This could also be corrected by changing the title (A) to "In or on buildings or structures" if the panel would chose to do it that way.

Submitter Information Verification

Submitter Full Name: Don Ganiere
Organization: none
Street Address:
City:
State:
Zip:

Submittal Date: Sun Aug 06 16:24:38 EDT 2023
Committee: NEC-P08

Committee Statement

Resolution: The panel is unaware of any conduit body listed as suitable for underground applications. Additional technical substantiation would be required to add conduit bodies for underground applications.

Public Input No. 3985-NFPA 70-2023 [Section No. 314.30(D)]

(D) Covers.

(1) Marking. Handhole enclosure covers shall have an identifying mark or logo that prominently identifies the function of the enclosure, such as “electric.” Handhole enclosure covers shall require the use of tools to open, or they shall weigh over 45 kg (100 lb).

(2) Bonding. Metal covers and other exposed conductive surfaces shall be bonded in accordance with 250.92 if the conductors in the handhole are service conductors, or in accordance with 250.96(A) if the conductors in the handhole are feeder or branch-circuit conductors.

Statement of Problem and Substantiation for Public Input

Breaking up 314.30(D) into a list item format to facilitate understanding for Code users. In accordance with NFPA Style Manual section 3.5.1.2 additional subdivisions shall be used where multiple requirements can be broken into independent requirements.

Submitter Information Verification

Submitter Full Name: Mike Holt
Organization: Mike Holt Enterprises Inc
Street Address:
City:
State:
Zip:
Submittal Date: Wed Sep 06 12:11:24 EDT 2023
Committee: NEC-P08

Committee Statement

Resolution: FR-7562-NFPA 70-2024
Statement: Created subdivisions in accordance with NEC 2023 Style Manual Section 3.5.1.2.

Public Input No. 2888-NFPA 70-2023 [Section No. 342.6]

342.~~6~~ 2 Listing Requirements.

IMC, factory elbows ~~and~~ , couplings, ~~and~~ associated fittings, and support and securement hardware shall be listed.

Statement of Problem and Substantiation for Public Input

To avoid damage to IMC and undue stress on electrical connections, the use of listed hardware for support and securement of IMC is necessary. UL 2239, the Standard for Safety for Hardware for the Support of Conduit, Tubing, and Cable, was first published nearly 20 years ago and contains all necessary hardware construction, performance, marking and installation instructions necessary to provide installers the guidance to properly support and secure IMC using hardware installed per the manufacturers' installation instructions.

Additionally, per the 2023 NEC style manual, clause 2.2.1, "Required Parallel Numbering Format" Listing requirements should be relocated from 342.6 to 342.2.

Submitter Information Verification

Submitter Full Name: David Gerstetter

Organization: Ul Solutions

Affiliation: UL Solutions

Street Address:

City:

State:

Zip:

Submittal Date: Fri Aug 25 22:24:44 EDT 2023

Committee: NEC-P08

Committee Statement

Resolution: No safety issues have been identified to justify the listing of support and securement hardware.

Public Input No. 3516-NFPA 70-2023 [Section No. 342.6]

342.~~6~~ 2 Listing Requirements.

IMC, factory elbows and couplings, and associated fittings shall be listed.

Statement of Problem and Substantiation for Public Input

This Public Input is being submitted on behalf of the NEC Correlating Committee Usability Task Group in order to provide correlation throughout the document. A new section is added to comply with the NEC Style Manual Section 2.2.1 regarding Listing Requirements.
2.2.1 Parallel Numbering Required. Technical committees shall use the following section numbers for the same purposes within articles. This requirement shall not apply to Articles 90, 100, and 110. If the article does not contain listing or reconditioning requirements, the subdivisions shall not be included in the article.
Required Parallel Numbering Format
XXX.1 Scope.
XXX.2 Listing Requirements.
XXX.3 Reconditioned Equipment.
XXX.3(A) Permitted to be Installed.
XXX.3(B) Not Permitted to be Installed.
The Usability Task Group members are: Derrick Atkins, David Hittinger, Richard Holub, Dean Hunter, Chad Kennedy and David Williams.

Submitter Information Verification

Submitter Full Name:	David Williams
Organization:	Delta Charter Township
Street Address:	
City:	
State:	
Zip:	
Submittal Date:	Mon Sep 04 17:32:24 EDT 2023
Committee:	NEC-P08

Committee Statement

Resolution: FR-7790-NFPA 70-2024

Statement: Renumbered to comply with the NEC Style Manual Section 2.2.1 regarding Listing Requirements.

Public Input No. 1301-NFPA 70-2023 [Section No. 342.10]

342.10 Uses Permitted.

(A) All Atmospheric Conditions and Occupancies.

~~Use of IMC~~ Galvanized steel and PVC coated steel IMC shall be permitted under all atmospheric conditions and occupancies.

(B) Corrosion Environments.

Galvanized steel and PVC coated steel IMC, elbows, couplings, and fittings shall be permitted to be installed in concrete, in direct contact with the earth, in direct burial applications, or in areas subject to severe corrosive influences where protected by corrosion protection approved for the condition.

(C) Cinder Fill.

Galvanized steel and PVC coated steel IMC shall be permitted to be installed in or under cinder fill where subject to permanent moisture where protected on all sides by a layer of noncinder concrete not less than 50 mm (2 in.) thick; where the conduit is not less than 450 mm (18 in.) under the fill; or where protected by corrosion protection approved for the condition.

(D) Wet Locations.

All supports, bolts, straps, screws, and so forth, shall be of corrosion-resistant materials or protected against corrosion by corrosion-resistant materials.

Informational Note: See 300.6 for protection against corrosion.

(E) Severe Physical Damage.

IMC shall be permitted to be installed where subject to severe physical damage.

Statement of Problem and Substantiation for Public Input

This public input adds Galvanized steel and PVC coated steel IMC for clarity and usability. The term “protective coatings” is not defined and could be interpreted as galvanized only. PVC coated steel IMC are listed to UL 6 in accordance with 342.6.

Submitter Information Verification

Submitter Full Name: Megan Hayes
Organization: NEMA
Street Address:
City:
State:
Zip:
Submittal Date: Fri Jul 07 15:38:07 EDT 2023
Committee: NEC-P08

Committee Statement

Resolution: FR-7797-NFPA 70-2024

Statement: This first revision adds an informational note for the use of galvanized steel and PVC coated steel conduit as examples of corrosion protection. However, for Aluminum conduit

PVC is one method of corrosion resistance but not the only method and the term "PVC coated" is not found in the UL standard 6A for Aluminum conduit.

Public Input No. 4462-NFPA 70-2023 [Section No. 342.14]

342.14 Dissimilar Metals.

Where practicable, dissimilar metals in contact anywhere in the system shall be avoided to eliminate the possibility of galvanic action.

Stainless steel and aluminum fittings and enclosures shall be permitted to be used with galvanized steel IMC where not subject to severe corrosive influences.

~~Stainless steel IMC shall only be used with the following~~ When transitioning from stainless IMC to Aluminum or Galvanized steel one of the following shall be used:

(1) A listed dielectric coupling to eliminate the possibility of galvanic reaction

(2) To reduce the galvanic reaction one of the following may be used :

- (3) Stainless steel fittings
- (4) Stainless steel boxes and enclosures
- (5) Steel (galvanized, painted, powder or PVC coated, and so forth) boxes and enclosures when not subject to severe corrosive influences
- (6) Stainless steel, nonmetallic, or approved accessories

Statement of Problem and Substantiation for Public Input

The current methods of making a transition from stainless to other metals are not an adequate solution and still have some amount of galvanic reaction that occurs. This can lead to the raceways or fittings corroding prematurely. By using a dielectric fitting to make the transition the possibility of galvanic reaction is eliminated because the two different metals never touch. A Dielectric Coupling is manufactured with components that isolates dissimilar metals in an electrical conduit/fitting installation. It would ensure that galvanic reaction does not exist in these applications when transitioning from stainless steel to a lesser noble metal.

Related Public Inputs for This Document

Related Input	Relationship
Public Input No. 4482-NFPA 70-2023 [Section No. 344.14]	

Submitter Information Verification

Submitter Full Name: Raymond Horner
Organization: Atkore
Affiliation: Atkore
Street Address:
City:
State:
Zip:
Submittal Date: Thu Sep 07 15:53:29 EDT 2023

Committee: NEC-P08

Committee Statement

Resolution: FR-7798-NFPA 70-2024

Statement: The revision adds an additional method to mitigate galvanic corrosion.

Public Input No. 1856-NFPA 70-2023 [Section No. 342.20(B)]

(B) Maximum.

IMC larger than metric designator 155 (trade size 6) shall not be used.

Exception: Listed conduit not exceeding metric designator 205 (trade size 8) shall be permitted where all of the following conditions are met:

(1) the voltage between ungrounded conductors is greater than 2,000 V ac, nominal

(2) is used between underground vaults or manholes used for pulling and of which no part of the conduit is installed aboveground

(3) is used with listed factory elbows

(4) is located where it does not pass through or enter, a Class I, or Zone 0, 1, or 2 hazardous (classified) location

(5) contains no fittings other than listed nonmetallic bell ends, couplings, adapters, insulating bushings, or metallic couplings

Informational Note: See 300.1(C) for the metric designators and trade sizes. These are for identification purposes only and do not relate to actual dimensions.

Statement of Problem and Substantiation for Public Input

Limiting conduit to trade sizes 6" max. is restrictive for medium voltage circuits such as 34.5 kV. Utility companies use 8" conduit underground as indicated by one of the major suppliers of cable as indicated in their cable catalog.
Adding this exception would permit IMC conduit manufacturers to pursue an NRTL listing for 8" trade size for use with medium and high voltage applications which is already being manufactured and marketed. It would only be applicable for underground applications in areas that do not contain hazardous vapors or gases where it doesn't have to terminate aboveground in enclosures. This eliminates the need for 8" conduit bodies or other conduit fittings such as explosion-proof conduit seals, locknuts, cable glands, LBs, T's, etc., normally used in aboveground installations. It is limited to listed conduit and factory elbows of types PVC, HDPE, RTRC, RMC, and IMC due to the issues with bending conduits of this size in the field.

Related Public Inputs for This Document

Related Input	Relationship
Public Input No. 430-NFPA 70-2023 [Section No. 353.20(B)]	8" conduit
Public Input No. 429-NFPA 70-2023 [Section No. 352.20(B)]	8" conduit
Public Input No. 1857-NFPA 70-2023 [Section No. 344.20(B)]	8" conduit
Public Input No. 1859-NFPA 70-2023 [Section No. 355.20(B)]	8" conduit
Public Input No. 1862-NFPA 70-2023 [Section No. 300.1(C)]	8" conduit
Public Input No. 430-NFPA 70-2023 [Section No. 353.20(B)]	
Public Input No. 1857-NFPA 70-2023 [Section No. 344.20(B)]	
Public Input No. 1859-NFPA 70-2023 [Section No. 355.20(B)]	
Public Input No. 1862-NFPA 70-2023 [Section No. 300.1(C)]	
Public Input No. 1875-NFPA 70-2023 [Section No. Table]	

Submitter Information Verification

Submitter Full Name: Paul Guidry
Organization: Fluor Enterprises, Inc.
Affiliation: Associated Builders and Contractors
Street Address:
City:
State:
Zip:
Submittal Date: Sun Aug 06 15:43:50 EDT 2023
Committee: NEC-P08

Committee Statement

Resolution: FR-7799-NFPA 70-2024
Statement: This revision will allow the use of conduit up to the 8” trade size when the product standard is developed.

Public Input No. 2367-NFPA 70-2023 [Section No. 342.22]

342.22 Number of Conductors.

The number of conductors shall not exceed that permitted by the percentage fill specified in Table 1, Chapter 9.

Cables shall be permitted to be installed where such use is not prohibited by the respective cable articles. ~~The~~ For complete raceway runs, the number of cables shall not exceed the allowable percentage fill specified in Table 1, Chapter 9.

Statement of Problem and Substantiation for Public Input

Table 1 applies only to complete conduit or tubing systems and is not intended to apply to sections of conduit or tubing used to protect exposed wiring and cable from physical damage. Adding this language to section 342.22 will add clarity for Code users.

Submitter Information Verification

Submitter Full Name: Mike Holt
Organization: Mike Holt Enterprises Inc
Street Address:
City:
State:
Zip:
Submittal Date: Wed Aug 16 14:58:15 EDT 2023
Committee: NEC-P08

Committee Statement

Resolution: The proposed revision is already covered by Table 1 of Chapter 9 in note 2.

Public Input No. 1393-NFPA 70-2023 [New Section after 342.28]

TITLE OF NEW CONTENT

342.29 Paired Locknuts

Paired locknuts shall be used per each enclosure opening that is not a threaded hub. The locknuts shall be installed circumjacent to the penetrated enclosure wall with a minimum of one locknut on each side of the penetrated enclosure wall. Other fittings listed for the purpose may serve as the locknut installed inside the enclosure.

Statement of Problem and Substantiation for Public Input

Present NEC language does not effectively exist which would allow a nipple between two enclosures to use just one pair of locknuts, not two pair, to install the nipple. One pair per nipple, likely, does not ensure a good grounding path (250.120) and can distort the enclosure out of shape (110.12B). The second sentence recognizes something like a ground bushing or grounding locknut that will effectively sandwich the enclosure wall.

My similar public input was proposed for the 2023 cycle. The CMP denied it and explained by citing 250.97, 300.10, and 300.12. It's possible the CMP thought I meant double locknuts to mean doubled, one locknut butting against the other locknut. For that reason the proposal wording from the last code cycle has been modified for clarity. The intention is to have a minimum one pair of locknuts per enclosure opening that sandwich the wall of that opening. The locknuts in this case would not be immediately adjacent to each other.

As an inspector and more than once, I've seen one pair of locknuts total used on a single threaded nipple that was connecting two enclosures. This nipple will either wobble loosely or distort the metal enclosures in an effort to make the nipple wrench tight. Two pairs of locknuts per threaded nipple should be the NEC minimum.

300.10 comes close to addressing the problem but not enough to make it the best reference for citing this as a code violation. The problem is unique to threaded raceways. The new proposal could be added in the threaded wall conduit articles or it could placed and adapted to 300.10. Adopting this paired locknuts public input gives NEC users a more explicit code reference.

Submitter Information Verification

Submitter Full Name:	Norman Feck
Organization:	State of Colorado
Affiliation:	self
Street Address:	
City:	
State:	
Zip:	
Submittal Date:	Wed Jul 12 19:27:53 EDT 2023
Committee:	NEC-P08

Committee Statement

Resolution: FR-7805-NFPA 70-2024

Statement: This revision identifies the requirements for the use of paired locknuts to maintain electrical and mechanical continuity.

Public Input No. 1502-NFPA 70-2023 [Section No. 342.30(A)]

(A) Securely Fastened.

IMC shall be secured in accordance with one of the following:

(1) IMC shall be securely fastened within 900 mm (3 ft) of each outlet box, junction box, device box, cabinet, conduit body, or other conduit termination.

(2) Where structural members do not readily permit fastening within 900 mm (3 ft), fastening shall be permitted to be increased to a distance of 1.5 m (5 ft).

(3) Where approved, conduit shall not be required to be securely fastened within 900 mm (3 ft) of the service head for above-the-roof termination of a mast.

Exception: For concealed work in finished buildings or prefinished wall panels where such securing is impracticable, unbroken lengths (without coupling) of IMC shall be permitted to be fished.

(B) IMC can be ran unsupported between cabinets or enclosures with lengths of 24" or less regardless if they are broken or unbroken.

Statement of Problem and Substantiation for Public Input

I feel that listed "nipple" fittings regardless of length are not required to be supported. What would be the difference if I thread a 24" section of IMC?

Related Public Inputs for This Document

Related Input	Relationship
Public Input No. 1343-NFPA 70-2023 [Sections 358.30(A), 358.30(B)]	
Public Input No. 4201-NFPA 70-2023 [New Section after 344.30(B)]	

Submitter Information Verification

Submitter Full Name:	William Snyder
Organization:	RCC Solutions
Affiliation:	High Voltage Live Show
Street Address:	
City:	
State:	
Zip:	
Submittal Date:	Sat Jul 22 02:25:59 EDT 2023
Committee:	NEC-P08

Committee Statement

Resolution: This proposed revision will cause confusion with the current language requiring support within 3ft in 342.30(A).

Public Input No. 2252-NFPA 70-2023 [Section No. 342.30(B)]

(B) Supports.

IMC shall be supported in accordance with one of the following:

(1) Conduit shall be supported at intervals not exceeding 3 m (10 ft).

(2) The distance between supports for straight runs of conduit shall be permitted in accordance with Table ~~344~~ 342 .30(B), provided the conduit is made up with threaded couplings and supports that prevent transmission of stresses to termination where conduit is deflected between supports.

(3) Exposed vertical risers from industrial machinery or fixed equipment shall be permitted to be supported at intervals not exceeding 6 m (20 ft) if the conduit is made up with threaded couplings, the conduit is supported and securely fastened at the top and bottom of the riser, and no other means of intermediate support is readily available.

(4) Horizontal runs of IMC supported by openings through framing members at intervals not exceeding 3 m (10 ft) and securely fastened within 900 mm (3 ft) of termination points shall be permitted.

Table ~~344~~ 342 .30(B) Supports for Intermediate Metal Conduit

Conduit Size		Maximum Distance Between Inte Supports
Metric Designator	**Trade Size**	**m**
16–21	1⁄2 –¾	3.0
27	1	3.7
35–41	1¼–1½	4.3
53–63	2–2½	4.9
78 and larger	3 and larger	6.1

Statement of Problem and Substantiation for Public Input

Adding new Table 342.30(B) using the same technical information from Table 344.30(B). This proposed revision will make it easier for Code users to find the distance between IMC supports.

Submitter Information Verification

Submitter Full Name: Mike Holt
Organization: Mike Holt Enterprises Inc
Street Address:
City:
State:
Zip:
Submittal Date: Tue Aug 15 13:34:21 EDT 2023
Committee: NEC-P08

Committee Statement

Resolution: This proposed revision does not add clarity, it duplicates a table already in the code. NEC Style Manual 4.1.1 states that redundant requirements should be avoided.

Public Input No. 2251-NFPA 70-2023 [Section No. 342.30 [Excluding any Sub-Sections]]

IMC shall be installed as a complete system in accordance with 300.18 and shall be securely fastened in place and supported in accordance with 342.30(A) and (B). Listed IMC fittings shall be permitted as a means of securement and support for IMC raceways not exceeding 24 in.

Statement of Problem and Substantiation for Public Input

This new language will permit a short piece of IMC to be installed without having any additional securing and supporting by allowing the IMC connector to serve as the means of securement and support. This has been a common practice in the trade and should be allowed by the Code.

Submitter Information Verification

Submitter Full Name: Mike Holt
Organization: Mike Holt Enterprises Inc
Street Address:
City:
State:
Zip:
Submittal Date: Tue Aug 15 13:29:39 EDT 2023
Committee: NEC-P08

Committee Statement

Resolution: 342.30(A)(1) already allows up to 3ft. Therefore, this would cause confusion when requiring a means of securement or support within 24 inches.

Public Input No. 3117-NFPA 70-2023 [New Section after 342.42]

342.44 Expansion Fittings.

Expansion fittings for IMC conduit shall be provided to compensate for thermal expansion and contraction where the length change is expected to be 6 mm (¼ in.) or greater in a straight run between securely mounted items such as boxes, cabinets, elbows, or other conduit terminations. A nominal number for steel conduit can be determined by multiplying the expansion length in Table 352.44 by 0.20. A nominal number for aluminum conduit can be determined by multiplying the expansion length in Table 352.44 by 0.40 .

Statement of Problem and Substantiation for Public Input

Added new section with the information that is contained in 300.7 Informational Note. This improves clarity and usability for Code users by having an actual requirement for expansion fittings for IMC rather than an informational note in 300.7.

Submitter Information Verification

Submitter Full Name: Mike Holt
Organization: Mike Holt Enterprises Inc
Street Address:
City:
State:
Zip:

Submittal Date: Tue Aug 29 13:02:45 EDT 2023
Committee: NEC-P08

Committee Statement

Resolution: PVC and Steel have different expansion characteristics. Values for PVC should not be used for steel.

Public Input No. 2362-NFPA 70-2023 [Section No. 342.42(A)]

(A) Threadless.

Threadless couplings and connectors used with conduit shall be made tight. Where buried in masonry or concrete, they shall be the concretetight type. Where ~~installed~~ in wet locations, they shall ~~comply with~~ ~~314.15~~ ~~.~~ be installed to prevent moisture from entering or accumulating and be listed for wet locations. Threadless couplings and connectors shall not be used on threaded conduit ends unless listed for the purpose.

Statement of Problem and Substantiation for Public Input

Revising language in first level subdivision 342.42(A) to make it easier for Code users to understand the requirement. Drainage openings are not done to couplings and connectors. Instead of referencing another section, this text with no technical change just mandates threadless coupling and connectors to be installed to prevent moisture from entering or accumulating and be listed for wet locations.

Submitter Information Verification

Submitter Full Name: Mike Holt

Organization: Mike Holt Enterprises Inc

Street Address:

City:

State:

Zip:

Submittal Date: Wed Aug 16 14:26:41 EDT 2023

Committee: NEC-P08

Committee Statement

Resolution: This proposed revision does not add clarity and usability to the code. Section 314.15 gives the requirements for installation in damp locations.

Public Input No. 4074-NFPA 70-2023 [Section No. 342.42(A)]

(A) Threadless.

(1) Made Tight. Threadless couplings and connectors used with conduit shall be made tight.

(2) Concrete Buried. Where buried in masonry or concrete, they shall be the concretetight type.

(3) Wet Locations. Where installed in wet locations, they shall comply with 314.15.

(4) Threaded Conduit Ends. Threadless couplings and connectors shall not be used on threaded conduit ends unless listed for the purpose.

Statement of Problem and Substantiation for Public Input

Breaking up 342.42(A) into a list item format to facilitate understanding for Code users. In accordance with NFPA Style Manual section 3.5.1.2 additional subdivisions shall be used where multiple requirements can be broken into independent requirements.

Submitter Information Verification

Submitter Full Name: Mike Holt

Organization: Mike Holt Enterprises Inc

Street Address:

City:

State:

Zip:

Submittal Date: Wed Sep 06 15:43:16 EDT 2023

Committee: NEC-P08

Committee Statement

Resolution: FR-7809-NFPA 70-2024

Statement: This revision complies with the NFPA Style manual section 3.5.1.2. Couplings and connectors are required to comply with 314.15, the text was removed to eliminate redundancy.

Public Input No. 4081-NFPA 70-2023 [Section No. 342.56]

~~**342.56** Splices and Taps.~~

~~Splices and taps shall be made in accordance with 300.15 .~~

Statement of Problem and Substantiation for Public Input

Delete 342.56 because it only references a requirement that is already covered in 300.15. Removing this section will improve redundancy for Code users.

Submitter Information Verification

Submitter Full Name: Mike Holt
Organization: Mike Holt Enterprises Inc
Street Address:
City:
State:
Zip:

Submittal Date: Wed Sep 06 16:09:46 EDT 2023
Committee: NEC-P08

Committee Statement

Resolution: FR-7623-NFPA 70-2024

Statement: Splices and taps are applicable to conductors, not the raceway. These requirements for splicing conductors are already addressed in Sections 110.14(B) and 300.15.

Public Input No. 2353-NFPA 70-2023 [Section No. 342.60]

342.~~60~~ 60 Equipment Grounding Conductor .

IMC shall be permitted as an equipment grounding conductor.

Statement of Problem and Substantiation for Public Input

The section title must be revised to match the technical requirement. In accordance with NEC style manual section 2.1.3.2 the title must be descriptive and concise with the intent of the requirement. See 215.6 Feeder Equipment Grounding Conductor, 320.108 Equipment Grounding Conductor, 330.108 Equipment Grounding Conductor, 334.108 Equipment Grounding Conductor, 410.182 Equipment Grounding Conductor, 547.27 Separate Equipment Grounding Conductor, 555.37 Equipment Grounding Conductor, and 690.45 Size of Equipment Grounding Conductors.

Submitter Information Verification

Submitter Full Name: Mike Holt

Organization: Mike Holt Enterprises Inc

Street Address:

City:

State:

Zip:

Submittal Date: Wed Aug 16 14:13:19 EDT 2023

Committee: NEC-P08

Committee Statement

Resolution: Changing the title does not add clarity. The current title is not in violation of the current NFPA Style Manual nor the 2023 NEC Style Manual. The grounding is not exclusive to Equipment Grounding Conductor. The Section is in place to address any grounding or bonding requirements. Section 250.118 does not have installation requirements for the equipment grounding conductors.

Public Input No. 3547-NFPA 70-2023 [Section No. 342.60]

342.60 Grounding ~~.~~ and Bonding

IMC shall be permitted as an equipment grounding conductor.

Statement of Problem and Substantiation for Public Input

There are 23 sections in Chapter 3 that have a .60 section. 19 of these sections are titled "Grounding." 3 of these sections are titled "Grounding and Bonding." 1 of these sections is titled "Equipment Grounding Conductor."
My suggestion is to rename all of these sections with "Grounding and Bonding."

Submitter Information Verification

Submitter Full Name:	Eric Stromberg
Organization:	Los Alamos National Laboratory
Affiliation:	Self
Street Address:	
City:	
State:	
Zip:	
Submittal Date:	Mon Sep 04 19:19:19 EDT 2023
Committee:	NEC-P08

Committee Statement

Resolution: CMP-8 maintains its position from the previous cycle. The submitter’s Public Input is editorial in nature and has not provided a technical substantiation to change the title of this section. Changing the title does not add clarity. The purpose is to address equipment grounding conductors for connection to earth and ground fault management, not equipotential bonding.

Public Input No. 1302-NFPA 70-2023 [Section No. 342.100]

342.100 Construction.

IMC shall be made of one of the following:

(1) Steel, with protective coatings

(2) <u>Steel, with PVC coating</u>

(3) Stainless steel

Statement of Problem and Substantiation for Public Input

This public input adds PVC coated Steel IMC for clarity and usability. The term “protective coatings” is not defined and could be interpreted as galvanized only. PVC coated Steel conduits are listed to UL 6 in accordance with 342.6.

Submitter Information Verification

Submitter Full Name: Megan Hayes
Organization: NEMA
Street Address:
City:
State:
Zip:
Submittal Date: Fri Jul 07 15:43:10 EDT 2023
Committee: NEC-P08

Committee Statement

Resolution: PVC is considered a protective coating covered in list item (1).

Public Input No. 2889-NFPA 70-2023 [Section No. 344.6]

344.~~6~~ 2 Listing Requirements.

RMC, factory elbows ~~and couplings~~ , ~~and~~ couplings, associated fittings and support and securement hardware shall be listed.

Statement of Problem and Substantiation for Public Input

To avoid damage to RMC and undue stress on electrical connections, the use of listed hardware for support and securement of RMC is necessary. UL 2239, the Standard for Safety for Hardware for the Support of Conduit, Tubing, and Cable, was first published nearly 20 years ago and contains all necessary hardware construction, performance, marking and installation instructions necessary to provide installers the guidance to properly support and secure RMC using hardware installed per the manufacturers' installation instructions.

Additionally, per the 2023 NEC style manual, clause 2.2.1, "Required Parallel Numbering Format" Listing requirements should be relocated from 344.6 to 344.2.

Submitter Information Verification

Submitter Full Name: David Gerstetter

Organization: Ul Solutions

Affiliation: UL Solutions

Street Address:

City:

State:

Zip:

Submittal Date: Fri Aug 25 22:29:51 EDT 2023

Committee: NEC-P08

Committee Statement

Resolution: No safety issues have been identified to justify the listing of support and securement hardware.

Public Input No. 3517-NFPA 70-2023 [Section No. 344.6]

~~344.6~~ 2 Listing Requirements.

RMC, factory elbows and couplings, and associated fittings shall be listed.

Statement of Problem and Substantiation for Public Input

This Public Input is being submitted on behalf of the NEC Correlating Committee Usability Task Group in order to provide correlation throughout the document. A new section is added to comply with the NEC Style Manual Section 2.2.1 regarding Listing Requirements.
2.2.1 Parallel Numbering Required. Technical committees shall use the following section numbers for the same purposes within articles. This requirement shall not apply to Articles 90, 100, and 110. If the article does not contain listing or reconditioning requirements, the subdivisions shall not be included in the article.
Required Parallel Numbering Format
XXX.1 Scope.
XXX.2 Listing Requirements.
XXX.3 Reconditioned Equipment.
XXX.3(A) Permitted to be Installed.
XXX.3(B) Not Permitted to be Installed.
The Usability Task Group members are: Derrick Atkins, David Hittinger, Richard Holub, Dean Hunter, Chad Kennedy and David Williams.

Submitter Information Verification

Submitter Full Name:	David Williams
Organization:	Delta Charter Township
Street Address:	
City:	
State:	
Zip:	
Submittal Date:	Mon Sep 04 17:33:03 EDT 2023
Committee:	NEC-P08

Committee Statement

Resolution:	FR-7816-NFPA 70-2024
Statement:	Renumbered to comply with the NEC Style Manual Section 2.2.1 regarding Listing Requirements.

Public Input No. 1303-NFPA 70-2023 [Section No. 344.10]

344.10 Uses Permitted.

(A) Atmospheric Conditions and Occupancies.

(1) Galvanized Steel, PVC Coated Steel, Stainless Steel, and Red Brass RMC.

Galvanized steel, PVC coated steel, stainless steel, and red brass RMC shall be permitted under all atmospheric conditions and occupancies.

(2) Aluminum, and PVC Coated Aluminum RMC.

Aluminum ~~RMC~~ , and PVC coated aluminum RMC shall be permitted to be installed where approved for the environment.

(3) Ferrous Raceways and Fittings.

Ferrous raceways and fittings protected from corrosion solely by enamel shall be permitted only indoors and in occupancies not subject to severe corrosive influences.

(B) Corrosive Environments.

(1) Galvanized Steel, PVC Coated Steel, Stainless Steel, and Red Brass RMC, Elbows, Couplings, and Fittings.

Galvanized steel, PVC coated steel, stainless steel, and red brass RMC, elbows, couplings, and fittings shall be permitted to be installed in concrete, in direct contact with the earth, in direct burial applications, or in areas subject to severe corrosive influences where protected by corrosion protection approved for the condition.

(2) Supplementary Protection of Aluminum RMC.

Aluminum RMC shall be provided with approved supplementary corrosion protection where encased in concrete or in direct contact with the earth, or in direct burial applications where identified for the application.

(C) Cinder Fill.

Galvanized steel, stainless steel, and red brass RMC shall be permitted to be installed in or under cinder fill where subject to permanent moisture where protected on all sides by a layer of noncinder concrete not less than 50 mm (2 in.) thick; where the conduit is not less than 450 mm (18 in.) under the fill; or where protected by corrosion protection approved for the condition.

(D) Wet Locations.

All supports, bolts, straps, screws, and so forth, shall be of corrosion-resistant materials or protected against corrosion by corrosion-resistant materials.

Informational Note: See 300.6 for protection against corrosion.

(E) Severe Physical Damage.

RMC shall be permitted to be installed where subject to severe physical damage.

Statement of Problem and Substantiation for Public Input

This public input adds both PVC coated Steel and Aluminum RMC for clarity and usability. The term “protective coatings” and “supplementary corrosive protection” are not defined and could be interpreted as galvanized or epoxy only. PVC coated Steel is listed to UL 6 and Aluminum RMC is listed to UL 6A in accordance with 344.6.

Submitter Information Verification

Submitter Full Name: Megan Hayes
Organization: NEMA
Street Address:
City:
State:
Zip:
Submittal Date: Fri Jul 07 15:48:13 EDT 2023
Committee: NEC-P08

Committee Statement

Resolution: FR-7817-NFPA 70-2024

Statement: This revision adds clarity for the permitted conditions for PVC coated steel conduit. However, for Aluminum conduit PVC is one method of corrosion resistance but not the only method and the term "PVC coated" is not found in the product standard for Aluminum conduit.

Public Input No. 4482-NFPA 70-2023 [Section No. 344.14]

344.14 Dissimilar Metals.

Where practicable, dissimilar metals in contact anywhere in the system shall be avoided to eliminate the possibility of galvanic action. Stainless steel and aluminum fittings and enclosures shall be permitted to be used with galvanized steel RMC, and galvanized steel fittings and enclosures shall be permitted to be used with aluminum RMC where not subject to severe corrosive influences. ~~Stainless steel rigid conduit shall only be used with the following~~ When transitioning from stainless Rigid to Aluminum or Galvanized steel one of the following shall be used:

(1) A listed dielectric coupling to eliminate the possibility of galvanic reaction

(2) To reduce the galvanic reaction one of the following may be used :

- (3) Stainless steel fittings
- (4) Stainless steel boxes and enclosures
- (5) Steel (galvanized, painted, powder or PVC coated, and so forth) boxes and enclosures when not subject to severe corrosive influences
- (6) Stainless steel, nonmetallic, or approved accessories

Statement of Problem and Substantiation for Public Input

The current methods of making a transition from stainless to other metals are not an adequate solution and still have some amount of galvanic reaction that occurs. This can lead to the raceways or fittings corroding prematurely. By using a dielectric fitting to make the transition the possibility of galvanic reaction is eliminated because the two different metals never touch. A Dielectric Coupling is manufactured with components that isolates dissimilar metals in an electrical conduit/fitting installation. It would ensure that galvanic reaction does not exist in these applications when transitioning from stainless steel to a lesser noble metal.

Related Public Inputs for This Document

Related Input	Relationship
Public Input No. 4462-NFPA 70-2023 [Section No. 342.14]	

Submitter Information Verification

Submitter Full Name: Raymond Horner
Organization: Atkore
Affiliation: Atkore
Street Address:
City:
State:
Zip:

Submittal Date: Thu Sep 07 16:16:38 EDT 2023
Committee: NEC-P08

Committee Statement

Resolution: FR-7819-NFPA 70-2024

Statement: The revision adds an additional method to mitigate galvanic corrosion.

Public Input No. 1857-NFPA 70-2023 [Section No. 344.20(B)]

(B) Maximum.

RMC larger than metric designator 155 (trade size 6) shall not be used.

~~Informational Note: See~~

Exception: Listed conduit not exceeding metric designator 205 (trade size 8) shall be permitted where all of the following conditions are met:

(1) the voltage between ungrounded conductors is greater than 2,000 V ac, nominal

(2) is used between underground vaults or manholes used for pulling and of which no part of the conduit is installed aboveground

(3) is used with listed factory elbows

(4) is located where it does not pass through or enter, a Class I, or Zone 0, 1, or 2 hazardous (classified) location

(5) contains no fittings other than listed nonmetallic bell ends, couplings, adapters, insulating bushings, or metallic couplings

Informational Note: See 300.1(C) for the

~~metric designators and~~

trade sizes

~~. These~~

and metric designators that are for identification purposes only and do not relate to actual dimensions.

Statement of Problem and Substantiation for Public Input

Limiting conduit to trade sizes 6" max. is restrictive for medium voltage circuits such as 34.5 kV. Utility companies use 8" conduit underground as indicated by one of the major suppliers of cable as indicated in their cable catalog.
Adding this exception would permit RMC conduit manufacturers to pursue an NRTL listing for RMC 8" trade size for use with medium and high voltage applications which is already being manufactured and marketed. It would only be applicable for underground applications in areas that do not contain hazardous vapors or gases where it doesn't have to terminate aboveground in enclosures. This eliminates the need for 8" conduit bodies or other conduit fittings such as explosion-proof conduit seals, locknuts, cable glands, LBs, T's, etc., normally used in aboveground installations. It is limited to listed conduit and factory elbows of types PVC, HDPE, RTRC, RMC, and IMC due to the issues with bending conduits of this size in the field.

Note to CMP: Terraview messed up and does not allow me to fix the Informational Note. No changes proposed for the current IN.

Related Public Inputs for This Document

Related Input	Relationship
Public Input No. 429-NFPA 70-2023 [Section No. 352.20(B)]	8" conduit
Public Input No. 430-NFPA 70-2023 [Section No. 353.20(B)]	8" conduit

Public Input No. 1856-NFPA 70-2023 [Section No. 342.20(B)]	8" conduit
Public Input No. 1859-NFPA 70-2023 [Section No. 355.20(B)]	8" conduit
Public Input No. 1862-NFPA 70-2023 [Section No. 300.1(C)]	8" conduit

Public Input No. 430-NFPA 70-2023 [Section No. 353.20(B)]
Public Input No. 1856-NFPA 70-2023 [Section No. 342.20(B)]
Public Input No. 1859-NFPA 70-2023 [Section No. 355.20(B)]
Public Input No. 1862-NFPA 70-2023 [Section No. 300.1(C)]
Public Input No. 1875-NFPA 70-2023 [Section No. Table]

Submitter Information Verification

Submitter Full Name: Paul Guidry
Organization: Fluor Enterprises, Inc.
Affiliation: Associated Builders and Contractors
Street Address:
City:
State:
Zip:
Submittal Date: Sun Aug 06 16:03:44 EDT 2023
Committee: NEC-P08

Committee Statement

Resolution: FR-7821-NFPA 70-2024
Statement: This will allow the use of conduit up to the 8” trade size when the product standard is developed.

Public Input No. 2368-NFPA 70-2023 [Section No. 344.22]

344.22 Number of Conductors.

The number of conductors shall not exceed that permitted by the percentage fill specified in Table 1, Chapter 9.

Cables shall be permitted to be installed where such use is not prohibited by the respective cable articles. ~~The~~ For complete raceway runs, the number of cables shall not exceed the allowable percentage fill specified in Table 1, Chapter 9.

Statement of Problem and Substantiation for Public Input

Table 1 applies only to complete conduit or tubing systems and is not intended to apply to sections of conduit or tubing used to protect exposed wiring and cable from physical damage. Adding this language to section 344.22 will add clarity for Code users.

Submitter Information Verification

Submitter Full Name: Mike Holt

Organization: Mike Holt Enterprises Inc

Street Address:

City:

State:

Zip:

Submittal Date: Wed Aug 16 15:00:20 EDT 2023

Committee: NEC-P08

Committee Statement

Resolution: This proposed revision is already covered in Table 1 of Chapter 9 in note 2.

Public Input No. 1394-NFPA 70-2023 [New Section after 344.28]

TITLE OF NEW CONTENT

344.29 Paired Locknuts

Paired locknuts shall be used per each enclosure opening that is not a threaded hub. The locknuts shall be installed circumjacent to the penetrated enclosure wall with a minimum of one locknut on each side of the penetrated enclosure wall. Other fittings listed for the purpose may serve as the locknut installed inside the enclosure.

Statement of Problem and Substantiation for Public Input

Present NEC language does not effectively exist which would allow a nipple between two enclosures to use just one pair of locknuts, not two pair, to install the nipple. One pair per nipple, likely, does not ensure a good grounding path (250.120) and can distort the enclosure out of shape (110.12B). The second sentence recognizes something like a ground bushing or grounding locknut that will effectively sandwich the enclosure wall.

My similar public input was proposed for the 2023 cycle. The CMP denied it and explained by citing 250.97, 300.10, and 300.12. It's possible the CMP thought I meant double locknuts to mean doubled, one locknut butting against the other locknut. For that reason the proposal wording from the last code cycle has been modified for clarity. The intention is to have a minimum one pair of locknuts per enclosure opening that sandwich the wall of that opening. The locknuts in this case would not be immediately adjacent to each other.

As an inspector and more than once, I've seen one pair of locknuts total used on a single threaded nipple that was connecting two enclosures. This nipple will either wobble loosely or distort the metal enclosures in an effort to make the nipple wrench tight. Two pairs of locknuts per threaded nipple should be the NEC minimum.

300.10 comes close to addressing the problem but not enough to make it the best reference for citing this as a code violation. The problem is unique to threaded raceways. The new proposal could be added in the threaded wall conduit articles or it could placed and adapted to 300.10. Adopting this paired locknuts public input gives NEC users a more explicit code reference.

Submitter Information Verification

Submitter Full Name:	Norman Feck
Organization:	State of Colorado
Affiliation:	self
Street Address:	
City:	
State:	
Zip:	
Submittal Date:	Wed Jul 12 19:35:37 EDT 2023
Committee:	NEC-P08

Committee Statement

Resolution: FR-7824-NFPA 70-2024

Statement: This revision identifies the requirements for the use of paired locknuts to maintain electrical and mechanical continuity.

Public Input No. 4454-NFPA 70-2023 [Section No. 344.28]

344.28 Reaming and Threading.

All cut ends shall be reamed or otherwise finished to remove rough edges. Where conduit is threaded in the field, a standard cutting die with a 1 in 16 taper (¾ in. taper per foot) shall be used. PVC-coated RMC shall be threaded in accordance with manufacturer's instructions to prevent damage to the exterior coating.

Informational Note No. 1: See ANSI/ASME B1.20.1-2013, *Standard for Pipe Threads, General Purpose (Inch)*.

Informational Note No. 2: See NECA 101~~-2013~~ , *Standard for Installing Steel Conduits (RMC, IMC, EMT)*, for information on threading and clamping methods for RMC and PVC-coated RMC.

Statement of Problem and Substantiation for Public Input

Revised informational Note No.2: removing the date to maintain shelf life of the reference. The reference will be maintained referring to the most recently published edition of the standard.

Submitter Information Verification

Submitter Full Name:	Kyle Krueger
Organization:	NECA
Affiliation:	NECA
Street Address:	
City:	
State:	
Zip:	
Submittal Date:	Thu Sep 07 15:42:26 EDT 2023
Committee:	NEC-P08

Committee Statement

Resolution: FR-7777-NFPA 70-2024

Statement: Reference dates are updated to the current edition in accordance with the NEC Style Manual Section 2.1.10. This is a response to the Global PI 3085.

Public Input No. 4201-NFPA 70-2023 [New Section after 344.30(B)]

TITLE OF NEW CONTENT

344.30(C) RMC can be ran unsupported between cabinets and enclosures as long as they are 24" or less in length regardless if they are broken or unbroken.

Statement of Problem and Substantiation for Public Input

I feel that currently in the NEC listed fittings regardless of length do not require support between boxes and cabinets. I don't see the difference if RMC is field threaded to a length of 24" or less.

Related Public Inputs for This Document

Related Input	Relationship
Public Input No. 1502-NFPA 70-2023 [Section No. 342.30(A)]	Unsupported raceway "nipple"
Public Input No. 1343-NFPA 70-2023 [Sections 358.30(A), 358.30(B)]	

Submitter Information Verification

Submitter Full Name: William Snyder

Organization: RCC Solutions

Affiliation: High Voltage Live Show

Street Address:

City:

State:

Zip:

Submittal Date: Wed Sep 06 21:24:35 EDT 2023

Committee: NEC-P08

Committee Statement

Resolution: This proposed revision will cause confusion with the current language requiring support within 3ft in 344.30(A).

Public Input No. 2254-NFPA 70-2023 [Section No. 344.30 [Excluding any Sub-Sections]]

RMC shall be installed as a complete system in accordance with 300.18 and shall be securely fastened in place and supported in accordance with 344.30(A) and (B). Listed RMC fittings shall be permitted as a means of securement and support for RMC raceways not exceeding 24 in.

Statement of Problem and Substantiation for Public Input

This language will permit a short piece of RMC to be installed without having any additional securing and supporting by allowing the RMC connector to serve as the means of securement and support. This has been a common practice in the trade and should be allowed by the Code.

Submitter Information Verification

Submitter Full Name:	Mike Holt
Organization:	Mike Holt Enterprises Inc
Street Address:	
City:	
State:	
Zip:	
Submittal Date:	Tue Aug 15 13:37:14 EDT 2023
Committee:	NEC-P08

Committee Statement

Resolution: 344.30(A)(1) already allows up to 3ft. Therefore, this would cause confusion when requiring a means of securement or support within 24 inches.

Public Input No. 3118-NFPA 70-2023 [New Section after 344.42]

34 4 .44 Expansion Fittings.

Expansion fittings for R MC conduit shall be provided to compensate for thermal expansion and contraction where the length change is expected to be 6 mm (¼ in.) or greater in a straight run between securely mounted items such as boxes, cabinets, elbows, or other conduit terminations. A nominal number for steel conduit can be determined by multiplying the expansion length in Table 352.44 by 0.20. A nominal number for aluminum conduit can be determined by multiplying the expansion length in Table 352.44 by 0.40 .

Statement of Problem and Substantiation for Public Input

Added new section with the information that is contained in 300.7 Informational Note. This improves clarity and usability for Code users by having an actual requirement for expansion fittings for RMC rather than an informational note in 300.7.

Submitter Information Verification

Submitter Full Name: Mike Holt
Organization: Mike Holt Enterprises Inc
Street Address:
City:
State:
Zip:
Submittal Date: Tue Aug 29 13:04:21 EDT 2023
Committee: NEC-P08

Committee Statement

Resolution: PVC and Steel have different expansion characteristics. Values for PVC should not be used for steel.

Public Input No. 2363-NFPA 70-2023 [Section No. 344.42(A)]

(A) Threadless.

Threadless couplings and connectors used with conduit shall be made tight. Where buried in masonry or concrete, they shall be the concrete tight type. Where ~~installed~~ in wet locations, they shall ~~comply with 314.15 .~~ be installed to prevent moisture from entering or accumulating and be listed for wet locations. Threadless couplings and connectors shall not be used on threaded conduit ends unless listed for the purpose.

Statement of Problem and Substantiation for Public Input

Revising language in first level subdivision 344.42(A) to make it easier for Code users to understand the requirement. Drainage openings are not done to couplings and connectors. Instead of referencing another section, this text with no technical change just mandates threadless coupling and connectors to be installed to prevent moisture from entering or accumulating and be listed for wet locations.

Submitter Information Verification

Submitter Full Name: Mike Holt
Organization: Mike Holt Enterprises Inc
Street Address:
City:
State:
Zip:

Submittal Date: Wed Aug 16 14:51:22 EDT 2023
Committee: NEC-P08

Committee Statement

Resolution: This proposed revision does not add clarity and usability to the code. Section 314.15 gives the requirements for installation in damp locations.

Public Input No. 4076-NFPA 70-2023 [Section No. 344.42(A)]

(A) Threadless.

(1) Made Tight. Threadless couplings and connectors used with conduit shall be made tight.

(2) Concrete Buried. Where buried in masonry or concrete, they shall be the concrete tight type.

(3) Wet Locations. Where installed in wet locations, they shall comply with 314.15.

(4) Threaded Conduit Ends. Threadless couplings and connectors shall not be used on threaded conduit ends unless listed for the purpose.

Statement of Problem and Substantiation for Public Input

Breaking up 344.42(A) into a list item format to facilitate understanding for Code users. In accordance with NFPA Style Manual section 3.5.1.2 additional subdivisions shall be used where multiple requirements can be broken into independent requirements.

Submitter Information Verification

Submitter Full Name: Mike Holt
Organization: Mike Holt Enterprises Inc
Street Address:
City:
State:
Zip:

Submittal Date: Wed Sep 06 15:47:49 EDT 2023
Committee: NEC-P08

Committee Statement

Resolution: FR-7826-NFPA 70-2024

Statement: This revision complies with the NFPA Style manual section 3.5.1.2. Couplings and connectors are required to comply with 314.15, the text was removed to eliminate redundancy.

Public Input No. 4082-NFPA 70-2023 [Section No. 344.56]

~~**344.56** Splices and Taps.~~

~~Splices and taps shall be made in accordance with 300.15 .~~

Statement of Problem and Substantiation for Public Input

Delete section 344.56 because it only references a requirement that is already covered in 300.15. Removing this section will improve redundancy for Code users.

Submitter Information Verification

Submitter Full Name: Mike Holt
Organization: Mike Holt Enterprises Inc
Street Address:
City:
State:
Zip:

Submittal Date: Wed Sep 06 16:11:48 EDT 2023
Committee: NEC-P08

Committee Statement

Resolution: FR-7624-NFPA 70-2024

Statement: Splices and taps are applicable to conductors, not the raceway. These requirements for splicing conductors are already addressed in Sections 110.14(B) and 300.15.

Public Input No. 2354-NFPA 70-2023 [Section No. 344.60]

344.~~60~~ 60 Equipment Grounding Conductor .

RMC shall be permitted as an equipment grounding conductor.

Statement of Problem and Substantiation for Public Input

The section title must be revised to match the technical requirement. In accordance with NEC style manual section 2.1.3.2 the title must be descriptive and concise with the intent of the requirement. See 215.6 Feeder Equipment Grounding Conductor, 320.108 Equipment Grounding Conductor, 330.108 Equipment Grounding Conductor, 334.108 Equipment Grounding Conductor, 410.182 Equipment Grounding Conductor, 547.27 Separate Equipment Grounding Conductor, 555.37 Equipment Grounding Conductor, and 690.45 Size of Equipment Grounding Conductors.

Submitter Information Verification

Submitter Full Name: Mike Holt

Organization: Mike Holt Enterprises Inc

Street Address:

City:

State:

Zip:

Submittal Date: Wed Aug 16 14:14:28 EDT 2023

Committee: NEC-P08

Committee Statement

Resolution: Changing the title does not add clarity. The current title is not in violation of the current NFPA Style Manual nor the 2023 NEC Style Manual. The grounding is not exclusive to Equipment Grounding Conductor. The Section is in place to address any grounding or bonding requirements. Section 250.118 does not have installation requirements for the equipment grounding conductors.

Public Input No. 3552-NFPA 70-2023 [Section No. 344.60]

344.60 Grounding and Bonding .

RMC shall be permitted as an equipment grounding conductor.

Statement of Problem and Substantiation for Public Input

There are 23 sections in Chapter 3 that have a .60 section. 19 of these sections are titled "Grounding." 3 of these sections are titled "Grounding and Bonding." 1 of these sections is titled "Equipment Grounding Conductor."
My suggestion is to rename all of these sections with "Grounding and Bonding."

Submitter Information Verification

Submitter Full Name: Eric Stromberg
Organization: Los Alamos National Laboratory
Affiliation: Self
Street Address:
City:
State:
Zip:
Submittal Date: Mon Sep 04 19:29:39 EDT 2023
Committee: NEC-P08

Committee Statement

Resolution: CMP-8 maintains its position from the previous cycle. The submitter’s Public Input is editorial in nature and has not provided a technical substantiation to change the title of this section. Changing the title does not add clarity. The purpose is to address equipment grounding conductors for connection to earth and ground fault management, not equipotential bonding.

Public Input No. 1304-NFPA 70-2023 [Section No. 344.100]

344.100 Construction.

RMC shall be made of one of the following:

(1) Steel with protective coatings

(2) Steel with PVC coating

(3) Aluminum

(4) Aluminum with PVC coating

(5) Red brass

(6) Stainless steel

Statement of Problem and Substantiation for Public Input

This public input adds both PVC coated Steel and Aluminum RMC for clarity and usability. The term "protective coatings" is not defined and could be interpreted as galvanized only. PVC coated Steel is listed to UL 6 and Aluminum RMC is listed to UL 6A in accordance with 344.6.

Submitter Information Verification

Submitter Full Name: Megan Hayes

Organization: NEMA

Street Address:

City:

State:

Zip:

Submittal Date: Fri Jul 07 15:55:54 EDT 2023

Committee: NEC-P08

Committee Statement

Resolution: PVC is considered a protective coating covered in list item (1).

Public Input No. 1321-NFPA 70-2023 [Section No. 348.2]

348.2 Reconditioned Equipment.

Reconditioned FMC shall not be ~~reconditioned~~ permitted .

Statement of Problem and Substantiation for Public Input

This public input is a part of a series of public inputs that seeks to align the language found across the NEC pertaining to how reconditioned equipment is addressed in the NEC.

The following sections us the language that says “Reconditioned ______ shall not be permitted.” 404.16, 406.2, 408.2,410.2, 470.2, 495.2, 495.49,695.2,700.2,701.2,702.2,708.2,

This change suggests the appropriate way to address reconditioned equipment in the NEC. The NEC is an installation code governing the installation of solutions and in many locations throughout the NEC the solution is either permitted or not permitted. This suggested language would bring all references towards reconditioned equipment in alignment.

Submitter Information Verification

Submitter Full Name: Thomas Domitrovich
Organization: Eaton Corporation
Street Address:
City:
State:
Zip:
Submittal Date: Sat Jul 08 11:34:38 EDT 2023
Committee: NEC-P08

Committee Statement

Resolution: FR-7645-NFPA 70-2024

Statement: The panel is not aware of any established programs that provide an acceptable approach to reconditioning for this type of equipment and maintain its listing. Section 110.20 indicates that equipment is permitted to be reconditioned unless otherwise prohibited. Renumbered to comply with the NEC Style Manual 2.2.1 regarding reconditioned equipment.

Public Input No. 2602-NFPA 70-2023 [Section No. 348.2]

348. ~~2~~ **3** Reconditioned Equipment.

Reconditioned FMC shall not ~~be reconditioned~~ be installed .

Statement of Problem and Substantiation for Public Input

This Public Input is being submitted on behalf of the NEC Correlating Committee Usability Task Group in order to provide correlation throughout the document. The text is revised to comply with the NEC Style Manual Section 2.2.1 regarding reconditioned equipment.
2.2.1 Parallel Numbering Required. Technical committees shall use the following section numbers for the same purposes within articles. This requirement shall not apply to Articles 90, 100, and 110. If the article does not contain listing or reconditioning requirements, the subdivisions shall not be included in the article.
Required Parallel Numbering Format
XXX.1 Scope.
XXX.2 Listing Requirements.
XXX.3 Reconditioned Equipment.
XXX.3(A) Permitted to be Installed.
XXX.3(B) Not Permitted to be Installed.
The Usability Task Group members are: Derrick Atkins, David Hittinger, Richard Holub, Dean Hunter, Chad Kennedy and David Williams.

Submitter Information Verification

Submitter Full Name: David Williams
Organization: Delta Charter Township
Street Address:
City:
State:
Zip:
Submittal Date: Wed Aug 23 19:38:26 EDT 2023
Committee: NEC-P08

Committee Statement

Resolution: FR-7645-NFPA 70-2024

Statement: The panel is not aware of any established programs that provide an acceptable approach to reconditioning for this type of equipment and maintain its listing. Section 110.20 indicates that equipment is permitted to be reconditioned unless otherwise prohibited. Renumbered to comply with the NEC Style Manual 2.2.1 regarding reconditioned equipment.

Public Input No. 2890-NFPA 70-2023 [Section No. 348.2]

348.~~2~~ 3 Reconditioned Equipment.

FMC shall not be reconditioned.

Statement of Problem and Substantiation for Public Input

Per the 2023 NEC style manual, clause 2.2.1, “Required Parallel Numbering Format” Reconditioned equipment should be relocated from 348.2 to 348.3.

Submitter Information Verification

Submitter Full Name: David Gerstetter
Organization: Ul Solutions
Affiliation: UL Solutions
Street Address:
City:
State:
Zip:
Submittal Date: Fri Aug 25 22:34:36 EDT 2023
Committee: NEC-P08

Committee Statement

Resolution: FR-7645-NFPA 70-2024

Statement: The panel is not aware of any established programs that provide an acceptable approach to reconditioning for this type of equipment and maintain its listing. Section 110.20 indicates that equipment is permitted to be reconditioned unless otherwise prohibited. Renumbered to comply with the NEC Style Manual 2.2.1 regarding reconditioned equipment.

Public Input No. 2891-NFPA 70-2023 [Section No. 348.6]

~~348.6~~ 2 Listing Requirements.

FMC ~~and associated fittings~~ , associated fittings and support and securement hardware shall be listed.

Statement of Problem and Substantiation for Public Input

To avoid damage to FMC and undue stress on electrical connections, the use of listed hardware for support and securement of FMC is necessary. UL 2239, the Standard for Safety for Hardware for the Support of Conduit, Tubing, and Cable, was first published nearly 20 years ago and contains all necessary hardware construction, performance, marking and installation instructions necessary to provide installers the guidance to properly support and secure FMC using hardware installed per the manufacturers' installation instructions. UL Listed Conduit and Cable Hardware is identified and can easily be found by AHJs in UL's Product iQ database under UL category code DWMU. Additionally, per the 2023 NEC style manual, clause 2.2.1, "Required Parallel Numbering Format" Listing requirements should be relocated from 348.6 to 348.2.

Related Public Inputs for This Document

Related Input	Relationship
Public Input No. 2892-NFPA 70-2023 [Section No. 348.30(A)]	

Submitter Information Verification

Submitter Full Name: David Gerstetter
Organization: Ul Solutions
Affiliation: UL Solutions
Street Address:
City:
State:
Zip:
Submittal Date: Fri Aug 25 22:38:26 EDT 2023
Committee: NEC-P08

Committee Statement

Resolution: Support hardware can be structural steel and hardware not listed may be used for support, subject to AHJ approval. No safety issues have been identified to justify the listing of support and securement hardware.

Public Input No. 3518-NFPA 70-2023 [Section No. 348.6]

348.~~6~~ 2 Listing Requirements.

FMC and associated fittings shall be listed.

Statement of Problem and Substantiation for Public Input

This Public Input is being submitted on behalf of the NEC Correlating Committee Usability Task Group in order to provide correlation throughout the document. A new section is added to comply with the NEC Style Manual Section 2.2.1 regarding Listing Requirements.
2.2.1 Parallel Numbering Required. Technical committees shall use the following section numbers for the same purposes within articles. This requirement shall not apply to Articles 90, 100, and 110. If the article does not contain listing or reconditioning requirements, the subdivisions shall not be included in the article.
Required Parallel Numbering Format
XXX.1 Scope.
XXX.2 Listing Requirements.
XXX.3 Reconditioned Equipment.
XXX.3(A) Permitted to be Installed.
XXX.3(B) Not Permitted to be Installed.
The Usability Task Group members are: Derrick Atkins, David Hittinger, Richard Holub, Dean Hunter, Chad Kennedy and David Williams.

Submitter Information Verification

Submitter Full Name: David Williams
Organization: Delta Charter Township
Street Address:
City:
State:
Zip:

Submittal Date: Mon Sep 04 17:33:45 EDT 2023
Committee: NEC-P08

Committee Statement

Resolution: FR-7680-NFPA 70-2024
Statement: Renumber to .2 in compliance with the NEC Style Manual section 2.2.1 parallel numbering required.

Public Input No. 2369-NFPA 70-2023 [Section No. 348.22]

348.22 Number of Conductors.

The number of conductors shall not exceed that permitted by the percentage fill specified in Table 1, Chapter 9, or as permitted in Table 348.22, or for metric designator 12 (trade size ⅜).

Cables shall be permitted to be installed where such use is not prohibited by the respective cable articles. ~~The~~ For complete raceway runs, the number of cables shall not exceed the allowable percentage fill specified in Table 1, Chapter 9.

Table 348.22 Maximum Number of Insulated Conductors in Metric Designator 12 (Trade Size ⅜) Flexible Metal Conduit (FMC)*

Size (AWG)	Types RFH-2, SF-2		-	Types TF, XHHW, TW		-	Types TFN, THHN, THWN		-	Types FEP, FEBP, PF, PGF	
	Fittings Inside Conduit	Fittings Outside Conduit	-	Fittings Inside Conduit	Fittings Outside Conduit	-	Fittings Inside Conduit	Fittings Outside Conduit	-	Fittings Inside Conduit	Fittings Outside Conduit
18	2	3	-	3	5	-	5	8	-	5	8
16	1	2	-	3	4	-	4	6	-	4	6
14	1	2	-	2	3	-	3	4	-	3	4
12	—	—	-	1	2	-	2	3	-	2	3
10	—	—	-	1	1	-	1	1	-	1	2

*In addition, one insulated, covered, or bare equipment grounding conductor of the same size shall be permitted.

Statement of Problem and Substantiation for Public Input

Table 1 applies only to complete conduit or tubing systems and is not intended to apply to sections of conduit or tubing used to protect exposed wiring and cable from physical damage. Adding this language to section 348.22 will add clarity for Code users.

Submitter Information Verification

Submitter Full Name: Mike Holt
Organization: Mike Holt Enterprises Inc
Street Address:
City:
State:
Zip:
Submittal Date: Wed Aug 16 15:01:24 EDT 2023
Committee: NEC-P08

Committee Statement

Resolution: NEC Style Manual 4.1.1 identifies that the use of redundant references shall be avoided. To avoid redundancy this is already covered in Chapter 9 Table 1 note #2.

Public Input No. 2255-NFPA 70-2023 [Section No. 348.30(A)]

(A) Securely Fastened.

FMC shall be securely fastened in place by an approved means within 300 mm (12 in.) of each box, cabinet, conduit body, or other conduit termination and shall be supported and secured at intervals not to exceed 1.4 m (4½ ft). Where used, cable ties shall be listed and be identified for securement and support.

Exception No. 1: Where FMC is fished between access points through concealed spaces in finished buildings or structures and supporting is impracticable.

Exception No. 2: Where flexibility is necessary after installation, lengths from the last point where the raceway is securely fastened shall not exceed the following:

(1) 900 mm (3 ft) for metric designators 16 through 35 (trade sizes ½ through 1¼)

(2) 1200 mm (4 ft) for metric designators 41 through 53 (trade sizes 1½ through 2)

(3) 1500 mm (5 ft) for metric designators 63 (trade size 2½) and larger

Exception No. 3: Lengths not exceeding 1.8 m (6 ft) from a luminaire terminal connection for tap connections to luminaires as permitted in 410.117(C).

Exception No. 4: Lengths not exceeding 1.8 m (6 ft) from the last point where the raceway is securely fastened for connections within an accessible ceiling to a luminaire(s) or other equipment.

For the purposes of the exceptions, listed FMC fittings shall be permitted as a means of securement and support.

Statement of Problem and Substantiation for Public Input

Relocating this language from Exception No. 4 to the bottom of 348.30(A) so this requirement applies to all exceptions which mirrors 350.30(A) for LFMC. This change will make the similar requirements more consistent for Code users.

Submitter Information Verification

Submitter Full Name: Mike Holt

Organization: Mike Holt Enterprises Inc

Street Address:

City:

State:

Zip:

Submittal Date: Tue Aug 15 13:40:56 EDT 2023

Committee: NEC-P08

Committee Statement

Resolution: FR-7683-NFPA 70-2024

Statement: This section was revised to improve clarity. In accordance with the NEC Style Manual 4.1.1. redundant requirements should be avoided. The general requirements already address approved means. The last sentence in exception 4 aligns with all Exceptions.

Public Input No. 2892-NFPA 70-2023 [Section No. 348.30(A)]

(A) Securely Fastened.

FMC shall be securely fastened in ~~place by an approved means within~~ place within 300 mm (12 in.) of each box, cabinet, conduit body, or other conduit termination and shall be supported and secured at intervals not to exceed 1.4 m (4½ ft). Where used, cable ties shall be listed and be identified for securement and support.

Exception No. 1: Where FMC is fished between access points through concealed spaces in finished buildings or structures and supporting is impracticable.

Exception No. 2: Where flexibility is necessary after installation, lengths from the last point where the raceway is securely fastened shall not exceed the following:

(1) 900 mm (3 ft) for metric designators 16 through 35 (trade sizes ½ through 1¼)

(2) 1200 mm (4 ft) for metric designators 41 through 53 (trade sizes 1½ through 2)

(3) 1500 mm (5 ft) for metric designators 63 (trade size 2½) and larger

Exception No. 3: Lengths not exceeding 1.8 m (6 ft) from a luminaire terminal connection for tap connections to luminaires as permitted in 410.117(C).

Exception No. 4: Lengths not exceeding 1.8 m (6 ft) from the last point where the raceway is securely fastened for connections within an accessible ceiling to a luminaire(s) or other equipment. For the purposes of the exceptions, listed FMC fittings shall be permitted as a means of securement and support.

Statement of Problem and Substantiation for Public Input

When listed support/securement hardware is required in the listing requirements section of the code the text "by an approved means" is no longer necessary and should be removed from 348.30.

Related Public Inputs for This Document

Related Input	Relationship
Public Input No. 2891-NFPA 70-2023 [Section No. 348.6]	listing requirement for support/securement hardware

Submitter Information Verification

Submitter Full Name: David Gerstetter
Organization: Ul Solutions
Affiliation: UL Solutions
Street Address:
City:
State:
Zip:
Submittal Date: Fri Aug 25 22:42:04 EDT 2023
Committee: NEC-P08

Committee Statement

Resolution: FR-7683-NFPA 70-2024

Statement: This section was revised to improve clarity. In accordance with the NEC Style Manual 4.1.1. redundant requirements should be avoided. The general requirements already address approved means. The last sentence in exception 4 aligns with all Exceptions.

Public Input No. 4078-NFPA 70-2023 [Section No. 348.30(A)]

(A) Securely Fastened.

(1) Lenghts. FMC shall be securely fastened in place by an approved means within 300 mm (12 in.) of each box, cabinet, conduit body, or other conduit termination and shall be supported and secured at intervals not to exceed 1.4 m (4½ ft).

(2) Cable Ties. Where used, cable ties shall be listed and be identified for securement and support.

Exception No. 1: Where FMC is fished between access points through concealed spaces in finished buildings or structures and supporting is impracticable.

Exception No. 2: Where flexibility is necessary after installation, lengths from the last point where the raceway is securely fastened shall not exceed the following:

(1) 900 mm (3 ft) for metric designators 16 through 35 (trade sizes ½ through 1¼)

(2) 1200 mm (4 ft) for metric designators 41 through 53 (trade sizes 1½ through 2)

(3) 1500 mm (5 ft) for metric designators 63 (trade size 2½) and larger

Exception No. 3: Lengths not exceeding 1.8 m (6 ft) from a luminaire terminal connection for tap connections to luminaires as permitted in 410.117(C).

Exception No. 4: Lengths not exceeding 1.8 m (6 ft) from the last point where the raceway is securely fastened for connections within an accessible ceiling to a luminaire(s) or other equipment. For the purposes of the exceptions, listed FMC fittings shall be permitted as a means of securement and support.

Statement of Problem and Substantiation for Public Input

Breaking up 348.30(A) into a list item format to facilitate understanding for Code users. In accordance with NFPA Style Manual section 3.5.1.2 additional subdivisions shall be used where multiple requirements can be broken into independent requirements.

Submitter Information Verification

Submitter Full Name: Mike Holt
Organization: Mike Holt Enterprises Inc
Street Address:
City:
State:
Zip:
Submittal Date: Wed Sep 06 16:00:43 EDT 2023
Committee: NEC-P08

Committee Statement

Resolution: The NEC Style Manual 3.5.1.2 states multiple requirements within a single subdivision shall be avoided. The section includes a single requirement with multiple parts.

Public Input No. 2120-NFPA 70-2023 [Section No. 348.42]

348.42 Couplings and Connectors.

Angle connectors shall ~~not be concealed~~ remain accessible after installation .

Additional Proposed Changes

File Name	Description	Approved
348.42.jpg		

Statement of Problem and Substantiation for Public Input

The current code language does not prohibit the installation shown in the attached picture as the connector is not concealed per the Article 100 definition of that term. It is not accessible (as applied to wiring methods) per the Article 100 definition, and changing the language as proposed will cover installations like in the picture.

Submitter Information Verification

Submitter Full Name: Don Ganiere
Organization: none
Street Address:
City:
State:
Zip:
Submittal Date: Sat Aug 12 11:35:15 EDT 2023
Committee: NEC-P08

Committee Statement

Resolution: The proposed wording change does not provide clarity. The language changes are not equivalent. You can have something concealed and remain accessible behind an access panel.

Public Input No. 4084-NFPA 70-2023 [Section No. 348.56]

~~**348.56** Splices and Taps.~~

~~Splices and taps shall be made in accordance with 300.15 .~~

Statement of Problem and Substantiation for Public Input

Delete 348.56 because it only references a requirement that is already covered in 300.15. Removing this section will improve redundancy for Code users.

Submitter Information Verification

Submitter Full Name: Mike Holt

Organization: Mike Holt Enterprises Inc

Street Address:

City:

State:

Zip:

Submittal Date: Wed Sep 06 16:13:59 EDT 2023

Committee: NEC-P08

Committee Statement

Resolution: FR-7625-NFPA 70-2024

Statement: Splices and taps are applicable to conductors, not the raceway. These requirements for splicing conductors are already addressed in Sections 110.14(B) and 300.15.

Public Input No. 3560-NFPA 70-2023 [Section No. 348.60(B)]

(B) Flexible Installation.

An equipment grounding conductor ~~shall~~ of the wire type shall be installed where flexibility is necessary to minimize the transmission of vibration from equipment or to provide flexibility for equipment that requires movement after installation.

Statement of Problem and Substantiation for Public Input

My assumption is that the intention of this section is to require an equipment grounding conductor of the wire type.

Submitter Information Verification

Submitter Full Name: Eric Stromberg
Organization: Los Alamos National Laboratory
Affiliation: Self
Street Address:
City:
State:
Zip:

Submittal Date: Mon Sep 04 19:40:55 EDT 2023
Committee: NEC-P08

Committee Statement

Resolution: CMP-8 maintains its position from the previous cycle. The submitter’s Public Input is editorial in nature and has not provided a technical substantiation to change the title of this section. Changing the title does not add clarity. The purpose is to address equipment grounding conductors for connection to earth and ground fault management, not equipotential bonding.

Public Input No. 1322-NFPA 70-2023 [Section No. 350.2]

350.2 Reconditioned Equipment.

Reconditioned LFMC shall not be ~~reconditioned~~ permitted .

Statement of Problem and Substantiation for Public Input

This public input is a part of a series of public inputs that seeks to align the language found across the NEC pertaining to how reconditioned equipment is addressed in the NEC.

The following sections us the language that says “Reconditioned ______ shall not be permitted.” 404.16, 406.2, 408.2,410.2, 470.2, 495.2, 495.49,695.2,700.2,701.2,702.2,708.2,

This change suggests the appropriate way to address reconditioned equipment in the NEC. The NEC is an installation code governing the installation of solutions and in many locations throughout the NEC the solution is either permitted or not permitted. This suggested language would bring all references towards reconditioned equipment in alignment.

Submitter Information Verification

Submitter Full Name: Thomas Domitrovich

Organization: Eaton Corporation

Street Address:

City:

State:

Zip:

Submittal Date: Sat Jul 08 11:35:22 EDT 2023

Committee: NEC-P08

Committee Statement

Resolution: FR-7646-NFPA 70-2024

Statement: The panel is not aware of any established programs that provide an acceptable approach to reconditioning for this type of equipment and maintain its listing. Section 110.20 indicates that equipment is permitted to be reconditioned unless otherwise prohibited. Renumbered to comply with the NEC Style Manual 2.2.1 regarding reconditioned equipment.

Public Input No. 2603-NFPA 70-2023 [Section No. 350.2]

350. ~~2~~ **3** Reconditioned Equipment.

Reconditioned LFMC shall not ~~be reconditioned~~ be installed .

Statement of Problem and Substantiation for Public Input

This Public Input is being submitted on behalf of the NEC Correlating Committee Usability Task Group in order to provide correlation throughout the document. The text is revised to comply with the NEC Style Manual Section 2.2.1 regarding reconditioned equipment.
2.2.1 Parallel Numbering Required. Technical committees shall use the following section numbers for the same purposes within articles. This requirement shall not apply to Articles 90, 100, and 110. If the article does not contain listing or reconditioning requirements, the subdivisions shall not be included in the article.
Required Parallel Numbering Format
XXX.1 Scope.
XXX.2 Listing Requirements.
XXX.3 Reconditioned Equipment.
XXX.3(A) Permitted to be Installed.
XXX.3(B) Not Permitted to be Installed.
The Usability Task Group members are: Derrick Atkins, David Hittinger, Richard Holub, Dean Hunter, Chad Kennedy and David Williams.

Submitter Information Verification

Submitter Full Name:	David Williams
Organization:	Delta Charter Township
Street Address:	
City:	
State:	
Zip:	
Submittal Date:	Wed Aug 23 19:39:55 EDT 2023
Committee:	NEC-P08

Committee Statement

Resolution: FR-7646-NFPA 70-2024

Statement: The panel is not aware of any established programs that provide an acceptable approach to reconditioning for this type of equipment and maintain its listing. Section 110.20 indicates that equipment is permitted to be reconditioned unless otherwise prohibited. Renumbered to comply with the NEC Style Manual 2.2.1 regarding reconditioned equipment.

Public Input No. 2893-NFPA 70-2023 [Section No. 350.2]

350.~~2~~ 3 Reconditioned Equipment.

LFMC shall not be reconditioned.

Statement of Problem and Substantiation for Public Input

Per the 2023 NEC style manual, clause 2.2.1, “Required Parallel Numbering Format” reconditioned equipment should be relocated from 350.2 to 350.3.

Submitter Information Verification

Submitter Full Name:	David Gerstetter
Organization:	Ul Solutions
Affiliation:	UL Solutions
Street Address:	
City:	
State:	
Zip:	
Submittal Date:	Fri Aug 25 22:49:14 EDT 2023
Committee:	NEC-P08

Committee Statement

Resolution: FR-7646-NFPA 70-2024

Statement: The panel is not aware of any established programs that provide an acceptable approach to reconditioning for this type of equipment and maintain its listing. Section 110.20 indicates that equipment is permitted to be reconditioned unless otherwise prohibited. Renumbered to comply with the NEC Style Manual 2.2.1 regarding reconditioned equipment.

Public Input No. 2894-NFPA 70-2023 [Section No. 350.6]

350.~~6~~ 2 Listing Requirements.

LFMC ~~and associated fittings shall~~ , associated fittings and support and securement hardware shall be listed.

Statement of Problem and Substantiation for Public Input

To avoid damage to LFMC and undue stress on electrical connections, the use of listed hardware for support and securement of LFMC is necessary. UL 2239, the Standard for Safety for Hardware for the Support of Conduit, Tubing, and Cable, was first published nearly 20 years ago and contains all necessary hardware construction, performance, marking and installation instructions necessary to provide installers the guidance to properly support and secure LFMC using hardware installed per the manufacturers' installation instructions.

Additionally, per the 2023 NEC style manual, clause 2.2.1, "Required Parallel Numbering Format" Listing requirements should be relocated from 350.6 to 350.2.

Related Public Inputs for This Document

Related Input	Relationship
Public Input No. 2895-NFPA 70-2023 [Section No. 350.30(A)]	

Submitter Information Verification

Submitter Full Name: David Gerstetter
Organization: UI Solutions
Affiliation: UL Solutions
Street Address:
City:
State:
Zip:
Submittal Date: Fri Aug 25 22:51:54 EDT 2023
Committee: NEC-P08

Committee Statement

Resolution: Support hardware can be structural steel and hardware not listed may be used for support, subject to AHJ approval. No safety issues have been identified to justify the listing of support and securement hardware.

Public Input No. 3519-NFPA 70-2023 [Section No. 350.6]

350.~~6~~ 2 Listing Requirements.

LFMC and associated fittings shall be listed.

Statement of Problem and Substantiation for Public Input

This Public Input is being submitted on behalf of the NEC Correlating Committee Usability Task Group in order to provide correlation throughout the document. A new section is added to comply with the NEC Style Manual Section 2.2.1 regarding Listing Requirements.
2.2.1 Parallel Numbering Required. Technical committees shall use the following section numbers for the same purposes within articles. This requirement shall not apply to Articles 90, 100, and 110. If the article does not contain listing or reconditioning requirements, the subdivisions shall not be included in the article.
Required Parallel Numbering Format
XXX.1 Scope.
XXX.2 Listing Requirements.
XXX.3 Reconditioned Equipment.
XXX.3(A) Permitted to be Installed.
XXX.3(B) Not Permitted to be Installed.
The Usability Task Group members are: Derrick Atkins, David Hittinger, Richard Holub, Dean Hunter, Chad Kennedy and David Williams.

Submitter Information Verification

Submitter Full Name: David Williams
Organization: Delta Charter Township
Street Address:
City:
State:
Zip:
Submittal Date: Mon Sep 04 17:34:32 EDT 2023
Committee: NEC-P08

Committee Statement

Resolution: FR-7686-NFPA 70-2024
Statement: Renumbered to “.2” in compliance with the NEC Style Manual section 2.2.1 parallel numbering required.

Public Input No. 3421-NFPA 70-2023 [Section No. 350.10]

350.10 Uses Permitted.

LFMC shall be permitted to be used in exposed or concealed locations as follows:

(1) Where conditions of installation, operation, or maintenance require flexibility or protection from machine oils, liquids, vapors, or solids.

(2) In hazardous (classified) locations where specifically permitted by Chapter 5.

(3) For direct burial where listed and marked for the purpose.

(4) Conductors or cables rated at a temperature higher than the listed temperature rating of LFMC shall be permitted to be installed in LFMC, provided the conductors or cables are not operated at a temperature higher than the listed temperature rating of the LFMC.

(5) For encasement in concrete where listed and marked for direct burial and installed in compliance with 350.42.

Statement of Problem and Substantiation for Public Input

350.10 does not specify encasement in concrete as a permittable use of liquidtight flexible metal conduit. The Public Input seeks to align 350.10 with 356.10, the uses permitted for liquidtight flexible nonmetallic conduit. The pipe stiffness requirements for direct burial of liquidtight flexible metal conduit (reference UL 360) are the same as those required for liquidtight flexible nonmetallic conduit (reference UL 1660).

Submitter Information Verification

Submitter Full Name: Megan Hayes

Organization: NEMA

Street Address:

City:

State:

Zip:

Submittal Date: Sat Sep 02 18:43:31 EDT 2023

Committee: NEC-P08

Committee Statement

Resolution: FR-7689-NFPA 70-2024

Statement: Added clarification for LFMC encased in concrete. Aligns Article 350.10 with Article 356.10 for permitted uses. The stiffness requirements for both products are the same.

Public Input No. 2371-NFPA 70-2023 [Section No. 350.22(A)]

(A) Metric Designators 16 through 103 (Trade Sizes ½ through 4).

The number of conductors shall not exceed that permitted by the percentage fill specified in Table 1, Chapter 9.

Cables shall be permitted to be installed where such use is not prohibited by the respective cable articles. ~~The~~ For complete raceway runs, the number of cables shall not exceed the allowable percentage fill specified in Table 1, Chapter 9.

Statement of Problem and Substantiation for Public Input

Table 1 applies only to complete conduit or tubing systems and is not intended to apply to sections of conduit or tubing used to protect exposed wiring and cable from physical damage. Adding this language to first level subdivision 350.22(A) will add clarity for Code users.

Submitter Information Verification

Submitter Full Name: Mike Holt
Organization: Mike Holt Enterprises Inc
Street Address:
City:
State:
Zip:
Submittal Date: Wed Aug 16 15:02:37 EDT 2023
Committee: NEC-P08

Committee Statement

Resolution: NEC Style Manual 4.1.1 identifies that the use of redundant references shall be avoided. To avoid redundancy this is already covered in Chapter 9 Table 1 note #2.

Public Input No. 2895-NFPA 70-2023 [Section No. 350.30(A)]

(A) Securely Fastened.

LFMC shall be securely fastened in ~~place by an approved means within~~ place within 300 mm (12 in.) of each box, cabinet, conduit body, or other conduit termination and shall be supported and secured at intervals not to exceed 1.4 m (4½ ft). Where used, cable ties shall be listed and be identified for securement and support.

Exception No. 1: Where LFMC is fished between access points through concealed spaces in finished buildings or structures and supporting is impractical.

Exception No. 2: Where flexibility is necessary after installation, lengths from the last point where the raceway is securely fastened shall not exceed the following:

(1) 900 mm (3 ft) for metric designators 16 through 35 (trade sizes ½ through 1¼)

(2) 1200 mm (4 ft) for metric designators 41 through 53 (trade sizes 1½ through 2)

(3) 1500 mm (5 ft) for metric designators 63 (trade size 2½) and larger

Exception No. 3: Lengths not exceeding 1.8 m (6 ft) from a luminaire terminal connection for tap conductors to luminaires, as permitted in 410.117(C).

Exception No. 4: Lengths not exceeding 1.8 m (6 ft) from the last point where the raceway is securely fastened for connections within an accessible ceiling to luminaire(s) or other equipment.

For the purposes of the exceptions, listed LFMC fittings shall be permitted as a means of securement and support.

Statement of Problem and Substantiation for Public Input

When listed support/securement hardware is included in the listing requirements of this article the text "by an approved means" is no longer necessary in 350.30(A). Refer to PI 2894

Related Public Inputs for This Document

Related Input	Relationship
Public Input No. 2894-NFPA 70-2023 [Section No. 350.6]	inclusion of listed support/securement hardware requirement in article

Submitter Information Verification

Submitter Full Name: David Gerstetter

Organization: Ul Solutions

Affiliation: UL Solutions

Street Address:

City:

State:

Zip:

Submittal Date: Fri Aug 25 22:56:13 EDT 2023

Committee: NEC-P08

Committee Statement

Resolution: FR-7694-NFPA 70-2024

Statement: This section was revised to improve clarity. In accordance with the NEC Style Manual 4.1.1. redundant requirements should be avoided. The general requirements already address approved means.

Public Input No. 4079-NFPA 70-2023 [Section No. 350.30(A)]

(A) Securely Fastened.

(1) Lenghts. LFMC shall be securely fastened in place by an approved means within 300 mm (12 in.) of each box, cabinet, conduit body, or other conduit termination and shall be supported and secured at intervals not to exceed 1.4 m (4½ ft).

(2) Cable Ties. Where used, cable ties shall be listed and be identified for securement and support.

Exception No. 1: Where LFMC is fished between access points through concealed spaces in finished buildings or structures and supporting is impractical.

Exception No. 2: Where flexibility is necessary after installation, lengths from the last point where the raceway is securely fastened shall not exceed the following:

(1) 900 mm (3 ft) for metric designators 16 through 35 (trade sizes ½ through 1¼)

(2) 1200 mm (4 ft) for metric designators 41 through 53 (trade sizes 1½ through 2)

(3) 1500 mm (5 ft) for metric designators 63 (trade size 2½) and larger

Exception No. 3: Lengths not exceeding 1.8 m (6 ft) from a luminaire terminal connection for tap conductors to luminaires, as permitted in 410.117(C).

Exception No. 4: Lengths not exceeding 1.8 m (6 ft) from the last point where the raceway is securely fastened for connections within an accessible ceiling to luminaire(s) or other equipment.

For the purposes of the exceptions, listed LFMC fittings shall be permitted as a means of securement and support.

Statement of Problem and Substantiation for Public Input

Breaking up 350.30(A) into a list item format to facilitate understanding for Code users. In accordance with NFPA Style Manual section 3.5.1.2 additional subdivisions shall be used where multiple requirements can be broken into independent requirements.

Submitter Information Verification

Submitter Full Name:	Mike Holt
Organization:	Mike Holt Enterprises Inc
Street Address:	
City:	
State:	
Zip:	
Submittal Date:	Wed Sep 06 16:04:56 EDT 2023
Committee:	NEC-P08

Committee Statement

Resolution: The NEC Style Manual 3.5.1.2 states multiple requirements within a single subdivision shall be avoided. The section includes a single requirement with multiple parts.

Public Input No. 3422-NFPA 70-2023 [Section No. 350.42]

350.42 Couplings and Connectors.

Only fittings listed for use with LFMC shall be used. Angle connectors shall not be concealed. Straight LFMC fittings shall be permitted for direct burial ~~where marked~~ or encasement in concrete, where marked for direct burial .

Statement of Problem and Substantiation for Public Input

350.42 does not specify encasement in concrete as a permittable use of liquidtight flexible metal conduit fittings. The Public Input
seeks to align 350.42 with 356.42, the uses permitted for liquidtight flexible nonmetallic conduit fittings. The test requirements for
direct burial of liquidtight flexible metal conduit fittings are the same as those required for direct burial of liquidtight flexible nonmetallic conduit fittings (reference UL 514B).

Submitter Information Verification

Submitter Full Name: Megan Hayes

Organization: NEMA

Street Address:

City:

State:

Zip:

Submittal Date: Sat Sep 02 18:48:10 EDT 2023

Committee: NEC-P08

Committee Statement

Resolution: FR-7695-NFPA 70-2024

Statement: Information was added to Section 350.10 in a new (5). The text was revised to not create redundant information to comply with NEC Style Manual Section 4.1.1. The requirements are revised to align with 356.42. The direct burial test requirements are the same for both types of raceways.

Public Input No. 4086-NFPA 70-2023 [Section No. 350.56]

~~**350.56** Splices and Taps.~~

~~Splices and taps shall be made in accordance with 300.15 .~~

Statement of Problem and Substantiation for Public Input

Delete 350.56 because it only references a requirement that is already covered in 300.15. Removing this section will improve redundancy for Code users.

Submitter Information Verification

Submitter Full Name:	Mike Holt
Organization:	Mike Holt Enterprises Inc
Street Address:	
City:	
State:	
Zip:	
Submittal Date:	Wed Sep 06 16:15:38 EDT 2023
Committee:	NEC-P08

Committee Statement

Resolution: FR-7626-NFPA 70-2024

Statement: Splices and taps are applicable to conductors, not the raceway. These requirements for splicing conductors are already addressed in Sections 110.14(B) and 300.15.

Public Input No. 3561-NFPA 70-2023 [Section No. 350.60(B)]

(B) Flexible Installation.

An equipment grounding conductor ~~shall~~ of the wire type shall be installed where flexibility is necessary to minimize the transmission of vibration from equipment or to provide flexibility for equipment that requires movement after installation.

Statement of Problem and Substantiation for Public Input

My assumption is that this section intends to require an equipment grounding conductor of the wire type.

Submitter Information Verification

Submitter Full Name:	Eric Stromberg
Organization:	Los Alamos National Laboratory
Affiliation:	Self
Street Address:	
City:	
State:	
Zip:	
Submittal Date:	Mon Sep 04 19:44:26 EDT 2023
Committee:	NEC-P08

Committee Statement

Resolution: CMP-8 maintains its position from the previous cycle. The submitter's Public Input is editorial in nature and has not provided a technical substantiation to change the title of this section. Changing the title does not add clarity. The purpose is to address equipment grounding conductors for connection to earth and ground fault management, not equipotential bonding.

Public Input No. 600-NFPA 70-2023 [New Section after 352.1]

352.2 Reconditioned Equipment

PVC conduit shall not be reconditioned

Statement of Problem and Substantiation for Public Input

Cables, Raceways, Conduits, and Tubings are not permitted to be reconditioned per the NEMA Technical Position on Reconditioned Equipment (NEMA CS 100-2020, Appendix B.1)

Related Public Inputs for This Document

Related Input	Relationship
Public Input No. 599-NFPA 70-2023 [New Section after 360.1]	reconditioned equipment
Public Input No. 614-NFPA 70-2023 [New Section after 340.1]	
Public Input No. 624-NFPA 70-2023 [New Section after 388.1]	

Submitter Information Verification

Submitter Full Name:	Russ Leblanc
Organization:	Leblanc Consulting Services
Street Address:	
City:	
State:	
Zip:	
Submittal Date:	Sun Apr 16 07:49:59 EDT 2023
Committee:	NEC-P08

Committee Statement

Resolution: FR-7649-NFPA 70-2024

Statement: The panel is not aware of any established programs that provide an acceptable approach to reconditioning for this type of equipment and maintain its listing. Section 110.20 indicates that equipment is permitted to be reconditioned unless otherwise prohibited.

Public Input No. 2902-NFPA 70-2023 [Section No. 352.6]

352.~~6~~ 2 Listing Requirements.

PVC conduit, factory elbows, ~~and associated fittings~~ associated fittings and support and securement hardware shall be listed.

Statement of Problem and Substantiation for Public Input

To avoid damage to PVC conduit and undue stress on electrical connections and to permit adequate movement from thermal expansion and/or contraction the use of listed hardware for support and securement of PVC conduit is necessary. UL 2239, the Standard for Safety for Hardware for the Support of Conduit, Tubing, and Cable, was first published nearly 20 years ago and contains all necessary hardware construction, performance, marking and installation instructions necessary to provide installers the guidance to properly support and secure PVC Conduit using hardware installed per the manufacturers' installation instructions.

Additionally, per the 2023 NEC style manual, clause 2.2.1, "Required Parallel Numbering Format" Listing requirements should be relocated from 352.6 to 352.2.

Submitter Information Verification

Submitter Full Name:	David Gerstetter
Organization:	Ul Solutions
Affiliation:	UL Solutions
Street Address:	
City:	
State:	
Zip:	
Submittal Date:	Fri Aug 25 23:56:42 EDT 2023
Committee:	NEC-P08

Committee Statement

Resolution: Support hardware can be structural steel and hardware not listed may be used for support, subject to AHJ approval. No safety issues have been identified to justify the listing of support and securement hardware.

Public Input No. 3520-NFPA 70-2023 [Section No. 352.6]

~~352.6~~ 2 _ Listing Requirements.

PVC conduit, factory elbows, and associated fittings shall be listed.

Statement of Problem and Substantiation for Public Input

This Public Input is being submitted on behalf of the NEC Correlating Committee Usability Task Group in order to provide correlation throughout the document. A new section is added to comply with the NEC Style Manual Section 2.2.1 regarding Listing Requirements.
2.2.1 Parallel Numbering Required. Technical committees shall use the following section numbers for the same purposes within articles. This requirement shall not apply to Articles 90, 100, and 110. If the article does not contain listing or reconditioning requirements, the subdivisions shall not be included in the article.
Required Parallel Numbering Format
XXX.1 Scope.
XXX.2 Listing Requirements.
XXX.3 Reconditioned Equipment.
XXX.3(A) Permitted to be Installed.
XXX.3(B) Not Permitted to be Installed.
The Usability Task Group members are: Derrick Atkins, David Hittinger, Richard Holub, Dean Hunter, Chad Kennedy and David Williams.

Submitter Information Verification

Submitter Full Name: David Williams
Organization: Delta Charter Township
Street Address:
City:
State:
Zip:
Submittal Date: Mon Sep 04 17:35:44 EDT 2023
Committee: NEC-P08

Committee Statement

Resolution: FR-7698-NFPA 70-2024
Statement: Renumber to .2 in compliance with the NEC Style Manual section 2.2.1 parallel numbering required.

Public Input No. 2179-NFPA 70-2023 [Section No. 352.10(I)]

(I) Support of Conduit Bodies.

PVC conduit shall be permitted to support nonmetallic conduit bodies not larger than the largest unmodified trade size of an entering raceway. These conduit bodies shall not support luminaires or other equipment and shall not contain devices other than splicing devices as permitted by 110.14(B) and 314.16(C)(2).

Statement of Problem and Substantiation for Public Input

352.10 (I) add language that the size of the largest entering conduit is based on the size of the conduit body and not modified by using a reducing bushing for example.

Submitter Information Verification

Submitter Full Name: Gary Hein
Organization: [Not Specified]
Street Address:
City:
State:
Zip:
Submittal Date: Mon Aug 14 12:40:28 EDT 2023
Committee: NEC-P08

Committee Statement

Resolution: The proposed revision is unnecessarily restrictive and lacks substantiation.

Public Input No. 2256-NFPA 70-2023 [Section No. 352.12(B)]

(B) Support of Luminaires.

For the support of luminaires or other equipment- ~~not described in 352~~ . ~~10(I).~~

Statement of Problem and Substantiation for Public Input

Deleting text because 352.10(I) is already covered under 352.10 Uses Permitted. This proposed revision improves redundancy for Code users.

Submitter Information Verification

Submitter Full Name:	Mike Holt
Organization:	Mike Holt Enterprises Inc
Street Address:	
City:	
State:	
Zip:	
Submittal Date:	Tue Aug 15 13:44:40 EDT 2023
Committee:	NEC-P08

Committee Statement

Resolution: Section 352.10(I) addresses supporting a luminaire on a conduit body whereas Section 352.12 addresses the conduit supporting luminaires directly.

Public Input No. 2239-NFPA 70-2023 [Section No. 352.12(C)]

(C) Physical Damage.

Where subject to physical damage, except ~~as permitted in 352.10(K)~~ ~~.~~ <u>if schedule 80 PVC conduit is used.</u>

Statement of Problem and Substantiation for Public Input

The requirement should state “Schedule 80 PVC” for clarity instead of referencing 352.10(K). Instead of referencing a requirement let's bring clarity to Code users by simply telling then to use Schedule 80 PVC conduit in areas subject to physical damage.

Submitter Information Verification

Submitter Full Name:	Mike Holt
Organization:	Mike Holt Enterprises Inc
Street Address:	
City:	
State:	
Zip:	
Submittal Date:	Tue Aug 15 13:07:02 EDT 2023
Committee:	NEC-P08

Committee Statement

Resolution: Schedule 80 is already covered in Section 352.10(K). NEC Style Manual Section 4.1.1 identifies that redundant references are to be avoided.

Public Input No. 429-NFPA 70-2023 [Section No. 352.20(B)]

~~(B) Maximum.~~

~~PVC conduit larger than metric designator 155 (trade size 6) shall not be used.~~

~~Informational Note: See 300.1(C) for the trade sizes and metric designators that are for identification purposes only and do not relate to actual dimensions.~~

Additional Proposed Changes

File Name	Description	Approved
PVC_Sched_40_8_inch.jpg		

Statement of Problem and Substantiation for Public Input

Limiting PVC to trade sizes 6" max. is overly restrictive for medium voltage circuits such as 34.5 kV. Utility companies use 8" PVC conduit underground extensively. Adding this exception would permit conduit manufacturers to pursue a NRTL listing for PVC conduit sizes up to 8" trade size which is already being manufactured and marketed. It would only be applicable for underground applications in areas that do not contain hazardous vapors or gases, so it doesn't open up possibilities for 8" conduit bodies or other conduit fittings such as explosion proof conduit seals, LB's, T's, etc., normally used in aboveground installations. It is limited to PVC due to the lack of commercially available field threading dies and conduit benders. It is also limited to listed factory elbows only so hot boxes or heat guns in the field will not be used.

Related Public Inputs for This Document

Related Input	Relationship
Public Input No. 430-NFPA 70-2023 [Section No. 353.20(B)]	Allows 8" conduit underground
Public Input No. 430-NFPA 70-2023 [Section No. 353.20(B)]	
Public Input No. 1856-NFPA 70-2023 [Section No. 342.20(B)]	
Public Input No. 1857-NFPA 70-2023 [Section No. 344.20(B)]	
Public Input No. 1859-NFPA 70-2023 [Section No. 355.20(B)]	
Public Input No. 1862-NFPA 70-2023 [Section No. 300.1(C)]	
Public Input No. 1875-NFPA 70-2023 [Section No. Table]	

Submitter Information Verification

Submitter Full Name: Paul Guidry
Organization: Fluor Corp.
Affiliation: Associated Builders and Contractors
Street Address:
City:
State:
Zip:
Submittal Date: Sun Mar 05 09:30:01 EST 2023
Committee: NEC-P08

Committee Statement

Resolution: Removing the prohibition on conduit larger than trade size 6 would permit the use of any size PVC conduit without limitation and guidance on installation in the NEC.

Schedule-40 PVC Rigid Conduit Rated for 90° C Wiring

[redacted] Schedule-40 is sunlight resistant. Meets or exceeds the requirements of NEMA TC-2 and UL-651 for Schedule 40 Conduit*.

Schedule 40 (10 ft Crate Quantities)

TRADE SIZE	PART NO.	AVG OD (IN)	MINIMUM AVG ID (IN)	MIN WALL (IN)	WEIGHT/FT (LBS)	10 FT CRATE QUANTITY (FT)
1/2	8102	0.84	0.578	0.109	0.165	6000
3/4	8103	1.05	0.78	0.113	0.22	4400
1	8104	1.315	1.004	0.133	0.326	3600
1-1/4	8105	1.66	1.335	0.14	0.441	3300
1-1/2	8106	1.9	1.564	0.145	0.528	2250
2	8108	2.375	2.021	0.154	0.73	1400
2-1/2	8110	2.875	2.414	0.203	1.158	930
3	8112	3.5	3.008	0.216	1.609	880
3-1/2	8114	4	3.486	0.226	1.935	630
4	8116	4.5	3.961	0.237	2.292	570
5	8120	5.563	4.975	0.258	3.105	380
6	8124	6.625	5.986	0.28	4.03	260
8*	880747	8.625	7.853	0.322	6.065	140

Public Input No. 2372-NFPA 70-2023 [Section No. 352.22]

352.22 Number of Conductors.

The number of conductors shall not exceed that permitted by the percentage fill specified in Table 1, Chapter 9.

Cables shall be permitted to be installed where such use is not prohibited by the respective cable articles. ~~The~~ For complete raceway runs, the number of cables shall not exceed the allowable percentage fill specified in Table 1, Chapter 9.

Statement of Problem and Substantiation for Public Input

Table 1 applies only to complete conduit or tubing systems and is not intended to apply to sections of conduit or tubing used to protect exposed wiring and cable from physical damage. Adding this language to section 352.22 will add clarity for Code users.

Submitter Information Verification

Submitter Full Name: Mike Holt
Organization: Mike Holt Enterprises Inc
Street Address:
City:
State:
Zip:
Submittal Date: Wed Aug 16 15:04:25 EDT 2023
Committee: NEC-P08

Committee Statement

Resolution: NEC Style Manual 4.1.1 identifies that the use of redundant references shall be avoided. To avoid redundancy this is already covered in Chapter 9 Table 1 note #2.

Public Input No. 2456-NFPA 70-2023 [Section No. 352.30(A)]

(A) Securely Fastened.

PVC conduit shall be securely fastened within 900 mm (3 ft) of each outlet box, junction box, device box, conduit body, or other conduit termination. Conduit listed for securing at other than 900 mm (3 ft) shall be permitted to be installed in accordance with the listing.

Exception : For concealed work in finished buildings or prefinished wall panels where such securing is impracticable, unbroken lengths (without coupling) of PVC conduit shall be permitted to be fished.

Statement of Problem and Substantiation for Public Input

Adding the same exception as permitted in 358.30(A) Exception 2 for EMT to allow PVC conduit to be fished inside walls of finished buildings where securing is impracticable. This proposed revision will bring consistency for Code users.

Submitter Information Verification

Submitter Full Name:	Mike Holt
Organization:	Mike Holt Enterprises Inc
Street Address:	
City:	
State:	
Zip:	
Submittal Date:	Thu Aug 17 13:11:18 EDT 2023
Committee:	NEC-P08

Committee Statement

Resolution: The substantiation is inadequate. No technical information was provided to support a change. The allowances for EMT and PVC should not be the same as there are strength, rigidity, and mounting differences.

Public Input No. 2257-NFPA 70-2023 [Section No. 352.30 [Excluding any Sub-Sections]]

PVC conduit shall be installed as a complete system as provided in 300.18 and shall be fastened so that movement from thermal expansion or contraction is permitted. PVC conduit shall be securely fastened and supported in accordance with 352.30(A) and (B). <u>Listed PVC fittings shall be permitted as a means of securement and support for PVC raceways not exceeding 24 in.</u>

Statement of Problem and Substantiation for Public Input

This language will permit a short piece of PVC to be installed without having any additional securing and supporting by allowing a PVC connector to serve as a means of securement and support. This has been a common practice in the trade and should be allowed by the Code.

Submitter Information Verification

Submitter Full Name: Mike Holt
Organization: Mike Holt Enterprises Inc
Street Address:
City:
State:
Zip:
Submittal Date: Tue Aug 15 13:58:08 EDT 2023
Committee: NEC-P08

Committee Statement

Resolution: The substantiation is inadequate. No technical information was provided to support a change. 352.30(A) already covers supporting conduit within 3 feet of junction boxes, etc.

Public Input No. 2289-NFPA 70-2023 [Section No. 352.44(A)]

~~**(A)** Thermal Expansion and Contraction.~~

~~Expansion fittings for PVC conduit shall be provided to compensate for thermal expansion and contraction where the length change, in accordance with Table 352.44(A) , is expected to be 6 mm (1/4 in.) or greater in a straight run between securely mounted items such as boxes, cabinets, elbows, or other conduit terminations.~~

~~Table 352.44(A) Expansion Characteristics of PVC Rigid Nonmetallic Conduit Coefficient of Thermal Expansion =~~ ~~6.084×10^{-5}~~ ~~mm/mm/°C (~~~~3.38×10^{-5}~~ ~~in./in./°F)~~

~~Temperature Change (°C) Length Change of PVC Conduit (mm/m) Temperature Change (°F) Length Change of PVC Conduit (in./100 ft) Temperature Change (°F) Length Change of PVC Conduit (in./100 ft) 5 0.30 5 0.20 105 4.26 10 0.61 10 0.41 110 4.46 15 0.91 15 0.61 115 4.66 20 1.22 20 0.81 1~~

Statement of Problem and Substantiation for Public Input

This is a companion public input which would delete 352.44(B) as being redundant to 300.5(J) and eliminate confusion caused by FR 7571 of the 2023 Edition. If accepted there would not be a need for the two sub sections 352.44(A) and (B).

The language should revert to the 2020 Edition. Lengthy debates took place during the 2023 CMP meetings. A lot of that discussion was relating to the substantiation shown above and with the companion PI submitted for 352.44(B).

Submitter Information Verification

Submitter Full Name: Rudy Garza
Organization: IAEI
Street Address:
City:
State:
Zip:

Submittal Date: Tue Aug 15 16:57:46 EDT 2023
Committee: NEC-P08

Committee Statement

Resolution: Compensating for PVC Conduit thermal expansion due to ambient temperature changes is necessary to protect the conduit from damage. The intent of 352.44(A) is to address how exposure temperatures cause PVC material to expand and contract based upon its material characteristics. The referenced 300.5(J) addresses external forces from frost heave and soil settling that does not account for that exerted movement onto the conduit.

Public Input No. 1267-NFPA 70-2023 [New Section after 352.44(B)]

TITLE OF NEW CONTENT

352.44B Exception

An expansion/contraction fitting shall not be required for any run of PVC conduit emerging from earth grade having an overall length of 3.05m (10') or less.

Statement of Problem and Substantiation for Public Input

This new exception follows 310.15C1c somewhat to allow a reasonable PVC raceway length to be installed without an expansion/contraction fitting. This will apply to PVC raceway sleeving direct burial conductors for physical protection that exit the raceway underground. This new exception differs from 310.15C1c in that it also applies to a PVC run extending from an above grade enclosure to an underground enclosure such as a handhole box. Far less likely, is a 10' or less run of PVC conduit that routes continuous from enclosure to enclosure, submerging below grade only to emerge again. What's prudent is the wording of this public input encompasses all installation scenarios.

Where we will usually see this in practice is for raceways that are installed above grade for the protection of the conductors (300.5D1) only to have those conductors route underground without a raceway. These runs are less likely to get dragged by settling or heaving earth. The conductors flex more than the hard raceway.

This new exception does not prohibit bend(s) being made in the conduit above or below grade. A below grade conduit bend will cause the conduit to be more prone to move with the earth movement. Is this drag tolerable? The answer to that is as vast and variable as the soil conditions of all the areas the NEC covers. Possibly, the CMP draws the line and states no bends are allowed below grade while exercising this exception. Myself, I prefer to see (but not mandate) a 90 degree conduit bend made below grade to point the direction of the cables. The sweep and radius of a conduit bend is kinder to the cables the conduit is intended to protect than an entirely straight and vertical run.

Related Public Inputs for This Document

Related Input	Relationship
Public Input No. 1268-NFPA 70-2023 [Section No. 300.5(J)]	
Public Input No. 1266-NFPA 70-2023 [Section No. 352.44(B)]	
Public Input No. 1266-NFPA 70-2023 [Section No. 352.44(B)]	
Public Input No. 1268-NFPA 70-2023 [Section No. 300.5(J)]	

Submitter Information Verification

Submitter Full Name: Norman Feck

Organization: State of Colorado

Affiliation: self

Street Address:

City:

State:

Zip:

Submittal Date: Mon Jul 03 16:04:46 EDT 2023

Committee: NEC-P08

Committee Statement

Resolution: The proposal provides no calculations or justifications for selecting a particular distance relative to the impact from frost heave or settling which varies based upon soil conditions, moisture level, and tamping. The intent of 352.44(B) is to address how to comply with 300.5(J) when the PVC conduit is direct buried only and clarify the specific placement of the expansion joint.

Public Input No. 1266-NFPA 70-2023 [Section No. 352.44(B)]

(B) Earth Movement.

Expansion/contraction fittings for underground runs of direct buried PVC conduit emerging from the ground shall be provided above grade ~~when required to~~ , where the conduit runs connect to a building or structure mounted enclosure, to compensate for earth settling or heaving movement~~, including frost heave.~~ .

The 352.30 required conduit support(s) shall only be placed on the stationary side of the PVC expansion/contraction fitting.

Informational Note: See 300.5(J).

Statement of Problem and Substantiation for Public Input

5 points:

1. 'Contraction' was aptly added to 'expansion' fitting. When installed according to the manufacturer's instructions, the fitting will allow for both expanding and contracting motion.
2. The "when required" part of 352.44B is no longer required with the adoption of my 2026 public input. An exception is added to 352.44B.
3. This only applies to the conduit runs that physically connect to a building or structure mounted enclosure after emerging from earth grade. It wouldn't apply to an installation such as a run that enters open bottomed equipment, switchgear of a pedestal for examples; or a threaded hub box with two or more conduits serving as the 314.23F box support.
4. NEC's "including frost" could be deleted. The ground may heave due to bentonite. The reason the ground moves doesn't matter as much to the NEC (90.1) as recognizing that the ground can settle or heave.
5. Any 352.30 required supports must only be installed on the stationary portion of the conduit run. The manufacturer's design of the fitting or slip riser allows minimal but some telescoping movement of that fitting or slip riser. Securing a conduit to structure surface, on the portion of the conduit run intended to expand and contract, contributes to defeating the purpose of the expansion/contraction fitting requirement.

Related Public Inputs for This Document

Related Input	Relationship
Public Input No. 1268-NFPA 70-2023 [Section No. 300.5(J)]	
Public Input No. 1267-NFPA 70-2023 [New Section after 352.44(B)]	
Public Input No. 1267-NFPA 70-2023 [New Section after 352.44(B)]	
Public Input No. 1268-NFPA 70-2023 [Section No. 300.5(J)]	

Submitter Information Verification

Submitter Full Name: Norman Feck
Organization: State of Colorado
Affiliation: self
Street Address:
City:
State:
Zip:

Submittal Date: Mon Jul 03 15:32:46 EDT 2023

Committee: NEC-P08

Committee Statement

Resolution: The proposal provides no clarity to the existing requirement. All expansion joints are used for both expansion and contraction and placement of the expansion joint above grade addresses the below grade soil movement while maintaining rigid movement above grade to avoid cabling termination stresses whether the conduit terminates at the enclosure or fixed asset or the cabling exits the conduit and enters enclosures and similar via a cable gland.

Public Input No. 2031-NFPA 70-2023 [Section No. 352.44(B)]

(B) Earth Movement.

Expansion fittings for underground complete runs of direct buried PVC conduit emerging from the ground shall be provided above grade when required to compensate for earth settling or movement, including frost heave.

Informational Note: See 300.5(J) for direct buried cables emerging from grade .

Statement of Problem and Substantiation for Public Input

This public input is being submitted on behalf of the Minnesota Department of Labor and Industry. Currently, the Department's inspection staff includes 14-office/field staff, 12-state field inspectors, 2-virtual inspectors and 50 plus contract electrical inspectors that complete over 170,000 electrical inspections annually.

This proposed changes clarifies that the section only applies to "complete" runs of PVC conduits which is covered in section 300.18(A). In addition, the Informational note referencing 300.5(J) has ben revised to point the user of the NEC to specific requirements for direct buried cables. The clarified text in the informational gives further direction and draws a distinction between installations when it is a direct buried cable installation versus a complete run of PVC emerging from grade where earth movement is encountered.

Submitter Information Verification

Submitter Full Name:	Dean Hunter
Organization:	Minnesota Department of Labor
Street Address:	
City:	
State:	
Zip:	
Submittal Date:	Fri Aug 11 10:40:34 EDT 2023
Committee:	NEC-P08

Committee Statement

Resolution: Vertical movement of PVC conduit impacted by soil movement occurs regardless of whether the horizontal run is complete or partial. Article 300.5(J) addresses the need for protection from soil movement.

Public Input No. 2287-NFPA 70-2023 [Section No. 352.44(B)]

~~**(B)** Earth Movement.~~

~~Expansion fittings for underground runs of direct buried PVC conduit emerging from the ground shall be provided above grade when required to compensate for earth settling or movement, including frost heave.~~

~~Informational Note: See 300.5(J) .~~

Statement of Problem and Substantiation for Public Input

The revisions to this section in the 2023 cycle create redundancy and contradictive requirements with 300.5(J). This revision has caused issues in the field by implying expansion fittings are only required for PVC raceways resulting in confusion. 300.5(J) is very clear that ground movement (frost heave) needs to be compensated for all types of raceways. Expansion fittings are not the only method for compliance.

With the present language in 352.44(B), this implies the only permitted method for frost heave is an expansion fitting which is contradictive of 300.5(J). The Informational Note in 300.5(J) gives guidance also. This is a companion public input to 352.44(A).

This language should revert to the 2020 Edition. Lengthy debates took place during the 2023 CMP meetings. A lot of that discussion was relating to the substantiation shown above.

Submitter Information Verification

Submitter Full Name: Rudy Garza

Organization: IAEI

Street Address:

City:

State:

Zip:

Submittal Date: Tue Aug 15 16:51:02 EDT 2023

Committee: NEC-P08

Committee Statement

Resolution: Deleting this section removes the method of protection for direct buried PVC conduit required by 300.5(J).

Public Input No. 3218-NFPA 70-2023 [Section No. 352.48]

~~**352.48** Joints.~~

~~All joints between lengths of conduit, and between conduit and couplings, fittings, and boxes, shall be made by an approved method.~~

Statement of Problem and Substantiation for Public Input

Delete this requirement because its already required for PVC to use fittings listed and specifically designed for the raceway. See 352.6 and 300.15.

Submitter Information Verification

Submitter Full Name: Mike Holt
Organization: Mike Holt Enterprises Inc
Street Address:
City:
State:
Zip:

Submittal Date: Wed Aug 30 11:50:22 EDT 2023
Committee: NEC-P08

Committee Statement

Resolution: 352.2 and 300.15 address selection of fittings. This article addresses methods for installing the fittings.

Public Input No. 4089-NFPA 70-2023 [Section No. 352.56]

~~**352.56** Splices and Taps.~~

~~Splices and taps shall be made in accordance with 300.15 .~~

Statement of Problem and Substantiation for Public Input

Delete 352.56 because it only references a requirement that is already covered in 300.15. Removing this section will improve redundancy for Code users.

Submitter Information Verification

Submitter Full Name: Mike Holt

Organization: Mike Holt Enterprises Inc

Street Address:

City:

State:

Zip:

Submittal Date: Wed Sep 06 16:16:20 EDT 2023

Committee: NEC-P08

Committee Statement

Resolution: FR-7627-NFPA 70-2024

Statement: Splices and taps are applicable to conductors, not the raceway. These requirements for splicing conductors are already addressed in Sections 110.14(B) and 300.15.

Public Input No. 143-NFPA 70-2023 [Section No. 352.60]

~~**352.60** Grounding.~~

~~Where equipment grounding is required, separate grounding conductor shall be installed in the conduit.~~

~~*Exception No. 1: The equipment grounding conductor shall be permitted to be run separately from the circuit conductors as permitted in 250.134 , Exception No. 2, for dc circuits and 250.134 , Exception No. 1, for separately run equipment grounding conductors.*~~

~~*Exception No. 2: The equipment grounding conductor shall not be required where the grounded conductor is used to ground equipment as permitted in 250.142 .*~~

Statement of Problem and Substantiation for Public Input

Grounding and bonding requirements belong in Article 250. It makes absolutely no sense to have grounding requirements in Article about a nonmetallic wiring method that provides no grounding or bonding. Article 250 adequately covers grounding and bonding methods. This requirement is superfluous, incomplete and may cause conflicts with Article 250 requirements.

Related Public Inputs for This Document

Related Input	Relationship
Public Input No. 144-NFPA 70-2023 [Section No. 353.60]	
Public Input No. 145-NFPA 70-2023 [Section No. 354.60]	
Public Input No. 146-NFPA 70-2023 [Section No. 355.60]	
Public Input No. 147-NFPA 70-2023 [Section No. 356.60]	
Public Input No. 148-NFPA 70-2023 [Section No. 362.60]	
Public Input No. 149-NFPA 70-2023 [Section No. 378.60]	
Public Input No. 150-NFPA 70-2023 [Section No. 388.60]	

Submitter Information Verification

Submitter Full Name: Russ Leblanc
Organization: Leblanc Consulting Services
Street Address:
City:
State:
Zip:
Submittal Date: Thu Jan 12 08:27:20 EST 2023
Committee: NEC-P08

Committee Statement

Resolution: FR-7570-NFPA 70-2024

Statement: Section 250.118 does not permit non-conductive raceways to be used as an equipment grounding conductor (EGC). The requirements for having a wire type equipment grounding conductor complying with Article 250 Part VI for this wiring method is already

provided in other parts of this Code.

Section 250.118 for permitted EGCs does not reference nonmetallic wiring methods and only allows metal raceways, cable tray, and similar metal wiring methods to be used as equipment grounding conductors. The xxx.60 section for this article is being removed to eliminate any confusion for installing an equipment grounding conductor with this non-metallic wiring method. Changing the title in this section and adding ‘of the wire type’ does not add clarity.

Public Input No. 2355-NFPA 70-2023 [Section No. 352.60]

352.~~60~~ 60 Equipment Grounding Conductor .

Where equipment grounding is required, separate grounding conductor shall be installed in the conduit.

Exception No. 1: The equipment grounding conductor shall be permitted to be run separately from the circuit conductors as permitted in 250.134, Exception No. 2, for dc circuits and 250.134, Exception No. 1, for separately run equipment grounding conductors.

Exception No. 2: The equipment grounding conductor shall not be required where the grounded conductor is used to ground equipment as permitted in 250.142.

Statement of Problem and Substantiation for Public Input

The section title must be revised to match the technical requirement. In accordance with NEC style manual section 2.1.3.2 the title must be descriptive and concise with the intent of the requirement. See 215.6 Feeder Equipment Grounding Conductor, 320.108 Equipment Grounding Conductor, 330.108 Equipment Grounding Conductor, 334.108 Equipment Grounding Conductor, 410.182 Equipment Grounding Conductor, 547.27 Separate Equipment Grounding Conductor, 555.37 Equipment Grounding Conductor, and 690.45 Size of Equipment Grounding Conductors.

Submitter Information Verification

Submitter Full Name: Mike Holt

Organization: Mike Holt Enterprises Inc

Street Address:

City:

State:

Zip:

Submittal Date: Wed Aug 16 14:15:45 EDT 2023

Committee: NEC-P08

Committee Statement

Resolution: FR-7570-NFPA 70-2024

Statement: Section 250.118 does not permit non-conductive raceways to be used as an equipment grounding conductor (EGC). The requirements for having a wire type equipment grounding conductor complying with Article 250 Part VI for this wiring method is already provided in other parts of this Code.

Section 250.118 for permitted EGCs does not reference nonmetallic wiring methods and only allows metal raceways, cable tray, and similar metal wiring methods to be used as equipment grounding conductors. The xxx.60 section for this article is being removed to eliminate any confusion for installing an equipment grounding conductor with this non-metallic wiring method. Changing the title in this section and adding 'of the wire type' does not add clarity.

Public Input No. 3563-NFPA 70-2023 [Section No. 352.60]

352.60 Grounding and Bonding .

Where equipment grounding is required, ~~separate grounding conductor~~ an equipment grounding conductor of the wire type shall be installed in the conduit.

Exception No. 1: The equipment grounding conductor shall be permitted to be run separately from the circuit conductors as permitted in 250.134, Exception No. 2, for dc circuits and 250.134, Exception No. 1, for separately run equipment grounding conductors.

Exception No. 2: The equipment grounding conductor shall not be required where the grounded conductor is used to ground equipment as permitted in 250.142.

Statement of Problem and Substantiation for Public Input

There are 23 sections in Chapter 3 that have a .60 section. 19 of these sections are titled "Grounding." 3 of these sections are titled "Grounding and Bonding." 1 of these sections is titled "Equipment Grounding Conductor."
My suggestion is to rename all of these sections with "Grounding and Bonding."

Also, "of the wire type" was added to "equipment grounding conductor" for consistency

Submitter Information Verification

Submitter Full Name: Eric Stromberg
Organization: Los Alamos National Laboratory
Affiliation: Self
Street Address:
City:
State:
Zip:
Submittal Date: Mon Sep 04 19:47:43 EDT 2023
Committee: NEC-P08

Committee Statement

Resolution: FR-7570-NFPA 70-2024

Statement: Section 250.118 does not permit non-conductive raceways to be used as an equipment grounding conductor (EGC). The requirements for having a wire type equipment grounding conductor complying with Article 250 Part VI for this wiring method is already provided in other parts of this Code.

Section 250.118 for permitted EGCs does not reference nonmetallic wiring methods and only allows metal raceways, cable tray, and similar metal wiring methods to be used as equipment grounding conductors. The xxx.60 section for this article is being removed to eliminate any confusion for installing an equipment grounding conductor with this non-metallic wiring method. Changing the title in this section and adding ‘of the wire type’ does not add clarity.

Public Input No. 689-NFPA 70-2023 [Section No. 352.60]

352.60 Grounding.

Where equipment grounding is required, ~~separate~~ an equipment grounding conductor shall be installed in the conduit.

Exception No. 1: The equipment grounding conductor shall be permitted to be run separately from the circuit conductors as permitted in 250.134, Exception No. 2, for dc circuits and 250.134, Exception No. 1, for separately run equipment grounding conductors.

Exception No. 2: The equipment grounding conductor shall not be required where the grounded conductor is used to ground equipment as permitted in 250.142.

Statement of Problem and Substantiation for Public Input

The term "grounding conductor" has not been used in the NEC for over a decade. It was deleted because it had no value and the NEC does not indicate how to install it, size it, or protect it...because there is no such term.

Related Public Inputs for This Document

Related Input	Relationship
Public Input No. 690-NFPA 70-2023 [Section No. 353.60]	
Public Input No. 692-NFPA 70-2023 [Section No. 354.60]	
Public Input No. 693-NFPA 70-2023 [Section No. 355.60]	
Public Input No. 694-NFPA 70-2023 [Section No. 356.60]	
Public Input No. 695-NFPA 70-2023 [Section No. 362.60]	
Public Input No. 696-NFPA 70-2023 [Section No. 378.60]	
Public Input No. 697-NFPA 70-2023 [Section No. 388.60]	

Submitter Information Verification

Submitter Full Name: Ryan Jackson
Organization: Self-employed
Affiliation: Steel Tube Institute
Street Address:
City:
State:
Zip:
Submittal Date: Thu Apr 20 15:18:51 EDT 2023
Committee: NEC-P08

Committee Statement

Resolution: FR-7570-NFPA 70-2024

Statement: Section 250.118 does not permit non-conductive raceways to be used as an equipment grounding conductor (EGC). The requirements for having a wire type equipment grounding conductor complying with Article 250 Part VI for this wiring method is already

provided in other parts of this Code.

Section 250.118 for permitted EGCs does not reference nonmetallic wiring methods and only allows metal raceways, cable tray, and similar metal wiring methods to be used as equipment grounding conductors. The xxx.60 section for this article is being removed to eliminate any confusion for installing an equipment grounding conductor with this non-metallic wiring method. Changing the title in this section and adding ‘of the wire type’ does not add clarity.

Public Input No. 602-NFPA 70-2023 [New Section after 353.1]

353.2 Reconditioned Equipment

HDPE conduit shall not be reconditioned

Statement of Problem and Substantiation for Public Input

Cables, Raceways, Conduits, and Tubings are not permitted to be reconditioned per the NEMA Technical Position on Reconditioned Equipment (NEMA CS 100-2020, Appendix B.1)

Related Public Inputs for This Document

Related Input	Relationship
Public Input No. 614-NFPA 70-2023 [New Section after 340.1]	
Public Input No. 624-NFPA 70-2023 [New Section after 388.1]	

Submitter Information Verification

Submitter Full Name: Russ Leblanc

Organization: Leblanc Consulting Services

Street Address:

City:

State:

Zip:

Submittal Date: Sun Apr 16 07:59:02 EDT 2023

Committee: NEC-P08

Committee Statement

Resolution: FR-7640-NFPA 70-2024

Statement: The panel is not aware of any established programs that provide an acceptable approach to reconditioning for this type of equipment and maintain its listing. Section 110.20 indicates that equipment is permitted to be reconditioned unless otherwise prohibited.

Public Input No. 2897-NFPA 70-2023 [Section No. 353.6]

353.~~6~~ 2 Listing Requirements.

HDPE conduit ~~and associated fittings shall~~ , associated fittings and support hardware shall be listed.

Statement of Problem and Substantiation for Public Input

To avoid damage to HDPE conduit and undue stress on electrical connections, the use of listed hardware for the support of HDPE conduit is necessary e.g. duct bank supports (templates) used in trenches. UL 2239, the Standard for Safety for Hardware for the Support of Conduit, Tubing, and Cable, was first published nearly 20 years ago and contains all necessary construction, performance, marking and installation instructions necessary to provide installers the guidance to properly support HDPE conduit using hardware, specifically duct bank supports, installed per the manufacturers' installation instructions.

Additionally, per the 2023 NEC style manual, clause 2.2.1, "Required Parallel Numbering Format" Listing requirements should be relocated from 353.6 to 353.2.

Submitter Information Verification

Submitter Full Name:	David Gerstetter
Organization:	Ul Solutions
Affiliation:	UL Solutions
Street Address:	
City:	
State:	
Zip:	
Submittal Date:	Fri Aug 25 23:11:21 EDT 2023
Committee:	NEC-P08

Committee Statement

Resolution: No safety issues with unlisted support and securement hardware have been identified to justify the listing requirement.

Public Input No. 3521-NFPA 70-2023 [Section No. 353.6]

~~353.6~~ 2 Listing Requirements.

HDPE conduit and associated fittings shall be listed.

Statement of Problem and Substantiation for Public Input

This Public Input is being submitted on behalf of the NEC Correlating Committee Usability Task Group in order to provide correlation throughout the document. A new section is added to comply with the NEC Style Manual Section 2.2.1 regarding Listing Requirements.
2.2.1 Parallel Numbering Required. Technical committees shall use the following section numbers for the same purposes within articles. This requirement shall not apply to Articles 90, 100, and 110. If the article does not contain listing or reconditioning requirements, the subdivisions shall not be included in the article.
Required Parallel Numbering Format
XXX.1 Scope.
XXX.2 Listing Requirements.
XXX.3 Reconditioned Equipment.
XXX.3(A) Permitted to be Installed.
XXX.3(B) Not Permitted to be Installed.
The Usability Task Group members are: Derrick Atkins, David Hittinger, Richard Holub, Dean Hunter, Chad Kennedy and David Williams.

Submitter Information Verification

Submitter Full Name: David Williams
Organization: Delta Charter Township
Street Address:
City:
State:
Zip:

Submittal Date: Mon Sep 04 17:36:35 EDT 2023
Committee: NEC-P08

Committee Statement

Resolution: FR-7588-NFPA 70-2024
Statement: Renumbered to comply with the NEC Style Manual Section 2.2.1 regarding Listing Requirements.

Public Input No. 430-NFPA 70-2023 [Section No. 353.20(B)]

(B) Maximum.

~~HDPE conduit~~
HDPE conduit larger than metric designator 155 (trade size 6) shall not be used.

~~Informational Note: See~~

Exception: Listed conduit not exceeding metric designator 205 (trade size 8) shall be permitted where all of the following conditions are met:

(1) the voltage between ungrounded conductors is greater than 2,000 V ac, nominal

(2) is used between underground vaults or manholes used for pulling and of which no part of the conduit is installed aboveground

(3) is used with listed factory elbows

(4) is located where it does not pass through or enter, a Class I, or Zone 0, 1, or 2 hazardous (classified) location

(5) contains no fittings other than listed nonmetallic bell ends, couplings, adapters, insulating bushings, or metallic couplings

Informational Note: See 300.1(C) for ~~the~~ trade sizes and metric designators ~~that~~ are for identification purposes only and ~~do not relate to actual~~ are not actual dimensions.

Statement of Problem and Substantiation for Public Input

Limiting HDPE to trade sizes 6" max. is overly restrictive for medium voltage circuits such as 34.5 kV. Utility companies use 8" HDPE conduit underground extensively. Adding this exception would permit conduit manufacturers to pursue a NRTL listing for HDPE conduit sizes up to 8" trade size which is already being manufactured and marketed. It would only be applicable for underground applications in areas that do not contain hazardous vapors or gases, so it doesn't open up possibilities for 8" conduit bodies or other conduit fittings such as explosion proof conduit seals, LB's, T's, etc., normally used in aboveground installations. It is limited to HDPE and PVC due to the lack of commercially available field threading dies and conduit benders. It is also limited to listed factory elbows only so hot boxes or heat guns in the field will not be used.
This is a companion proposal to one for PVC..

Related Public Inputs for This Document

Related Input	Relationship
Public Input No. 429-NFPA 70-2023 [Section No. 352.20(B)]	8" conduit
Public Input No. 1856-NFPA 70-2023 [Section No. 342.20(B)]	8" conduit
Public Input No. 1857-NFPA 70-2023 [Section No. 344.20(B)]	8" conduit
Public Input No. 1859-NFPA 70-2023 [Section No. 355.20(B)]	8" conduit
Public Input No. 1862-NFPA 70-2023 [Section No. 300.1(C)]	
Public Input No. 429-NFPA 70-2023 [Section No. 352.20(B)]	
Public Input No. 1856-NFPA 70-2023 [Section No. 342.20(B)]	
Public Input No. 1857-NFPA 70-2023 [Section No. 344.20(B)]	

Public Input No. 1859-NFPA 70-2023 [Section No. 355.20(B)]
Public Input No. 1862-NFPA 70-2023 [Section No. 300.1(C)]
Public Input No. 1875-NFPA 70-2023 [Section No. Table]

Submitter Information Verification

Submitter Full Name: Paul Guidry
Organization: Fluor Corp.
Affiliation: Associated Contractors and Builders
Street Address:
City:
State:
Zip:
Submittal Date: Sun Mar 05 09:34:49 EST 2023
Committee: NEC-P08

Committee Statement

Resolution: FR-7590-NFPA 70-2024

Statement: Adding an exception to the .20(B)'s simply to permit trade sizes greater than 6 for underground use is a step forward for the code and would introduce the allowance for larger trade sizes of listed conduit, elbows and fittings. The conditions listed allow for trade sizes larger than 6 because these conditions are not established elsewhere in the code.

A Nationally Recognized Testing Laboratory can develop certification requirements rather quickly for the larger trade size conduits that manufacturers are already producing and installing. The limitations of the installation code upon those larger trade size conduits e.g. underground use only, conductor fill will have to be generated. For example, for underground use only eliminates the need for support distance spacing data having to be generated.

Public Input No. 144-NFPA 70-2023 [Section No. 353.60]

~~**353.60** Grounding.~~

~~Where equipment grounding is required, a separate grounding conductor shall be installed in the conduit.~~

~~*Exception No. 1: The equipment grounding conductor shall be permitted to be run separately from the conduit where used for grounding dc circuits as permitted in 250.134 , Exception No. 2.*~~

~~*Exception No. 2: The equipment grounding conductor shall not be required where the grounded conductor is used to ground equipment as permitted in 250.142 .*~~

Statement of Problem and Substantiation for Public Input

Grounding and bonding requirements belong in Article 250. It makes absolutely no sense to have grounding requirements in Article about a nonmetallic wiring method that provides no grounding or bonding. Article 250 adequately covers grounding and bonding methods. This requirement is superfluous, incomplete and may cause conflicts with Article 250 requirements.

Related Public Inputs for This Document

Related Input	Relationship
Public Input No. 143-NFPA 70-2023 [Section No. 352.60]	grounding belongs in Article 250
Public Input No. 145-NFPA 70-2023 [Section No. 354.60]	
Public Input No. 146-NFPA 70-2023 [Section No. 355.60]	
Public Input No. 147-NFPA 70-2023 [Section No. 356.60]	
Public Input No. 148-NFPA 70-2023 [Section No. 362.60]	
Public Input No. 149-NFPA 70-2023 [Section No. 378.60]	
Public Input No. 150-NFPA 70-2023 [Section No. 388.60]	

Submitter Information Verification

Submitter Full Name: Russ Leblanc
Organization: Leblanc Consulting Services
Street Address:
City:
State:
Zip:
Submittal Date: Thu Jan 12 08:28:48 EST 2023
Committee: NEC-P08

Committee Statement

Resolution: FR-7572-NFPA 70-2024

Statement: Section 250.118 does not permit non-conductive raceways to be used as an equipment grounding conductor (EGC). The requirements for having a wire type equipment grounding conductor complying with Article 250 Part VI for this wiring method is already

provided in other parts of this Code.

Section 250.118 for permitted EGCs does not reference nonmetallic wiring methods and only allows metal raceways, cable tray, and similar metal wiring methods to be used as equipment grounding conductors. The xxx.60 section for this article is being removed to eliminate any confusion for installing an equipment grounding conductor with this non-metallic wiring method. Changing the title in this section and adding ‘of the wire type’ does not add clarity.

Public Input No. 2820-NFPA 70-2023 [Section No. 353.60]

353.~~60~~ 60 Equipment Grounding Conductor .

Where equipment grounding is required, a separate grounding conductor shall be installed in the conduit.

Exception No. 1: The equipment grounding conductor shall be permitted to be run separately from the conduit where used for grounding dc circuits as permitted in 250.134, Exception No. 2.

Exception No. 2: The equipment grounding conductor shall not be required where the grounded conductor is used to ground equipment as permitted in 250.142.

Statement of Problem and Substantiation for Public Input

The section title must be revised to match the technical requirement. In accordance with NEC style manual section 2.1.3.2 the title must be descriptive and concise with the intent of the requirement. See 215.6 Feeder Equipment Grounding Conductor, 320.108 Equipment Grounding Conductor, 330.108 Equipment Grounding Conductor, 334.108 Equipment Grounding Conductor, 410.182 Equipment Grounding Conductor, 547.27 Separate Equipment Grounding Conductor, 555.37 Equipment Grounding Conductor, and 690.45 Size of Equipment Grounding Conductors.

Submitter Information Verification

Submitter Full Name: Mike Holt

Organization: Mike Holt Enterprises Inc

Street Address:

City:

State:

Zip:

Submittal Date: Fri Aug 25 14:09:17 EDT 2023

Committee: NEC-P08

Committee Statement

Resolution: FR-7572-NFPA 70-2024

Statement: Section 250.118 does not permit non-conductive raceways to be used as an equipment grounding conductor (EGC). The requirements for having a wire type equipment grounding conductor complying with Article 250 Part VI for this wiring method is already provided in other parts of this Code.

Section 250.118 for permitted EGCs does not reference nonmetallic wiring methods and only allows metal raceways, cable tray, and similar metal wiring methods to be used as equipment grounding conductors. The xxx.60 section for this article is being removed to eliminate any confusion for installing an equipment grounding conductor with this non-metallic wiring method. Changing the title in this section and adding 'of the wire type' does not add clarity.

Public Input No. 3566-NFPA 70-2023 [Section No. 353.60]

353.60 Grounding and Bonding .

Where equipment grounding is required, a separate equipment grounding conductor of the wire type shall be installed in the conduit.

Exception No. 1: The equipment grounding conductor shall be permitted to be run separately from the conduit where used for grounding dc circuits as permitted in 250.134, Exception No. 2.

Exception No. 2: The equipment grounding conductor shall not be required where the grounded conductor is used to ground equipment as permitted in 250.142.

Statement of Problem and Substantiation for Public Input

There are 23 sections in Chapter 3 that have a .60 section. 19 of these sections are titled "Grounding." 3 of these sections are titled "Grounding and Bonding." 1 of these sections is titled "Equipment Grounding Conductor."
My suggestion is to rename all of these sections with "Grounding and Bonding."

Also, added "of the wire type" for consistency

Submitter Information Verification

Submitter Full Name: Eric Stromberg
Organization: Los Alamos National Laboratory
Affiliation: Self
Street Address:
City:
State:
Zip:

Submittal Date: Mon Sep 04 19:52:18 EDT 2023
Committee: NEC-P08

Committee Statement

Resolution: FR-7572-NFPA 70-2024

Statement: Section 250.118 does not permit non-conductive raceways to be used as an equipment grounding conductor (EGC). The requirements for having a wire type equipment grounding conductor complying with Article 250 Part VI for this wiring method is already provided in other parts of this Code.

Section 250.118 for permitted EGCs does not reference nonmetallic wiring methods and only allows metal raceways, cable tray, and similar metal wiring methods to be used as equipment grounding conductors. The xxx.60 section for this article is being removed to eliminate any confusion for installing an equipment grounding conductor with this non-metallic wiring method. Changing the title in this section and adding ‘of the wire type’ does not add clarity.

Public Input No. 690-NFPA 70-2023 [Section No. 353.60]

353.60 Grounding.

Where equipment grounding is required, ~~a separate~~ an equipment grounding conductor shall be installed in the conduit.

Exception No. 1: The equipment grounding conductor shall be permitted to be run separately from the conduit where used for grounding dc circuits as permitted in 250.134, Exception No. 2.

Exception No. 2: The equipment grounding conductor shall not be required where the grounded conductor is used to ground equipment as permitted in 250.142.

Statement of Problem and Substantiation for Public Input

The term "grounding conductor" has not been used in the NEC for over a decade. It was deleted because it had no value and the NEC does not indicate how to install it, size it, or protect it...because there is no such term.

Related Public Inputs for This Document

Related Input	Relationship
Public Input No. 689-NFPA 70-2023 [Section No. 352.60]	Same issue
Public Input No. 692-NFPA 70-2023 [Section No. 354.60]	
Public Input No. 693-NFPA 70-2023 [Section No. 355.60]	
Public Input No. 694-NFPA 70-2023 [Section No. 356.60]	
Public Input No. 695-NFPA 70-2023 [Section No. 362.60]	
Public Input No. 696-NFPA 70-2023 [Section No. 378.60]	
Public Input No. 697-NFPA 70-2023 [Section No. 388.60]	

Submitter Information Verification

Submitter Full Name:	Ryan Jackson
Organization:	Self-employed
Affiliation:	Steel Tube Institute
Street Address:	
City:	
State:	
Zip:	
Submittal Date:	Thu Apr 20 15:22:21 EDT 2023
Committee:	NEC-P08

Committee Statement

Resolution: FR-7572-NFPA 70-2024

Statement: Section 250.118 does not permit non-conductive raceways to be used as an equipment grounding conductor (EGC). The requirements for having a wire type equipment grounding conductor complying with Article 250 Part VI for this wiring method is already

provided in other parts of this Code.

Section 250.118 for permitted EGCs does not reference nonmetallic wiring methods and only allows metal raceways, cable tray, and similar metal wiring methods to be used as equipment grounding conductors. The xxx.60 section for this article is being removed to eliminate any confusion for installing an equipment grounding conductor with this non-metallic wiring method. Changing the title in this section and adding ‘of the wire type’ does not add clarity.

Public Input No. 601-NFPA 70-2023 [New Section after 354.1]

354.2 Reconditioned Equipment

NUCC shall not be reconditioned

Statement of Problem and Substantiation for Public Input

Cables, Raceways, Conduits, and Tubings are not permitted to be reconditioned per the NEMA Technical Position on Reconditioned Equipment (NEMA CS 100-2020, Appendix B.1)

Related Public Inputs for This Document

Related Input	Relationship
Public Input No. 614-NFPA 70-2023 [New Section after 340.1]	
Public Input No. 624-NFPA 70-2023 [New Section after 388.1]	

Submitter Information Verification

Submitter Full Name: Russ Leblanc
Organization: Leblanc Consulting Services
Street Address:
City:
State:
Zip:
Submittal Date: Sun Apr 16 07:56:21 EDT 2023
Committee: NEC-P08

Committee Statement

Resolution: FR-7594-NFPA 70-2024

Statement: The panel is not aware of any established programs that provide an acceptable approach to reconditioning for this type of equipment and maintain its listing. Section 110.20 indicates that equipment is permitted to be reconditioned unless otherwise prohibited.

Public Input No. 2898-NFPA 70-2023 [Section No. 354.6]

354.~~6~~ 2 Listing Requirements.

NUCC ~~and associated fittings shall~~ , associated fittings and support hardware shall be listed.

Statement of Problem and Substantiation for Public Input

To avoid damage to NUCC and undue stress on electrical connections, the use of listed hardware for support of NUCC is necessary e.g. duct bank supports (templates).used in trenches UL 2239, the Standard for Safety for Hardware for the Support of Conduit, Tubing, and Cable, was first published nearly 20 years ago and contains all necessary hardware construction, performance, marking and installation instructions necessary to provide installers the guidance to properly support and secure NUCC using hardware installed per the manufacturers' installation instructions.

Additionally, per the 2023 NEC style manual, clause 2.2.1, "Required Parallel Numbering Format" Listing requirements should be relocated from 354.6 to 354.2.

Submitter Information Verification

Submitter Full Name: David Gerstetter

Organization: Ul Solutions

Affiliation: UL Solutions

Street Address:

City:

State:

Zip:

Submittal Date: Fri Aug 25 23:18:50 EDT 2023

Committee: NEC-P08

Committee Statement

Resolution: No safety issue has been identified to justify the listing of support and securement hardware.

Public Input No. 3522-NFPA 70-2023 [Section No. 354.6]

354.~~6~~ 2 Listing Requirements.

NUCC and associated fittings shall be listed.

Statement of Problem and Substantiation for Public Input

This Public Input is being submitted on behalf of the NEC Correlating Committee Usability Task Group in order to provide correlation throughout the document. A new section is added to comply with the NEC Style Manual Section 2.2.1 regarding Listing Requirements.
2.2.1 Parallel Numbering Required. Technical committees shall use the following section numbers for the same purposes within articles. This requirement shall not apply to Articles 90, 100, and 110. If the article does not contain listing or reconditioning requirements, the subdivisions shall not be included in the article.
Required Parallel Numbering Format
XXX.1 Scope.
XXX.2 Listing Requirements.
XXX.3 Reconditioned Equipment.
XXX.3(A) Permitted to be Installed.
XXX.3(B) Not Permitted to be Installed.
The Usability Task Group members are: Derrick Atkins, David Hittinger, Richard Holub, Dean Hunter, Chad Kennedy and David Williams.

Submitter Information Verification

Submitter Full Name: David Williams
Organization: Delta Charter Township
Street Address:
City:
State:
Zip:

Submittal Date: Mon Sep 04 17:37:15 EDT 2023
Committee: NEC-P08

Committee Statement

Resolution: FR-7597-NFPA 70-2024

Statement: Per the 2023 NEC Style Manual, clause 2.2.1, “Required Parallel Numbering Format” Listing requirements is relocated from 354.6 to 354.2.

Public Input No. 691-NFPA 70-2023 [Section No. 354.10]

354.10 Uses Permitted.

The use of NUCC and fittings shall be permitted in the following:

(1) For direct burial underground- ~~installation (For minimum cover requirements, see Table 300.5(A) and Table 305.15(A) .)~~

(2) Encased or embedded in concrete

(3) In cinder fill

(4) In underground locations subject to severe corrosive influences as covered in 300.6 and where subject to chemicals for which the assembly is specifically approved

(5) Above ground, except as prohibited in 354.12, where encased in not less than 50 mm (2 in.) of concrete

Statement of Problem and Substantiation for Public Input

Other raceway articles do not point to which column of 300.5 the user needs to read, why should this one? It is obviously the "nonmetallic" column, considering that the word "nonmetallic" is the first word in the title of this wiring method.

Submitter Information Verification

Submitter Full Name: Ryan Jackson
Organization: Self-employed
Street Address:
City:
State:
Zip:
Submittal Date: Thu Apr 20 15:23:51 EDT 2023
Committee: NEC-P08

Committee Statement

Resolution: Removal of reference to the Tables is not warranted. They include required burial depths.

Public Input No. 145-NFPA 70-2023 [Section No. 354.60]

~~**354.60** Grounding.~~

~~Where equipment grounding is required, an assembly containing a separate grounding conductor shall be used.~~

~~*Exception No. 1: The equipment grounding conductor shall be permitted to be run separately from the conduit where used for grounding dc circuits as permitted in 250.134, Exception No. 2.*~~

~~*Exception No. 2: The equipment grounding conductor shall not be required where the grounded conductor is used to ground equipment as permitted in 250.142.*~~

Statement of Problem and Substantiation for Public Input

Grounding and bonding requirements belong in Article 250. It makes absolutely no sense to have grounding requirements in Article about a nonmetallic wiring method that provides no grounding or bonding. Article 250 adequately covers grounding and bonding methods. This requirement is superfluous, incomplete and may cause conflicts with Article 250 requirements.

Related Public Inputs for This Document

Related Input	Relationship
Public Input No. 144-NFPA 70-2023 [Section No. 353.60]	Grounding belongs in 250
Public Input No. 143-NFPA 70-2023 [Section No. 352.60]	Grounding belongs in 250
Public Input No. 146-NFPA 70-2023 [Section No. 355.60]	
Public Input No. 147-NFPA 70-2023 [Section No. 356.60]	
Public Input No. 148-NFPA 70-2023 [Section No. 362.60]	
Public Input No. 149-NFPA 70-2023 [Section No. 378.60]	
Public Input No. 150-NFPA 70-2023 [Section No. 388.60]	

Submitter Information Verification

Submitter Full Name: Russ Leblanc
Organization: Leblanc Consulting Services
Street Address:
City:
State:
Zip:

Submittal Date: Thu Jan 12 08:30:56 EST 2023
Committee: NEC-P08

Committee Statement

Resolution: FR-7574-NFPA 70-2024

Statement: Section 250.118 does not permit non-conductive raceways to be used as an equipment grounding conductor (EGC). The requirements for having a wire type equipment grounding conductor complying with Article 250 Part VI for this wiring method is already

provided in other parts of this Code.

Section 250.118 for permitted EGCs does not reference nonmetallic wiring methods and only allows metal raceways, cable tray, and similar metal wiring methods to be used as equipment grounding conductors. The xxx.60 section for this article is being removed to eliminate any confusion for installing an equipment grounding conductor with this non-metallic wiring method. Changing the title in this section and adding ‘of the wire type’ does not add clarity.

Public Input No. 2821-NFPA 70-2023 [Section No. 354.60]

354.~~60~~ 60 Equipment Grounding Conductor .

Where equipment grounding is required, an assembly containing a separate grounding conductor shall be used.

Exception No. 1: The equipment grounding conductor shall be permitted to be run separately from the conduit where used for grounding dc circuits as permitted in 250.134, Exception No. 2.

Exception No. 2: The equipment grounding conductor shall not be required where the grounded conductor is used to ground equipment as permitted in 250.142.

Statement of Problem and Substantiation for Public Input

The section title must be revised to match the technical requirement. In accordance with NEC style manual section 2.1.3.2 the title must be descriptive and concise with the intent of the requirement. See 215.6 Feeder Equipment Grounding Conductor, 320.108 Equipment Grounding Conductor, 330.108 Equipment Grounding Conductor, 334.108 Equipment Grounding Conductor, 410.182 Equipment Grounding Conductor, 547.27 Separate Equipment Grounding Conductor, 555.37 Equipment Grounding Conductor, and 690.45 Size of Equipment Grounding Conductors.

Submitter Information Verification

Submitter Full Name: Mike Holt

Organization: Mike Holt Enterprises Inc

Street Address:

City:

State:

Zip:

Submittal Date: Fri Aug 25 14:10:55 EDT 2023

Committee: NEC-P08

Committee Statement

Resolution: FR-7574-NFPA 70-2024

Statement: Section 250.118 does not permit non-conductive raceways to be used as an equipment grounding conductor (EGC). The requirements for having a wire type equipment grounding conductor complying with Article 250 Part VI for this wiring method is already provided in other parts of this Code.

Section 250.118 for permitted EGCs does not reference nonmetallic wiring methods and only allows metal raceways, cable tray, and similar metal wiring methods to be used as equipment grounding conductors. The xxx.60 section for this article is being removed to eliminate any confusion for installing an equipment grounding conductor with this non-metallic wiring method. Changing the title in this section and adding ‘of the wire type’ does not add clarity.

Public Input No. 692-NFPA 70-2023 [Section No. 354.60]

354.60 Grounding.

Where equipment grounding is required, an assembly containing ~~a separate~~ an equipment grounding conductor shall be used.

Exception No. 1: The equipment grounding conductor shall be permitted to be run separately from the conduit where used for grounding dc circuits as permitted in 250.134, Exception No. 2.

Exception No. 2: The equipment grounding conductor shall not be required where the grounded conductor is used to ground equipment as permitted in 250.142.

Statement of Problem and Substantiation for Public Input

The term "grounding conductor" has not been used in the NEC for over a decade. It was deleted because it had no value and the NEC does not indicate how to install it, size it, or protect it...because there is no such term.

Related Public Inputs for This Document

Related Input	Relationship
Public Input No. 690-NFPA 70-2023 [Section No. 353.60]	Same issue
Public Input No. 689-NFPA 70-2023 [Section No. 352.60]	Same issue
Public Input No. 693-NFPA 70-2023 [Section No. 355.60]	
Public Input No. 694-NFPA 70-2023 [Section No. 356.60]	
Public Input No. 695-NFPA 70-2023 [Section No. 362.60]	
Public Input No. 696-NFPA 70-2023 [Section No. 378.60]	
Public Input No. 697-NFPA 70-2023 [Section No. 388.60]	

Submitter Information Verification

Submitter Full Name: Ryan Jackson
Organization: Self-employed
Affiliation: Steel Tube Institute
Street Address:
City:
State:
Zip:

Submittal Date: Thu Apr 20 15:25:30 EDT 2023
Committee: NEC-P08

Committee Statement

Resolution: FR-7574-NFPA 70-2024

Statement: Section 250.118 does not permit non-conductive raceways to be used as an equipment grounding conductor (EGC). The requirements for having a wire type equipment grounding conductor complying with Article 250 Part VI for this wiring method is already

provided in other parts of this Code.

Section 250.118 for permitted EGCs does not reference nonmetallic wiring methods and only allows metal raceways, cable tray, and similar metal wiring methods to be used as equipment grounding conductors. The xxx.60 section for this article is being removed to eliminate any confusion for installing an equipment grounding conductor with this non-metallic wiring method. Changing the title in this section and adding ‘of the wire type’ does not add clarity.

Public Input No. 603-NFPA 70-2023 [New Section after 355.1]

355.2 Reconditioned Equipment

RTRC Conduit shall not be reconditioned

Statement of Problem and Substantiation for Public Input

Cables, Raceways, Conduits, and Tubings are not permitted to be reconditioned per the NEMA Technical Position on Reconditioned Equipment (NEMA CS 100-2020, Appendix B.1)

Related Public Inputs for This Document

Related Input	Relationship
Public Input No. 614-NFPA 70-2023 [New Section after 340.1]	
Public Input No. 624-NFPA 70-2023 [New Section after 388.1]	

Submitter Information Verification

Submitter Full Name: Russ Leblanc
Organization: Leblanc Consulting Services
Street Address:
City:
State:
Zip:
Submittal Date: Sun Apr 16 08:00:43 EDT 2023
Committee: NEC-P08

Committee Statement

Resolution: FR-7600-NFPA 70-2024

Statement: The panel is not aware of any established programs that provide an acceptable approach to reconditioning for this type of equipment and maintain its listing. Section 110.20 indicates that equipment is permitted to be reconditioned unless otherwise prohibited.

Public Input No. 2899-NFPA 70-2023 [Section No. 355.6]

355.~~6~~ 2 Listing Requirements.

RTRC, factory elbows, ~~and~~ associated fittings ~~shall~~ and support and securement hardware shall be listed.

Statement of Problem and Substantiation for Public Input

To avoid damage to RTRC and undue stress on electrical connections, the use of listed hardware for securement and support of RTRC is necessary. UL 2239, the Standard for Safety for Hardware for the Support of Conduit, Tubing, and Cable, was first published nearly 20 years ago and contains all necessary hardware construction, performance, marking and installation instructions necessary to provide installers the guidance to properly support and secure RTRC using hardware installed per the manufacturers' installation instructions.

Additionally, per the 2023 NEC style manual, clause 2.2.1, "Required Parallel Numbering Format" Listing requirements should be relocated from 355.6 to 355.2.

Submitter Information Verification

Submitter Full Name: David Gerstetter

Organization: Ul Solutions

Affiliation: UL Solutions

Street Address:

City:

State:

Zip:

Submittal Date: Fri Aug 25 23:36:37 EDT 2023

Committee: NEC-P08

Committee Statement

Resolution: No safety issue has been identified to justify the listing of support and securement hardware.

Public Input No. 3523-NFPA 70-2023 [Section No. 355.6]

~~355.6~~ 2 Listing Requirements.

RTRC, factory elbows, and associated fittings shall be listed.

Statement of Problem and Substantiation for Public Input

This Public Input is being submitted on behalf of the NEC Correlating Committee Usability Task Group in order to provide correlation throughout the document. A new section is added to comply with the NEC Style Manual Section 2.2.1 regarding Listing Requirements.
2.2.1 Parallel Numbering Required. Technical committees shall use the following section numbers for the same purposes within articles. This requirement shall not apply to Articles 90, 100, and 110. If the article does not contain listing or reconditioning requirements, the subdivisions shall not be included in the article.
Required Parallel Numbering Format
XXX.1 Scope.
XXX.2 Listing Requirements.
XXX.3 Reconditioned Equipment.
XXX.3(A) Permitted to be Installed.
XXX.3(B) Not Permitted to be Installed.
The Usability Task Group members are: Derrick Atkins, David Hittinger, Richard Holub, Dean Hunter, Chad Kennedy and David Williams.

Submitter Information Verification

Submitter Full Name:	David Williams
Organization:	Delta Charter Township
Street Address:	
City:	
State:	
Zip:	
Submittal Date:	Mon Sep 04 17:37:58 EDT 2023
Committee:	NEC-P08

Committee Statement

Resolution: FR-7602-NFPA 70-2024

Statement: Renumbered to comply with the NEC Style Manual Section 2.2.1 regarding Listing Requirements.

Public Input No. 1859-NFPA 70-2023 [Section No. 355.20(B)]

(B) Maximum.

RTRC larger than metric designator 155 (trade size 6) shall not be used.

Exception: Listed conduit not exceeding metric designator 205 (trade size 8) shall be permitted where all of the following conditions are met:

(1) the voltage between ungrounded conductors is greater than 2,000 V ac, nominal

(2) is used between underground vaults or manholes used for pulling and of which no part of the conduit is installed aboveground

(3) is used with listed factory elbows

(4) is located where it does not pass through or enter, a Class I, or Zone 0, 1, or 2 hazardous (classified) location

(5) contains no fittings other than listed nonmetallic bell ends, couplings, adapters, insulating bushings, or metallic couplings

Informational Note: See 300.1(C) for the trade sizes and metric designators that are for identification purposes only and do not relate to actual dimensions.

Statement of Problem and Substantiation for Public Input

Limiting conduit to trade sizes 6" max. is restrictive for medium voltage circuits such as 34.5 kV. Utility companies use 8" conduit underground as indicated by one of the major suppliers of cable as indicated in their cable catalog.
Adding this exception would permit RTRC manufacturers to pursue an NRTL listing for 8" trade size for use with medium and high voltage applications which is already being manufactured and marketed. It would only be applicable for underground applications in areas that do not contain hazardous vapors or gases where it doesn't have to terminate aboveground in enclosures. This eliminates the need for 8" conduit bodies or other conduit fittings such as explosion-proof conduit seals, locknuts, cable glands, LBs, T's, etc., normally used in aboveground installations. It is limited to listed conduit and factory elbows of types PVC, HDPE, RTRC, RMC, and IMC due to the issues with bending conduits of this size in the field.

Related Public Inputs for This Document

Related Input	Relationship
Public Input No. 1856-NFPA 70-2023 [Section No. 342.20(B)]	8" conduit
Public Input No. 1857-NFPA 70-2023 [Section No. 344.20(B)]	8" conduit
Public Input No. 429-NFPA 70-2023 [Section No. 352.20(B)]	8" conduit
Public Input No. 430-NFPA 70-2023 [Section No. 353.20(B)]	8" conduit
Public Input No. 430-NFPA 70-2023 [Section No. 353.20(B)]	
Public Input No. 1856-NFPA 70-2023 [Section No. 342.20(B)]	
Public Input No. 1857-NFPA 70-2023 [Section No. 344.20(B)]	
Public Input No. 1862-NFPA 70-2023 [Section No. 300.1(C)]	
Public Input No. 1875-NFPA 70-2023 [Section No. Table]	

Submitter Information Verification

Submitter Full Name: Paul Guidry
Organization: Fluor Enterprises, Inc.
Affiliation: Associated Builders and Contractors
Street Address:
City:
State:
Zip:
Submittal Date: Sun Aug 06 16:12:56 EDT 2023
Committee: NEC-P08

Committee Statement

Resolution: FR-7605-NFPA 70-2024

Statement: Adding an exception to the .20(B)'s simply to permit trade sizes greater than 6 for underground use is a step forward for the code and would introduce the allowance for larger trade sizes of listed conduit, elbows and fittings. The conditions listed allow for trade sizes larger than 6 because these conditions are not established elsewhere in the code.

A Nationally Recognized Testing Laboratory can develop certification requirements rather quickly for the larger trade size conduits that manufacturers are already producing and installing. The limitations of the installation code upon those larger trade size conduits e.g. underground use only, conductor fill will have to be generated. For example, for underground use only eliminates the need for support distance spacing data having to be generated.

Public Input No. 146-NFPA 70-2023 [Section No. 355.60]

~~**355.60** Grounding.~~

~~Where equipment grounding is required, a separate grounding conductor shall be installed in the conduit.~~

~~*Exception No. 1: The equipment grounding conductor shall be permitted to be run separately from the circuit conductors as permitted in 250.134 , Exception No. 2, for dc circuits and 250.134 , Exception No. 1, for separately run equipment grounding conductors.*~~

~~*Exception No. 2: An equipment grounding conductor shall not be required where the grounded conductor is used to ground equipment as in 250.142(A) .*~~

Statement of Problem and Substantiation for Public Input

Grounding and bonding requirements belong in Article 250. It makes absolutely no sense to have grounding requirements in Article about a nonmetallic wiring method that provides no grounding or bonding. Article 250 adequately covers grounding and bonding methods. This requirement is superfluous, incomplete and may cause conflicts with Article 250 requirements.

Related Public Inputs for This Document

Related Input	Relationship
Public Input No. 145-NFPA 70-2023 [Section No. 354.60]	Grounding belongs in 250
Public Input No. 144-NFPA 70-2023 [Section No. 353.60]	Grounding belongs in 250
Public Input No. 143-NFPA 70-2023 [Section No. 352.60]	Grounding belongs in 250
Public Input No. 147-NFPA 70-2023 [Section No. 356.60]	
Public Input No. 148-NFPA 70-2023 [Section No. 362.60]	
Public Input No. 149-NFPA 70-2023 [Section No. 378.60]	
Public Input No. 150-NFPA 70-2023 [Section No. 388.60]	

Submitter Information Verification

Submitter Full Name: Russ Leblanc
Organization: Leblanc Consulting Services
Street Address:
City:
State:
Zip:
Submittal Date: Thu Jan 12 08:33:06 EST 2023
Committee: NEC-P08

Committee Statement

Resolution: FR-7575-NFPA 70-2024

Statement: Section 250.118 does not permit non-conductive raceways to be used as an equipment grounding conductor (EGC). The requirements for having a wire type equipment grounding conductor complying with Article 250 Part VI for this wiring method is already

provided in other parts of this Code.

Section 250.118 for permitted EGCs does not reference nonmetallic wiring methods and only allows metal raceways, cable tray, and similar metal wiring methods to be used as equipment grounding conductors. The xxx.60 section for this article is being removed to eliminate any confusion for installing an equipment grounding conductor with this non-metallic wiring method. Changing the title in this section and adding ‘of the wire type’ does not add clarity.

Public Input No. 2822-NFPA 70-2023 [Section No. 355.60]

355.~~60~~ 60 Equipment Grounding Conductor .

Where equipment grounding is required, a separate grounding conductor shall be installed in the conduit.

Exception No. 1: The equipment grounding conductor shall be permitted to be run separately from the circuit conductors as permitted in 250.134, Exception No. 2, for dc circuits and 250.134, Exception No. 1, for separately run equipment grounding conductors.

Exception No. 2: An equipment grounding conductor shall not be required where the grounded conductor is used to ground equipment as in 250.142(A).

Statement of Problem and Substantiation for Public Input

The section title must be revised to match the technical requirement. In accordance with NEC style manual section 2.1.3.2 the title must be descriptive and concise with the intent of the requirement. See 215.6 Feeder Equipment Grounding Conductor, 320.108 Equipment Grounding Conductor, 330.108 Equipment Grounding Conductor, 334.108 Equipment Grounding Conductor, 410.182 Equipment Grounding Conductor, 547.27 Separate Equipment Grounding Conductor, 555.37 Equipment Grounding Conductor, and 690.45 Size of Equipment Grounding Conductors.

Submitter Information Verification

Submitter Full Name: Mike Holt

Organization: Mike Holt Enterprises Inc

Street Address:

City:

State:

Zip:

Submittal Date: Fri Aug 25 14:12:22 EDT 2023

Committee: NEC-P08

Committee Statement

Resolution: FR-7575-NFPA 70-2024

Statement: Section 250.118 does not permit non-conductive raceways to be used as an equipment grounding conductor (EGC). The requirements for having a wire type equipment grounding conductor complying with Article 250 Part VI for this wiring method is already provided in other parts of this Code.

Section 250.118 for permitted EGCs does not reference nonmetallic wiring methods and only allows metal raceways, cable tray, and similar metal wiring methods to be used as equipment grounding conductors. The xxx.60 section for this article is being removed to eliminate any confusion for installing an equipment grounding conductor with this non-metallic wiring method. Changing the title in this section and adding ‘of the wire type’ does not add clarity.

Public Input No. 3567-NFPA 70-2023 [Section No. 355.60]

355.60 Grounding and Bonding .

Where equipment grounding is required, a separate equipment grounding conductor of the wire type shall be installed in the conduit.

Exception No. 1: The equipment grounding conductor shall be permitted to be run separately from the circuit conductors as permitted in 250.134, Exception No. 2, for dc circuits and 250.134, Exception No. 1, for separately run equipment grounding conductors.

Exception No. 2: An equipment grounding conductor shall not be required where the grounded conductor is used to ground equipment as in 250.142(A).

Statement of Problem and Substantiation for Public Input

There are 23 sections in Chapter 3 that have a .60 section. 19 of these sections are titled "Grounding." 3 of these sections are titled "Grounding and Bonding." 1 of these sections is titled "Equipment Grounding Conductor."
My suggestion is to rename all of these sections with "Grounding and Bonding."

Also, added "of the wire type" for consistency

Submitter Information Verification

Submitter Full Name: Eric Stromberg

Organization: Los Alamos National Laboratory

Affiliation: Self

Street Address:

City:

State:

Zip:

Submittal Date: Mon Sep 04 19:54:47 EDT 2023

Committee: NEC-P08

Committee Statement

Resolution: FR-7575-NFPA 70-2024

Statement: Section 250.118 does not permit non-conductive raceways to be used as an equipment grounding conductor (EGC). The requirements for having a wire type equipment grounding conductor complying with Article 250 Part VI for this wiring method is already provided in other parts of this Code.

Section 250.118 for permitted EGCs does not reference nonmetallic wiring methods and only allows metal raceways, cable tray, and similar metal wiring methods to be used as equipment grounding conductors. The xxx.60 section for this article is being removed to eliminate any confusion for installing an equipment grounding conductor with this non-metallic wiring method. Changing the title in this section and adding ‘of the wire type’ does not add clarity.

Public Input No. 693-NFPA 70-2023 [Section No. 355.60]

355.60 Grounding.

Where equipment grounding is required, ~~a separate~~ an equipment grounding conductor shall be installed in the conduit.

Exception No. 1: The equipment grounding conductor shall be permitted to be run separately from the circuit conductors as permitted in 250.134, Exception No. 2, for dc circuits and 250.134, Exception No. 1, for separately run equipment grounding conductors.

Exception No. 2: An equipment grounding conductor shall not be required where the grounded conductor is used to ground equipment as in 250.142(A).

Statement of Problem and Substantiation for Public Input

The term "grounding conductor" has not been used in the NEC for over a decade. It was deleted because it had no value and the NEC does not indicate how to install it, size it, or protect it...because there is no such term.

Related Public Inputs for This Document

Related Input	Relationship
Public Input No. 689-NFPA 70-2023 [Section No. 352.60]	Same issue
Public Input No. 690-NFPA 70-2023 [Section No. 353.60]	Same issue
Public Input No. 692-NFPA 70-2023 [Section No. 354.60]	Same issue
Public Input No. 694-NFPA 70-2023 [Section No. 356.60]	
Public Input No. 695-NFPA 70-2023 [Section No. 362.60]	
Public Input No. 696-NFPA 70-2023 [Section No. 378.60]	
Public Input No. 697-NFPA 70-2023 [Section No. 388.60]	

Submitter Information Verification

Submitter Full Name: Ryan Jackson
Organization: Self-employed
Affiliation: Steel Tube Institute
Street Address:
City:
State:
Zip:
Submittal Date: Thu Apr 20 15:26:43 EDT 2023
Committee: NEC-P08

Committee Statement

Resolution: FR-7575-NFPA 70-2024

Statement: Section 250.118 does not permit non-conductive raceways to be used as an equipment grounding conductor (EGC). The requirements for having a wire type equipment grounding conductor complying with Article 250 Part VI for this wiring method is already

provided in other parts of this Code.

Section 250.118 for permitted EGCs does not reference nonmetallic wiring methods and only allows metal raceways, cable tray, and similar metal wiring methods to be used as equipment grounding conductors. The xxx.60 section for this article is being removed to eliminate any confusion for installing an equipment grounding conductor with this non-metallic wiring method. Changing the title in this section and adding ‘of the wire type’ does not add clarity.

Public Input No. 598-NFPA 70-2023 [New Section after 356.1]

356.2 Reconditioned Equipment

LFNMC shall not be reconditioned

Statement of Problem and Substantiation for Public Input

Flexible conduits and tubings are not permitted to be reconditioned per the NEMA Technical Position on Reconditioned Equipment (NEMA CS 100-2020, Appendix B.1)

• Also Applies to Types FMC, LFMC, LFNMC, FMT, and ENT

Related Public Inputs for This Document

Related Input	Relationship
Public Input No. 599-NFPA 70-2023 [New Section after 360.1]	
Public Input No. 614-NFPA 70-2023 [New Section after 340.1]	
Public Input No. 624-NFPA 70-2023 [New Section after 388.1]	

Submitter Information Verification

Submitter Full Name: Russ Leblanc

Organization: Leblanc Consulting Services

Street Address:

City:

State:

Zip:

Submittal Date: Sun Apr 16 07:40:34 EDT 2023

Committee: NEC-P08

Committee Statement

Resolution: FR-7642-NFPA 70-2024

Statement: The panel is not aware of any established programs that provide an acceptable approach to reconditioning for this type of equipment and maintain its listing. Section 110.20 indicates that equipment is permitted to be reconditioned unless otherwise prohibited.

Public Input No. 2900-NFPA 70-2023 [Section No. 356.6]

356.~~6~~ 2 Listing Requirements.

LFNC ~~and associated fittings~~ , associated fittings and support and securement hardware shall be listed.

Statement of Problem and Substantiation for Public Input

To avoid damage to LFNC and undue stress on electrical connections, the use of listed hardware for the securement and support of LFNC should be required just as cable ties are required to be listed. UL 2239, the Standard for Safety for Hardware for the Support of Conduit, Tubing, and Cable, was first published nearly 20 years ago and contains all necessary hardware construction, performance, marking and installation instructions necessary to provide installers the guidance to properly support and secure LFNC using hardware installed per the manufacturers' installation instructions.

Additionally, per the 2023 NEC style manual, clause 2.2.1, "Required Parallel Numbering Format" Listing requirements should be relocated from 356.6 to 356.2.

Submitter Information Verification

Submitter Full Name: David Gerstetter
Organization: Ul Solutions
Affiliation: UL Solutions
Street Address:
City:
State:
Zip:

Submittal Date: Fri Aug 25 23:41:36 EDT 2023
Committee: NEC-P08

Committee Statement

Resolution: No safety issues have been identified to justify the listing of support and securement hardware.

Public Input No. 3524-NFPA 70-2023 [Section No. 356.6]

356.~~6~~ 2 Listing Requirements.

LFNC and associated fittings shall be listed.

Statement of Problem and Substantiation for Public Input

This Public Input is being submitted on behalf of the NEC Correlating Committee Usability Task Group in order to provide correlation throughout the document. A new section is added to comply with the NEC Style Manual Section 2.2.1 regarding Listing Requirements.
2.2.1 Parallel Numbering Required. Technical committees shall use the following section numbers for the same purposes within articles. This requirement shall not apply to Articles 90, 100, and 110. If the article does not contain listing or reconditioning requirements, the subdivisions shall not be included in the article.
Required Parallel Numbering Format
XXX.1 Scope.
XXX.2 Listing Requirements.
XXX.3 Reconditioned Equipment.
XXX.3(A) Permitted to be Installed.
XXX.3(B) Not Permitted to be Installed.
The Usability Task Group members are: Derrick Atkins, David Hittinger, Richard Holub, Dean Hunter, Chad Kennedy and David Williams.

Submitter Information Verification

Submitter Full Name: David Williams
Organization: Delta Charter Township
Street Address:
City:
State:
Zip:
Submittal Date: Mon Sep 04 17:38:36 EDT 2023
Committee: NEC-P08

Committee Statement

Resolution: FR-7501-NFPA 70-2024
Statement: Renumbered to comply with the NEC Style Manual Section 2.2.1 regarding Listing Requirements.

Public Input No. 3217-NFPA 70-2023 [Section No. 356.10]

356.10 Uses Permitted.

LFNC shall be permitted to be used in exposed or concealed locations for the following purposes:

(1) Where flexibility is required for installation, operation, or maintenance.

(2) Where protection of the contained conductors is required from vapors, machine oils, liquids, or solids.

(3) For outdoor locations where listed and marked as suitable for the purpose.

(4) For direct burial where listed and marked for the purpose.

(5) Installed in lengths longer than 1.8 m (6 ft)~~ where secured in accordance with 356~~ . ~~30.~~

(6) LFNC-B as a listed manufactured prewired assembly, metric designator 16 through 27 (trade size ½ through 1) conduit.

(7) For encasement in concrete where listed for direct burial and installed in compliance with 356.42.

(8) In locations subject to severe corrosive influences as covered in 300.6 and where subject to chemicals for which the materials are specifically approved.

(9) Conductors or cables rated at a temperature higher than the listed temperature rating of LFNC shall be permitted to be installed in LFNC, provided the conductors or cables are not operated at a temperature higher than the listed temperature rating of the LFNC.

Informational Note: Extreme cold can cause some types of nonmetallic conduits to become brittle and therefore more susceptible to damage from physical contact.

Statement of Problem and Substantiation for Public Input

Deleting text 'where secured in accordance with 356.30' because that requirement already applies. This proposed revision will reduce redundancy and improve clarity for Code users.

Submitter Information Verification

Submitter Full Name: Mike Holt
Organization: Mike Holt Enterprises Inc
Street Address:
City:
State:
Zip:
Submittal Date: Wed Aug 30 11:48:11 EDT 2023
Committee: NEC-P08

Committee Statement

Resolution: The deletion does not add clarity to the code. The requirements are not repeated as the text directs the reader to the correct section.

Public Input No. 2373-NFPA 70-2023 [Section No. 356.22]

356.22 Number of Conductors.

The number of conductors shall not exceed that permitted by the percentage fill specified in Table 1, Chapter 9.

Cables shall be permitted to be installed where such use is not prohibited by the respective cable articles. ~~The~~ For complete raceway runs, the number of cables shall not exceed the allowable percentage fill specified in Table 1, Chapter 9.

Statement of Problem and Substantiation for Public Input

Table 1 applies only to complete conduit or tubing systems and is not intended to apply to sections of conduit or tubing used to protect exposed wiring and cable from physical damage. Adding this language to section 356.22 will add clarity for Code users.

Submitter Information Verification

Submitter Full Name: Mike Holt

Organization: Mike Holt Enterprises Inc

Street Address:

City:

State:

Zip:

Submittal Date: Wed Aug 16 15:06:02 EDT 2023

Committee: NEC-P08

Committee Statement

Resolution: To avoid redundancy request is already covered in Chapter 9 Tables note #2.

Public Input No. 2258-NFPA 70-2023 [Section No. 356.30]

356.30 Securing and Supporting.

LFNC shall be securely fastened and supported in accordance with one of the following:

(1) Where installed in lengths exceeding 1.8 m (6 ft), the conduit shall be securely fastened at intervals not exceeding 900 mm (3 ft) and within 300 mm (12 in.) on each side of every outlet box, junction box, cabinet, or fitting. Where used, cable ties shall be listed for the application and for securing and supporting.

(2) Securing or supporting of the conduit shall not be required where it is fished, installed in lengths not exceeding 900 mm (3 ft) at terminals where flexibility is required, or installed in lengths not exceeding 1.8 m (6 ft) from a luminaire terminal connection for tap conductors to luminaires permitted in 410.117(C).

(3) Horizontal runs of LFNC supported by openings through framing members at intervals not exceeding 900 mm (3 ft) and securely fastened within 300 mm (12 in.) of termination points shall be permitted.

(4) Securing or supporting of LFNC shall not be required where installed in lengths not exceeding 1.8 m (6 ft) from the last point where the raceway is securely fastened for connections within an accessible ceiling to a luminaire(s) or other equipment.

For the purpose of 356.30 , listed

~~liquidtight flexible~~

liquidtight flexible nonmetallic conduit fittings shall be permitted as a means of support.

Statement of Problem and Substantiation for Public Input

Relocating this language from 356.30(4) to the bottom of 356.30 because this requirement applies to all this section and its current location implies it only applicable to (4). This proposed revision will bring consistency for Code users.

Submitter Information Verification

Submitter Full Name: Mike Holt
Organization: Mike Holt Enterprises Inc
Street Address:
City:
State:
Zip:
Submittal Date: Tue Aug 15 14:02:19 EDT 2023
Committee: NEC-P08

Committee Statement

Resolution: FR-7502-NFPA 70-2024

Statement: This First Revision clarifies that Listed LFNC Fittings are permitted as the means of securement and support.

Public Input No. 4090-NFPA 70-2023 [Section No. 356.56]

~~**356.56** Splices and Taps.~~

~~Splices and taps shall be made in accordance with 300.15 .~~

Statement of Problem and Substantiation for Public Input

Delete 356.56 because it only references a requirement that is already covered in 300.15. Removing this section will improve redundancy for Code users.

Submitter Information Verification

Submitter Full Name: Mike Holt
Organization: Mike Holt Enterprises Inc
Street Address:
City:
State:
Zip:
Submittal Date: Wed Sep 06 16:17:21 EDT 2023
Committee: NEC-P08

Committee Statement

Resolution: FR-7631-NFPA 70-2024

Statement: Splices and taps are applicable to conductors, not the raceway. These requirements for splicing conductors are already addressed in Sections 110.14(B) and 300.15.

Public Input No. 147-NFPA 70-2023 [Section No. 356.60]

~~**356.60** Grounding.~~

~~Where equipment grounding is required, a separate grounding conductor shall be installed in the conduit.~~

~~*Exception No. 1: The equipment grounding conductor shall be permitted to be run separately from the circuit conductors as permitted in 250.134 , Exception No. 2, for dc circuits and 250.134 , Exception No. 1, for separately run equipment grounding conductors.*~~

~~*Exception No. 2: The equipment grounding conductor shall not be required where the grounded conductor is used to ground equipment as permitted in 250.142 .*~~

Statement of Problem and Substantiation for Public Input

Grounding and bonding requirements belong in Article 250. It makes absolutely no sense to have grounding requirements in an Article about a nonmetallic wiring method that provides no grounding or bonding. Article 250 adequately covers grounding and bonding requirements. This requirement is superfluous, incomplete and may cause conflicts with Article 250 requirements.

Related Public Inputs for This Document

Related Input	Relationship
Public Input No. 146-NFPA 70-2023 [Section No. 355.60]	Grounding belongs in 250
Public Input No. 145-NFPA 70-2023 [Section No. 354.60]	Grounding belongs in 250
Public Input No. 144-NFPA 70-2023 [Section No. 353.60]	Grounding belongs in 250
Public Input No. 143-NFPA 70-2023 [Section No. 352.60]	Grounding belongs in 250
Public Input No. 148-NFPA 70-2023 [Section No. 362.60]	
Public Input No. 149-NFPA 70-2023 [Section No. 378.60]	
Public Input No. 150-NFPA 70-2023 [Section No. 388.60]	

Submitter Information Verification

Submitter Full Name: Russ Leblanc

Organization: Leblanc Consulting Services

Street Address:

City:

State:

Zip:

Submittal Date: Thu Jan 12 08:35:06 EST 2023

Committee: NEC-P08

Committee Statement

Resolution: FR-7576-NFPA 70-2024

Statement: Section 250.118 does not permit non-conductive raceways to be used as an equipment grounding conductor (EGC). The requirements for having a wire type equipment grounding conductor complying with Article 250 Part VI for this wiring method is already

provided in other parts of this Code.

Section 250.118 for permitted EGCs does not reference nonmetallic wiring methods and only allows metal raceways, cable tray, and similar metal wiring methods to be used as equipment grounding conductors. The xxx.60 section for this article is being removed to eliminate any confusion for installing an equipment grounding conductor with this non-metallic wiring method. Changing the title in this section and adding ‘of the wire type’ does not add clarity.

Public Input No. 1870-NFPA 70-2023 [Section No. 356.60]

356.60 Grounding.

Where equipment grounding is required, a separate equipment grounding conductor shall be installed in the conduit.

Exception No. 1: The equipment grounding conductor shall be permitted to be run separately from the circuit conductors as permitted in 250.134, Exception No. 2, for dc circuits and 250.134, Exception No. 1, for separately run equipment grounding conductors.

Exception No. 2: The equipment grounding conductor shall not be required where the grounded conductor is used to ground equipment as permitted in 250.142.

Statement of Problem and Substantiation for Public Input

"Grounding conductor" is not a defined conductor. The requirement is to install an "equipment grounding conductor".

Submitter Information Verification

Submitter Full Name: Don Ganiere
Organization: none
Street Address:
City:
State:
Zip:
Submittal Date: Sun Aug 06 17:48:49 EDT 2023
Committee: NEC-P08

Committee Statement

Resolution: Section 250.118 does not permit non-conductive raceways to be used as an equipment grounding conductor (EGC). The requirements for having a wire type equipment grounding conductor complying with Article 250 Part VI for this wiring method is already provided in other parts of this Code. Section 250.118 for permitted EGCs does not reference nonmetallic wiring methods and only allows metal raceways, cable tray, and similar metal wiring methods to be used as equipment grounding conductors. The xxx.60 section for this article is being removed to eliminate any confusion for installing an equipment grounding conductor with this non-metallic wiring method. Changing the title in this section and adding 'of the wire type' does not add clarity.

Public Input No. 2356-NFPA 70-2023 [Section No. 356.60]

356.~~60~~ 60 Equipment Grounding Conductor .

Where equipment grounding is required, a separate grounding conductor shall be installed in the conduit.

Exception No. 1: The equipment grounding conductor shall be permitted to be run separately from the circuit conductors as permitted in 250.134, Exception No. 2, for dc circuits and 250.134, Exception No. 1, for separately run equipment grounding conductors.

Exception No. 2: The equipment grounding conductor shall not be required where the grounded conductor is used to ground equipment as permitted in 250.142.

Statement of Problem and Substantiation for Public Input

The section title must be revised to match the technical requirement. In accordance with NEC style manual section 2.1.3.2 the title must be descriptive and concise with the intent of the requirement. See 215.6 Feeder Equipment Grounding Conductor, 320.108 Equipment Grounding Conductor, 330.108 Equipment Grounding Conductor, 334.108 Equipment Grounding Conductor, 410.182 Equipment Grounding Conductor, 547.27 Separate Equipment Grounding Conductor, 555.37 Equipment Grounding Conductor, and 690.45 Size of Equipment Grounding Conductors.

Submitter Information Verification

Submitter Full Name: Mike Holt
Organization: Mike Holt Enterprises Inc
Street Address:
City:
State:
Zip:
Submittal Date: Wed Aug 16 14:16:54 EDT 2023
Committee: NEC-P08

Committee Statement

Resolution: FR-7576-NFPA 70-2024

Statement: Section 250.118 does not permit non-conductive raceways to be used as an equipment grounding conductor (EGC). The requirements for having a wire type equipment grounding conductor complying with Article 250 Part VI for this wiring method is already provided in other parts of this Code.

Section 250.118 for permitted EGCs does not reference nonmetallic wiring methods and only allows metal raceways, cable tray, and similar metal wiring methods to be used as equipment grounding conductors. The xxx.60 section for this article is being removed to eliminate any confusion for installing an equipment grounding conductor with this non-metallic wiring method. Changing the title in this section and adding ‘of the wire type’ does not add clarity.

Public Input No. 694-NFPA 70-2023 [Section No. 356.60]

356.60 Grounding.

Where equipment grounding is required, ~~a separate~~ an equipment grounding conductor shall be installed in the conduit.

Exception No. 1: The equipment grounding conductor shall be permitted to be run separately from the circuit conductors as permitted in 250.134, Exception No. 2, for dc circuits and 250.134, Exception No. 1, for separately run equipment grounding conductors.

Exception No. 2: The equipment grounding conductor shall not be required where the grounded conductor is used to ground equipment as permitted in 250.142.

Statement of Problem and Substantiation for Public Input

The term "grounding conductor" has not been used in the NEC for over a decade. It was deleted because it had no value and the NEC does not indicate how to install it, size it, or protect it...because there is no such term.

Related Public Inputs for This Document

Related Input	Relationship
Public Input No. 689-NFPA 70-2023 [Section No. 352.60]	Same issue
Public Input No. 690-NFPA 70-2023 [Section No. 353.60]	Same issue
Public Input No. 692-NFPA 70-2023 [Section No. 354.60]	Same issue
Public Input No. 693-NFPA 70-2023 [Section No. 355.60]	Same issue
Public Input No. 695-NFPA 70-2023 [Section No. 362.60]	
Public Input No. 696-NFPA 70-2023 [Section No. 378.60]	
Public Input No. 697-NFPA 70-2023 [Section No. 388.60]	

Submitter Information Verification

Submitter Full Name: Ryan Jackson
Organization: Self-employed
Affiliation: Steel Tube Institute
Street Address:
City:
State:
Zip:
Submittal Date: Thu Apr 20 15:28:39 EDT 2023
Committee: NEC-P08

Committee Statement

Resolution: FR-7576-NFPA 70-2024

Statement: Section 250.118 does not permit non-conductive raceways to be used as an equipment grounding conductor (EGC). The requirements for having a wire type equipment grounding conductor complying with Article 250 Part VI for this wiring method is already

provided in other parts of this Code.

Section 250.118 for permitted EGCs does not reference nonmetallic wiring methods and only allows metal raceways, cable tray, and similar metal wiring methods to be used as equipment grounding conductors. The xxx.60 section for this article is being removed to eliminate any confusion for installing an equipment grounding conductor with this non-metallic wiring method. Changing the title in this section and adding ‘of the wire type’ does not add clarity.

Public Input No. 2901-NFPA 70-2023 [Section No. 358.6]

358.~~6~~ 2 Listing Requirements.

EMT, factory elbows, ~~and~~ associated fittings and support and securement hardware shall be listed.

Statement of Problem and Substantiation for Public Input

To ensure the expected lifetime of EMT, avoid damage to EMT and to eliminate undue stress on electrical connections, the use of listed hardware for the securement and support of EMT is necessary. UL 2239, the Standard for Safety for Hardware for the Support of Conduit, Tubing, and Cable, was first published nearly 20 years ago and contains all necessary hardware construction, performance, marking and installation instructions necessary to provide installers the guidance to properly support and secure EMT by using listed hardware installed per the manufacturers' installation instructions.

Additionally, per the 2023 NEC style manual, clause 2.2.1, "Required Parallel Numbering Format" Listing requirements should be relocated from 358.6 to 358.2

Submitter Information Verification

Submitter Full Name: David Gerstetter

Organization: Ul Solutions

Affiliation: UL Solutions

Street Address:

City:

State:

Zip:

Submittal Date: Fri Aug 25 23:47:37 EDT 2023

Committee: NEC-P08

Committee Statement

Resolution: No safety issues have been identified to justify the listing of support and securement hardware.

Public Input No. 3525-NFPA 70-2023 [Section No. 358.6]

~~358.6~~ 2 _ Listing Requirements.

EMT, factory elbows, and associated fittings shall be listed.

Statement of Problem and Substantiation for Public Input

This Public Input is being submitted on behalf of the NEC Correlating Committee Usability Task Group in order to provide correlation throughout the document. A new section is added to comply with the NEC Style Manual Section 2.2.1 regarding Listing Requirements.
2.2.1 Parallel Numbering Required. Technical committees shall use the following section numbers for the same purposes within articles. This requirement shall not apply to Articles 90, 100, and 110. If the article does not contain listing or reconditioning requirements, the subdivisions shall not be included in the article.
Required Parallel Numbering Format
XXX.1 Scope.
XXX.2 Listing Requirements.
XXX.3 Reconditioned Equipment.
XXX.3(A) Permitted to be Installed.
XXX.3(B) Not Permitted to be Installed.
The Usability Task Group members are: Derrick Atkins, David Hittinger, Richard Holub, Dean Hunter, Chad Kennedy and David Williams.

Submitter Information Verification

Submitter Full Name:	David Williams
Organization:	Delta Charter Township
Street Address:	
City:	
State:	
Zip:	
Submittal Date:	Mon Sep 04 17:39:22 EDT 2023
Committee:	NEC-P08

Committee Statement

Resolution: FR-7833-NFPA 70-2024

Statement: Renumbered to comply with the NEC Style Manual Section 2.2.1 regarding Listing Requirements.

Public Input No. 2374-NFPA 70-2023 [Section No. 358.22]

358.22 Number of Conductors.

The number of conductors shall not exceed that permitted by the percentage fill specified in Table 1, Chapter 9.

Cables shall be permitted to be installed where such use is not prohibited by the respective cable articles. ~~The~~ For complete raceway runs, the number of cables shall not exceed the allowable percentage fill specified in Table 1, Chapter 9.

Statement of Problem and Substantiation for Public Input

Table 1 applies only to complete conduit or tubing systems and is not intended to apply to sections of conduit or tubing used to protect exposed wiring and cable from physical damage. Adding this language to section 358.22 will add clarity for Code users.

Submitter Information Verification

Submitter Full Name: Mike Holt
Organization: Mike Holt Enterprises Inc
Street Address:
City:
State:
Zip:
Submittal Date: Wed Aug 16 15:07:09 EDT 2023
Committee: NEC-P08

Committee Statement

Resolution: This proposed revision is already covered in Table 1 of Chapter 9 in note 2.

Public Input No. 1988-NFPA 70-2023 [Section No. 358.30(A)]

(A) Securely Fastened.

EMT shall be securely fastened in place in accordance with the following:

(1) At intervals not to exceed 3 m (10 ft)

(2) Within 900 mm (3 ft) of each outlet box, junction box, device box, cabinet, conduit body, or ~~other tubing termination~~ fitting.

Exception No. 1: Fastening of unbroken lengths shall be permitted to be increased to a distance of 1.5 m (5 ft) where structural members do not readily permit fastening within 900 mm (3 ft).

Exception No. 2: For concealed work in finished buildings or prefinished wall panels where such securing is impracticable, unbroken lengths (without coupling) of EMT shall be permitted to be fished.

Statement of Problem and Substantiation for Public Input

describing what a tubing termination is

Submitter Information Verification

Submitter Full Name:	Wyatt Peyton
Organization:	OESCO
Affiliation:	IBEW 1141
Street Address:	
City:	
State:	
Zip:	
Submittal Date:	Thu Aug 10 08:47:49 EDT 2023
Committee:	NEC-P08

Committee Statement

Resolution: The proposed revision does not add clarity. Other tubing terminations include fittings. There is no need to change the language.

Public Input No. 346-NFPA 70-2023 [Section No. 358.30(A)]

(A) Securely Fastened.

EMT shall be securely fastened in place in accordance with the following:

(1) At intervals not to exceed 3 m (10 ft)

(2) Within 900 mm (3 ft) of each outlet box, junction box, device box, cabinet, conduit body, or other tubing termination

Exception No. 1: Fastening of unbroken lengths shall be permitted to be increased to a distance of 1.5 m (5 ft) where structural members do not readily permit fastening within 900 mm (3 ft).

Exception No. 2: For concealed work in finished buildings or prefinished wall panels where such securing is impracticable, unbroken lengths (without coupling) of EMT shall be permitted to be fished.

Exception No. 3: For unbent and unbroken lengths (without coupling) of EMT not to exceed 900 mm (3 ft), installed between enclosures, the tubing termination fittings of independently-supported enclosures shall be permitted to act as a means of fastening. The tubing termination fittings of raceway-supported enclosures of the kind mentioned in 314.23(E) and (F) shall not satisfy the requirements of this exception.

Additional Proposed Changes

File Name	Description	Approved
Public_Input_-_EMT_fastening.pdf	Substantiation - EMT fastening clarification, exception	

Statement of Problem and Substantiation for Public Input

(Please see attached PDF for substantiation and supporting document)

Submitter Information Verification

Submitter Full Name: Luke Bogue
Organization: NIETC Electrical Training Ctr
Street Address:
City:
State:
Zip:
Submittal Date: Thu Feb 16 18:05:55 EST 2023
Committee: NEC-P08

Committee Statement

Resolution: This proposed revision will cause confusion with the current language requiring support within 3ft in 358.30(A).

Panel members,

It is my opinion that the proposal included below, which changed the language of EMT support requirements from the 2008 cycle to the 2011 cycle, has left substantial ambiguity about the ability of an enclosure's termination fittings to meet the requirements of "securely fastening" a length of EMT.

The highlighted portions of Mr. Carpenter's substantiation make it clear that his assumption is that no AHJ would require short, unbroken lengths of EMT to be securely fastened other than at their terminations.

The panel's response, however, noted that - while they accepted the proposed change to the NEC - they did not necessarily agree with the substantiation on the grounds that "securement requirements are found in 358.30(A)".

The language of their disagreement does nothing to clarify the subdivision's intent - Mr. Carpenter clearly agrees with the panel on the location of the requirements in the NEC, but both have come to seemingly different conclusions.

My proposal, then, is to alleviate ambiguity about this particular subdivision's intent. I am of the opinion that most AHJ's would not consider an unbroken and unfastened 8" length of EMT between enclosures to be a Code violation. I am also of the opinion that several AHJ's may consider an unfastened 90º-bent 35" length of EMT to be a Code violation. 358.30(A) currently treats these installations as identical. It is my opinion that this proposed exception may offer clarity to this subdivision's requirements for these common installations.

Thank you for your time.

- Luke Bogue
  Instructor / (he, him)
  NECA/IBEW Training Center
  Portland, OR

8-125 Log #2204 NEC-P08 Final Action: Accept
(358.30(C))

Submitter: James W. Carpenter, International Association of Electrical Inspectors

Recommendation: Delete this provision. Also, delete the clause "or permitted to be unsupported in accordance with 358.30(C)" from the last sentence of 358.30.
Substantiation: The concept of a special support rule for short lengths of raceway run between enclosures of various sorts was added to the 2008 NEC for the first time in the history of the NEC with negligible technical substantiation and no evidence of loss experience, and remains at variance from routine trade practice. The existence of a coupling now immediately provokes a support requirement, even on a 6-inch and a 4-inch long heavy-wall 4 trade size steel nipples put together to make an 11-inch (approx.) combined raceway. A 90 degree sweep roughly 2 trade size or larger (any centerline length over 18 in.) now requires intermediate support. The literal text now requires support to structure on a 3-in. nipple if even one of its ends "encounters" a concentric knockout.

Although there are those who believe the new rule simply offers limited relief from a rule that required all raceways to be independently supported, routine field experience throughout the history of rigid raceway wiring methods does not substantiate such assertions. We are unaware of any significant attempts to require supports on short nipples. All rigid raceways under NEC rules must be listed, including their couplings; is it conceivable that a coupling between two segments of a short (3 ft or less) nipple so seriously degrades the stability of the raceway that such a support is needed? Concentric knockouts in enclosures are reviewed as part of the UL 50 process, and as anyone working these enclosures recently should be aware, those standards have been strengthened and these knockouts are now more robust than in previous decades; is this the time to require even more support?

Raceways generally require support within 3 ft of terminations, and when the entire length is just that long or shorter, no additional support should be needed. In effect, the locknuts and bushings or connectors and locknuts at each end are supports. This is not a new concept for the NEC: CMP 7 just added the wording "(wiring method) fittings shall be permitted as a means of cable support" in a number of cable articles. If carried to its logical conclusion and routinely enforced (however unlikely), this new support rule will likely drive the market in the direction of cabled wiring methods without any technical justification.

It should be remembered that supports to structure are not infallible. Many raceways hang from threaded rod of indefinite length every 10 ft or so and within 3 ft (5 ft. in some cases) of enclosures, depending on the specific rules for the size and character of the supported raceway. Such support clearly meets the rules in this section, but would it add anything to a nipple between enclosures? Further, even when rigid supports such as one-hole clips are used, the raceway beyond the last clip can have an indefinite number of couplings and enter the center knockout of an indefinite number of concentric knockouts; how is this arrangement so inherently more secure than a nipple between enclosures? This new NEC provision was without precedent, and addressed a nonexistent problem.

Panel Meeting Action: Accept
Panel Statement: CMP-8 does not necessarily agree with the submitter's substantiation. Securement requirements are found in 358.30(A).
Number Eligible to Vote: 12
Ballot Results: Affirmative: 11 Negative: 1

Public Input No. 1343-NFPA 70-2023 [Sections 358.30(A), 358.30(B)]

Sections 358.30(A), 358.30(B)

(A) Securely Fastened.

EMT shall be securely fastened in place in accordance with the following:

(1) At intervals not to exceed 3 m (10 ft)

(2) Within 900 mm (3 ft) of each outlet box, junction box, device box, cabinet, conduit body, or other tubing termination

Exception No. 1: Fastening of unbroken lengths shall be permitted to be increased to a distance of 1.5 m (5 ft) where structural members do not readily permit fastening within 900 mm (3 ft).

Exception No. 2: For concealed work in finished buildings or prefinished wall panels where such securing is impracticable, unbroken lengths (without coupling) of EMT shall be permitted to be fished.

(B) Supports.

Horizontal runs of EMT supported by openings through framing members at intervals not greater than 3 m (10 ft) and securely fastened within 900 mm (3 ft) of termination points shall be permitted.

<u>**(C)** Conduit sections 24" or less are considered to be "nipples" and can be unsupported for lengths of 24" or less.</u>

Statement of Problem and Substantiation for Public Input

I feel that short sections of raceways when ran unsupported for lengths of 24" or less would be a good clarification to 358.30 as well as the other XXX.30 sections that deal with raceways. 358.30(C) was removed in the 2011 cycle due to the language of an 18" section of raceway being required to be "unbroken". I feel it should be added back for the 2026 cycle without the unbroken language and a overall length of unsupported raceway not to exceed 24".

Related Public Inputs for This Document

Related Input	Relationship
Public Input No. 4201-NFPA 70-2023 [New Section after 344.30(B)]	
Public Input No. 1502-NFPA 70-2023 [Section No. 342.30(A)]	

Submitter Information Verification

Submitter Full Name: William Snyder
Organization: RCC Solutions
Affiliation: High Voltage Live Show
Street Address:
City:
State:
Zip:

Submittal Date: Sun Jul 09 02:13:30 EDT 2023

Committee: NEC-P08

Committee Statement

Resolution: 358.30(A)(1) already allows up to 3ft. Therefore, this would cause confusion when requiring a means of securement or support within 24 inches.

Public Input No. 859-NFPA 70-2023 [Section No. 358.30(B)]

(B) Supports.

Horizontal runs of EMT supported by openings through framing members at intervals not greater than ~~3 m~~ 5 m (~~10 ft~~ 16 ft) and securely fastened within ~~900 mm~~ 1524 mm (~~3 ft~~ 5 ft) of termination points shall be permitted.

Statement of Problem and Substantiation for Public Input

The problem that would be resolved is that there is a requirement for too many supports. Creating more distance between each support would do a few things. First, adding space between each support would reduce the amount of supports needed to complete a run. Second, by adding space between each support and using less supports, the cost of materials would go down as well; not a huge difference but over time the cost would add up. Third, creating more space between supports would help with some of those hard to reach spaces, lets say you are running EMT and it needs to be supported and there is no easily accessible place to do so, having those few extra feet would come in handy when you are in those types of situations. Lastly, adding more space between supports wouldn't do any harm, the reason being is that the requirement is only the maximum distance between supports, there is no rule stating that you can not support a run before that 3 and 10 foot requirement, all this revision would be doing is giving us electricians a little more room to work with when running EMT.

Submitter Information Verification

Submitter Full Name: Connor Moreno
Organization: E Light Electric
Street Address:
City:
State:
Zip:
Submittal Date: Sun May 21 13:16:22 EDT 2023
Committee: NEC-P08

Committee Statement

Resolution: No technical substantiation was provided to show that the supports need to be changed.

Public Input No. 2259-NFPA 70-2023 [Section No. 358.30 [Excluding any Sub-Sections]]

EMT shall be installed as a complete system in accordance with 300.18 and shall be securely fastened in place and supported in accordance with 358.30(A) and (B). Listed EMT fittings shall be permitted as a means of securement and support for EMT raceways not exceeding 24 in.

Statement of Problem and Substantiation for Public Input

This language will permit a short piece of EMT to be installed without having any additional securing and supporting by allowing an EMT connector to serve as a means of securement and support. This has been a common practice in the trade and should be allowed by the Code.

Submitter Information Verification

Submitter Full Name:	Mike Holt
Organization:	Mike Holt Enterprises Inc
Street Address:	
City:	
State:	
Zip:	
Submittal Date:	Tue Aug 15 14:07:01 EDT 2023
Committee:	NEC-P08

Committee Statement

Resolution: 358.30(A)(1) already allows up to 3ft. Therefore, this would cause confusion when requiring a means of securement or support within 24 inches.

Public Input No. 2364-NFPA 70-2023 [Section No. 358.42]

358.42 Couplings and Connectors.

Couplings and connectors used with EMT shall be made up tight. Where buried in masonry or concrete, they shall be concretetight type. Where ~~installed~~ in wet locations, they shall ~~comply with 314.15 .~~ be installed to prevent moisture from entering or accumulating and be listed for wet locations.

Statement of Problem and Substantiation for Public Input

Revising language in section 358.42 to make it easier for Code users to understand the requirement. Drainage openings are not done to couplings and connectors. Instead of referencing another section, this text with no technical change just mandates threadless coupling and connectors to be installed to prevent moisture from entering or accumulating and be listed for wet locations.

Submitter Information Verification

Submitter Full Name: Mike Holt

Organization: Mike Holt Enterprises Inc

Street Address:

City:

State:

Zip:

Submittal Date: Wed Aug 16 14:54:11 EDT 2023

Committee: NEC-P08

Committee Statement

Resolution: This proposed revision does not add clarity and usability to the code. Section 314.15 gives the requirements for installation in damp locations.

Public Input No. 4091-NFPA 70-2023 [Section No. 358.42]

358.42 Couplings and Connectors.

(1) Made Tight. Couplings and connectors used with EMT shall be made up tight.

(2) Concrete Buried. Where buried in masonry or concrete, they shall be concretetight type.

(3) Wet Locations. Where installed in wet locations, they shall comply with 314.15.

Statement of Problem and Substantiation for Public Input

Breaking up 358.42 into a list item format to facilitate understanding for Code users. In accordance with NFPA Style Manual section 3.5.1.2 additional subdivisions shall be used where multiple requirements can be broken into independent requirements.

Submitter Information Verification

Submitter Full Name: Mike Holt
Organization: Mike Holt Enterprises Inc
Street Address:
City:
State:
Zip:

Submittal Date: Wed Sep 06 16:21:05 EDT 2023
Committee: NEC-P08

Committee Statement

Resolution: FR-7837-NFPA 70-2024

Statement: This revision complies with the NFPA Style manual section 3.5.1.2. Couplings and connectors are required to comply with 314.15, the text was removed to eliminate redundancy.

Public Input No. 4095-NFPA 70-2023 [Section No. 358.56]

~~**358.56** Splices and Taps.~~

~~Splices and taps shall be made in accordance with 300.15 .~~

Statement of Problem and Substantiation for Public Input

Delete 358.56 because it only references a requirement that is already covered in 300.15. Removing this section will improve redundancy for Code users.

Submitter Information Verification

Submitter Full Name: Mike Holt

Organization: Mike Holt Enterprises Inc

Street Address:

City:

State:

Zip:

Submittal Date: Wed Sep 06 16:27:06 EDT 2023

Committee: NEC-P08

Committee Statement

Resolution: FR-7632-NFPA 70-2024

Statement: Splices and taps are applicable to conductors, not the raceway. These requirements for splicing conductors are already addressed in Sections 110.14(B) and 300.15.

Public Input No. 1122-NFPA 70-2023 [Section No. 358.60]

358.60 Grounding.

EMT shall be permitted as an equipment grounding conductor except as specified in 440 .9.

Statement of Problem and Substantiation for Public Input

The addition of this text will tie in the requirements of 440.9 which specifically references EMT raceway with this article, which will avoid any misapplication.

Submitter Information Verification

Submitter Full Name: Greg Chontow
Organization: Boro of Hopatcong, NJ
Street Address:
City:
State:
Zip:

Submittal Date: Sun Jun 18 12:48:21 EDT 2023
Committee: NEC-P08

Committee Statement

Resolution: Does not add clarity to the code and is redundant by pointing back to another section of the code.

Public Input No. 2357-NFPA 70-2023 [Section No. 358.60]

358.~~60~~ 60 Equipment Grounding Conductor .

EMT shall be permitted as an equipment grounding conductor.

Statement of Problem and Substantiation for Public Input

The section title must be revised to match the technical requirement. In accordance with NEC style manual section 2.1.3.2 the title must be descriptive and concise with the intent of the requirement. See 215.6 Feeder Equipment Grounding Conductor, 320.108 Equipment Grounding Conductor, 330.108 Equipment Grounding Conductor, 334.108 Equipment Grounding Conductor, 410.182 Equipment Grounding Conductor, 547.27 Separate Equipment Grounding Conductor, 555.37 Equipment Grounding Conductor, and 690.45 Size of Equipment Grounding Conductors.

Submitter Information Verification

Submitter Full Name: Mike Holt

Organization: Mike Holt Enterprises Inc

Street Address:

City:

State:

Zip:

Submittal Date: Wed Aug 16 14:17:48 EDT 2023

Committee: NEC-P08

Committee Statement

Resolution: Changing the title does not add clarity. The current title is not in violation of the current NFPA Style Manual nor the 2023 NEC Style Manual. The grounding is not exclusive to Equipment Grounding Conductor. The Section is in place to address any grounding or bonding requirements. Section 250.118 does not have installation requirements for the equipment grounding conductors.

Public Input No. 3555-NFPA 70-2023 [Section No. 358.60]

358.60 Grounding and Bonding .

EMT shall be permitted as an equipment grounding conductor.

Statement of Problem and Substantiation for Public Input

There are 23 sections in Chapter 3 that have a .60 section. 19 of these sections are titled "Grounding." 3 of these sections are titled "Grounding and Bonding." 1 of these sections is titled "Equipment Grounding Conductor."
My suggestion is to rename all of these sections with "Grounding and Bonding."

Submitter Information Verification

Submitter Full Name: Eric Stromberg
Organization: Los Alamos National Laboratory
Affiliation: Self
Street Address:
City:
State:
Zip:

Submittal Date: Mon Sep 04 19:34:33 EDT 2023
Committee: NEC-P08

Committee Statement

Resolution: CMP-8 maintains its position from the previous cycle. The submitter's Public Input is editorial in nature and has not provided a technical substantiation to change the title of this section. Changing the title does not add clarity. The purpose is to address equipment grounding conductors for connection to earth and ground fault management, not equipotential bonding.

Public Input No. 599-NFPA 70-2023 [New Section after 360.1]

360.2 Reconditioned Equipment

FMT shall not be reconditioned

Statement of Problem and Substantiation for Public Input

Flexible conduits and tubings are not permitted to be reconditioned per the NEMA Technical Position on Reconditioned Equipment (NEMA CS 100-2020, Appendix B.1)

• Also Applies to Types FMC, LFMC, LFNMC, FMT, and ENT

Related Public Inputs for This Document

Related Input	Relationship
Public Input No. 598-NFPA 70-2023 [New Section after 356.1]	Reconditioned equipment
Public Input No. 600-NFPA 70-2023 [New Section after 352.1]	
Public Input No. 614-NFPA 70-2023 [New Section after 340.1]	
Public Input No. 624-NFPA 70-2023 [New Section after 388.1]	

Submitter Information Verification

Submitter Full Name: Russ Leblanc

Organization: Leblanc Consulting Services

Street Address:

City:

State:

Zip:

Submittal Date: Sun Apr 16 07:44:30 EDT 2023

Committee: NEC-P08

Committee Statement

Resolution: FR-7661-NFPA 70-2024

Statement: The panel is not aware of any established programs that provide an acceptable approach to reconditioning for this type of equipment and maintain its listing. Section 110.20 indicates that equipment is permitted to be reconditioned unless otherwise prohibited.

Public Input No. 2896-NFPA 70-2023 [Section No. 360.6]

360.~~6~~ 2 Listing Requirements.

FMT ~~and associated fittings~~ , associated fittings and support and securement hardware shall be listed.

Statement of Problem and Substantiation for Public Input

To avoid damage to FMT and undue stress on electrical connections, the use of listed hardware for the securement and support of FMT is necessary. UL 2239, the Standard for Safety for Hardware for the Support of Conduit, Tubing, and Cable, was first published nearly 20 years ago and contains all necessary hardware construction, performance, marking and installation instructions necessary to provide installers the guidance to properly support and secure FMT using hardware installed per the manufacturers' installation instructions.

Additionally, per the 2023 NEC style manual, clause 2.2.1, "Required Parallel Numbering Format" Listing requirements should be relocated from 360.6 to 360.2.

Submitter Information Verification

Submitter Full Name: David Gerstetter
Organization: Ul Solutions
Affiliation: UL Solutions
Street Address:
City:
State:
Zip:
Submittal Date: Fri Aug 25 23:02:53 EDT 2023
Committee: NEC-P08

Committee Statement

Resolution: No safety issue has been identified to justify the listing of support and securement hardware.

Public Input No. 3526-NFPA 70-2023 [Section No. 360.6]

360.~~6~~ 2 Listing Requirements.

FMT and associated fittings shall be listed.

Statement of Problem and Substantiation for Public Input

This Public Input is being submitted on behalf of the NEC Correlating Committee Usability Task Group in order to provide correlation throughout the document. A new section is added to comply with the NEC Style Manual Section 2.2.1 regarding Listing Requirements.
2.2.1 Parallel Numbering Required. Technical committees shall use the following section numbers for the same purposes within articles. This requirement shall not apply to Articles 90, 100, and 110. If the article does not contain listing or reconditioning requirements, the subdivisions shall not be included in the article.
Required Parallel Numbering Format
XXX.1 Scope.
XXX.2 Listing Requirements.
XXX.3 Reconditioned Equipment.
XXX.3(A) Permitted to be Installed.
XXX.3(B) Not Permitted to be Installed.
The Usability Task Group members are: Derrick Atkins, David Hittinger, Richard Holub, Dean Hunter, Chad Kennedy and David Williams.

Submitter Information Verification

Submitter Full Name: David Williams

Organization: Delta Charter Township

Street Address:

City:

State:

Zip:

Submittal Date: Mon Sep 04 17:39:59 EDT 2023

Committee: NEC-P08

Committee Statement

Resolution: FR-7609-NFPA 70-2024

Statement: Per the 2023 NEC Style Manual, clause 2.2.1, “Required Parallel Numbering Format” Listing requirements should be relocated from 360.6 to 360.2.

Public Input No. 2375-NFPA 70-2023 [Section No. 360.22(A)]

(A) FMT — Metric Designators 16 and 21 (Trade Sizes ½ and ¾).

The number of conductors in metric designators 16 (trade size ½) and 21 (trade size ¾) shall not exceed that permitted by the percentage fill specified in Table 1, Chapter 9.

Cables shall be permitted to be installed where such use is not prohibited by the respective cable articles. ~~The~~ For complete raceway runs, the number of cables shall not exceed the allowable percentage fill specified in Table 1, Chapter 9.

Statement of Problem and Substantiation for Public Input

Table 1 applies only to complete conduit or tubing systems and is not intended to apply to sections of conduit or tubing used to protect exposed wiring and cable from physical damage. Adding this language to first level subdivision 360.22(A) will add clarity for Code users.

Submitter Information Verification

Submitter Full Name: Mike Holt
Organization: Mike Holt Enterprises Inc
Street Address:
City:
State:
Zip:

Submittal Date: Wed Aug 16 15:08:19 EDT 2023
Committee: NEC-P08

Committee Statement

Resolution: To avoid redundancy, the proposed revision is already covered in Chapter 9 Tables note #2.

Public Input No. 2358-NFPA 70-2023 [Section No. 360.60]

360.~~60~~ 60 Equipment Grounding Conductor .

FMT shall be permitted as an equipment grounding conductor where installed in accordance with 250.118(A)(7).

Statement of Problem and Substantiation for Public Input

The section title must be revised to match the technical requirement. In accordance with NEC style manual section 2.1.3.2 the title must be descriptive and concise with the intent of the requirement. See 215.6 Feeder Equipment Grounding Conductor, 320.108 Equipment Grounding Conductor, 330.108 Equipment Grounding Conductor, 334.108 Equipment Grounding Conductor, 410.182 Equipment Grounding Conductor, 547.27 Separate Equipment Grounding Conductor, 555.37 Equipment Grounding Conductor, and 690.45 Size of Equipment Grounding Conductors.

Submitter Information Verification

Submitter Full Name: Mike Holt

Organization: Mike Holt Enterprises Inc

Street Address:

City:

State:

Zip:

Submittal Date: Wed Aug 16 14:19:06 EDT 2023

Committee: NEC-P08

Committee Statement

Resolution: Changing the title does not add clarity. The current title is not in violation of the current NFPA Style Manual nor the 2023 NEC Style Manual. The grounding is not exclusive to Equipment Grounding Conductor. The Section is in place to address any grounding or bonding requirements. Section 250.118 does not have installation requirements for the equipment grounding conductors.

Public Input No. 3569-NFPA 70-2023 [Section No. 360.60]

360.60 Grounding and Bonding .

FMT shall be permitted as an equipment grounding conductor where installed in accordance with 250.118(A)(7).

Statement of Problem and Substantiation for Public Input

There are 23 sections in Chapter 3 that have a .60 section. 19 of these sections are titled "Grounding." 3 of these sections are titled "Grounding and Bonding." 1 of these sections is titled "Equipment Grounding Conductor."
My suggestion is to rename all of these sections with "Grounding and Bonding."

Submitter Information Verification

Submitter Full Name:	Eric Stromberg
Organization:	Los Alamos National Laboratory
Affiliation:	Self
Street Address:	
City:	
State:	
Zip:	
Submittal Date:	Mon Sep 04 20:01:05 EDT 2023
Committee:	NEC-P08

Committee Statement

Resolution: CMP-8 maintains its position from the previous cycle. The submitter’s Public Input is editorial in nature and has not provided a technical substantiation to change the title of this section. Changing the title does not add clarity. The purpose is to address equipment grounding conductors for connection to earth and ground fault management, not equipotential bonding.

Public Input No. 1323-NFPA 70-2023 [Section No. 362.2]

362.2 Reconditioned Equipment.

Reconditioned ENT shall not be ~~reconditioned~~ permitted .

Statement of Problem and Substantiation for Public Input

This public input is a part of a series of public inputs that seeks to align the language found across the NEC pertaining to how reconditioned equipment is addressed in the NEC.

The following sections us the language that says “Reconditioned ______ shall not be permitted.” 404.16, 406.2, 408.2,410.2, 470.2, 495.2, 495.49,695.2,700.2,701.2,702.2,708.2,

This change suggests the appropriate way to address reconditioned equipment in the NEC. The NEC is an installation code governing the installation of solutions and in many locations throughout the NEC the solution is either permitted or not permitted. This suggested language would bring all references towards reconditioned equipment in alignment.

Submitter Information Verification

Submitter Full Name: Thomas Domitrovich

Organization: Eaton Corporation

Street Address:

City:

State:

Zip:

Submittal Date: Sat Jul 08 11:36:04 EDT 2023

Committee: NEC-P08

Committee Statement

Resolution: FR-7647-NFPA 70-2024

Statement: The panel is not aware of any established programs that provide an acceptable approach to reconditioning for this type of equipment and maintain its listing. Section 110.20 indicates that equipment is permitted to be reconditioned unless otherwise prohibited. Renumbered to comply with the NEC Style Manual 2.2.1 regarding reconditioned equipment.

Public Input No. 2604-NFPA 70-2023 [Section No. 362.2]

362. ~~2~~ 3 Reconditioned Equipment.

Reconditioned ENT shall not be ~~reconditioned~~ installed .

Statement of Problem and Substantiation for Public Input

This Public Input is being submitted on behalf of the NEC Correlating Committee Usability Task Group in order to provide correlation throughout the document. The text is revised to comply with the NEC Style Manual Section 2.2.1 regarding reconditioned equipment.
2.2.1 Parallel Numbering Required. Technical committees shall use the following section numbers for the same purposes within articles. This requirement shall not apply to Articles 90, 100, and 110. If the article does not contain listing or reconditioning requirements, the subdivisions shall not be included in the article.
Required Parallel Numbering Format
XXX.1 Scope.
XXX.2 Listing Requirements.
XXX.3 Reconditioned Equipment.
XXX.3(A) Permitted to be Installed.
XXX.3(B) Not Permitted to be Installed.
The Usability Task Group members are: Derrick Atkins, David Hittinger, Richard Holub, Dean Hunter, Chad Kennedy and David Williams.

Submitter Information Verification

Submitter Full Name: David Williams
Organization: Delta Charter Township
Street Address:
City:
State:
Zip:

Submittal Date: Wed Aug 23 19:41:01 EDT 2023
Committee: NEC-P08

Committee Statement

Resolution: FR-7647-NFPA 70-2024

Statement: The panel is not aware of any established programs that provide an acceptable approach to reconditioning for this type of equipment and maintain its listing. Section 110.20 indicates that equipment is permitted to be reconditioned unless otherwise prohibited. Renumbered to comply with the NEC Style Manual 2.2.1 regarding reconditioned equipment.

Public Input No. 2876-NFPA 70-2023 [Section No. 362.2]

362.~~2~~ 3 Reconditioned Equipment.

ENT shall not be reconditioned.

Statement of Problem and Substantiation for Public Input

per the 2023 NEC style manual, clause 2.2.1, “Required Parallel Numbering Format” reconditioned equipment should be relocated from 362.2 to 362.3.

Related Public Inputs for This Document

Related Input	Relationship
Public Input No. 2877-NFPA 70-2023 [Section No. 362.6]	
Public Input No. 2877-NFPA 70-2023 [Section No. 362.6]	
Public Input No. 2878-NFPA 70-2023 [Section No. 362.30]	

Submitter Information Verification

Submitter Full Name:	David Gerstetter
Organization:	Ul Solutions
Affiliation:	UL Solutions
Street Address:	
City:	
State:	
Zip:	
Submittal Date:	Fri Aug 25 18:35:30 EDT 2023
Committee:	NEC-P08

Committee Statement

Resolution: FR-7647-NFPA 70-2024

Statement: The panel is not aware of any established programs that provide an acceptable approach to reconditioning for this type of equipment and maintain its listing. Section 110.20 indicates that equipment is permitted to be reconditioned unless otherwise prohibited. Renumbered to comply with the NEC Style Manual 2.2.1 regarding reconditioned equipment.

Public Input No. 2877-NFPA 70-2023 [Section No. 362.6]

~~362.6~~ 2 Listing Requirements.

ENT ~~and associated fittings~~ , associated fittings, securement and support hardware shall be listed.

Statement of Problem and Substantiation for Public Input

To avoid damage to ENT and undue stress on electrical connections, the use of listed hardware for the securement and support of ENT should be required, just as cable ties in 362.30(A) are required to be listed for the application and for securing and supporting. ANSI/UL 2239, the Standard for Safety for Hardware for the Support of Conduit, Tubing, and Cable, was first published nearly 20 years ago and contains all necessary hardware construction, performance, marking and installation instructions necessary to provide installers the guidance to properly support and secure ENT using hardware installed per the manufacturers' installation instructions.
Also, per the 2023 NEC style manual, clause 2.2.1, "Required Parallel Numbering Format" Listing requirements should be relocated from 362.6 to 362.2

Related Public Inputs for This Document

Related Input	Relationship
Public Input No. 2878-NFPA 70-2023 [Section No. 362.30]	
Public Input No. 2876-NFPA 70-2023 [Section No. 362.2]	
Public Input No. 2876-NFPA 70-2023 [Section No. 362.2]	
Public Input No. 2878-NFPA 70-2023 [Section No. 362.30]	

Submitter Information Verification

Submitter Full Name: David Gerstetter
Organization: Ul Solutions
Affiliation: UL Solutions
Street Address:
City:
State:
Zip:
Submittal Date: Fri Aug 25 18:38:32 EDT 2023
Committee: NEC-P08

Committee Statement

Resolution: Support hardware can be structure steel and hardware not listed may be used for support. No safety issues have been identified to justify the listing of support and securement hardware.

Public Input No. 3527-NFPA 70-2023 [Section No. 362.6]

362.~~6~~ 2 Listing Requirements.

ENT and associated fittings shall be listed.

Statement of Problem and Substantiation for Public Input

This Public Input is being submitted on behalf of the NEC Correlating Committee Usability Task Group in order to provide correlation throughout the document. A new section is added to comply with the NEC Style Manual Section 2.2.1 regarding Listing Requirements.
2.2.1 Parallel Numbering Required. Technical committees shall use the following section numbers for the same purposes within articles. This requirement shall not apply to Articles 90, 100, and 110. If the article does not contain listing or reconditioning requirements, the subdivisions shall not be included in the article.
Required Parallel Numbering Format
XXX.1 Scope.
XXX.2 Listing Requirements.
XXX.3 Reconditioned Equipment.
XXX.3(A) Permitted to be Installed.
XXX.3(B) Not Permitted to be Installed.
The Usability Task Group members are: Derrick Atkins, David Hittinger, Richard Holub, Dean Hunter, Chad Kennedy and David Williams.

Submitter Information Verification

Submitter Full Name: David Williams
Organization: Delta Charter Township
Street Address:
City:
State:
Zip:
Submittal Date: Mon Sep 04 17:40:42 EDT 2023
Committee: NEC-P08

Committee Statement

Resolution: FR-7613-NFPA 70-2024

Statement: Renumbered to comply with the NEC Style Manual Section 2.2.1 regarding Listing Requirements.

Public Input No. 2376-NFPA 70-2023 [Section No. 362.22]

362.22 Number of Conductors.

The number of conductors shall not exceed that permitted by the percentage fill in Table 1, Chapter 9.

Cables shall be permitted to be installed where such use is not prohibited by the respective cable articles. ~~The~~ For complete race runs, the number of cables shall not exceed the allowable percentage fill specified in Table 1, Chapter 9.

Statement of Problem and Substantiation for Public Input

Table 1 applies only to complete conduit or tubing systems and is not intended to apply to sections of conduit or tubing used to protect exposed wiring and cable from physical damage. Adding this language to section 362.22 will add clarity for Code users.

Submitter Information Verification

Submitter Full Name:	Mike Holt
Organization:	Mike Holt Enterprises Inc
Street Address:	
City:	
State:	
Zip:	
Submittal Date:	Wed Aug 16 15:09:45 EDT 2023
Committee:	NEC-P08

Committee Statement

Resolution: To avoid redundancy, the proposed revision is already covered in Chapter 9 Tables note #2. The proposal does not define the maximum allowed lengths of a “complete cable run” or a partial cable run”. “Partial cable runs” may also exceed heating criteria and cable fill.

Public Input No. 2878-NFPA 70-2023 [Section No. 362.30]

362.30 Securing and Supporting.

ENT shall be installed as a complete system in accordance with 300.18 and shall be securely fastened in place ~~by an approved means~~ and supported in accordance with 362.30(A) and (B).

(A) Securely Fastened.

ENT shall be securely fastened at intervals not exceeding 900 mm (3 ft). In addition, ENT shall be securely fastened in place within 900 mm (3 ft) of each outlet box, device box, junction box, cabinet, or fitting where it terminates. Where used, hardware and/or cable ties shall be listed for the application and for securing and supporting.

Exception No. 1: Lengths not exceeding a distance of 1.8 m (6 ft) from a luminaire terminal connection for tap connections to lighting luminaires shall be permitted without being secured.

Exception No. 2: Lengths not exceeding 1.8 m (6 ft) from the last point where the raceway is securely fastened for connections within an accessible ceiling to luminaire(s) or other equipment.

Exception No. 3: For concealed work in finished buildings or prefinished wall panels where such securing is impracticable, unbroken lengths (without coupling) of ENT shall be permitted to be fished.

(B) Supports.

Horizontal runs of ENT supported by openings in framing members at intervals not exceeding 900 mm (3 ft) and securely fastened within 900 mm (3 ft) of termination points shall be permitted.

Statement of Problem and Substantiation for Public Input

PI 2877 includes listing requirements for securement and support hardware making the reference to fastening in place by an approved means unnecessary. The additional reference to listing requirements reinforces the need for proper listing of hardware just as cable ties have long been required by the NEC to be listed for both support and securement.

Related Public Inputs for This Document

Related Input	Relationship
Public Input No. 2876-NFPA 70-2023 [Section No. 362.2]	
Public Input No. 2877-NFPA 70-2023 [Section No. 362.6]	
Public Input No. 2877-NFPA 70-2023 [Section No. 362.6]	

Submitter Information Verification

Submitter Full Name: David Gerstetter
Organization: Ul Solutions
Affiliation: UL Solutions
Street Address:
City:
State:
Zip:

Submittal Date: Fri Aug 25 18:46:44 EDT 2023
Committee: NEC-P08

Committee Statement

Resolution: Support hardware can be structure steel and hardware not listed and may be used for support. No safety issues have been identified to justify the listing of support and securement hardware.

Public Input No. 2260-NFPA 70-2023 [Section No. 362.30(A)]

(A) Securely Fastened.

ENT shall be securely fastened at intervals not exceeding 900 mm (3 ft). In addition, ENT shall be securely fastened in place within 900 mm (3 ft) of each outlet box, device box, junction box, cabinet, or fitting where it terminates. Where used, cable ties shall be listed for the application and for securing and supporting.

Exception No. 1: Lengths not exceeding a distance of 1.8 m (6 ft) from a luminaire terminal connection for tap connections to lighting luminaires shall be permitted without being secured.

Exception No. 2: Lengths not exceeding 1.8 m (6 ft) from the last point where the raceway is securely fastened for connections within an accessible ceiling to luminaire(s) or other equipment.

Exception No. 3: For concealed work in finished buildings or prefinished wall panels where such securing is impracticable, unbroken lengths (without coupling) of ENT shall be permitted to be fished.

For the purposes of the exceptions, listed ENT fittings shall be permitted as a means of securement and support.

Statement of Problem and Substantiation for Public Input

Adding this text to the bottom of 362.30(A) to be consistent with 348.30(A)and 350.30(A). These flexible raceway wiring methods should have the same requirements.

Submitter Information Verification

Submitter Full Name: Mike Holt
Organization: Mike Holt Enterprises Inc
Street Address:
City:
State:
Zip:
Submittal Date: Tue Aug 15 14:11:19 EDT 2023
Committee: NEC-P08

Committee Statement

Resolution: Articles 348 and 350 address a flexible conduit made from metal, not plastic. The panel has not been shown that metal and plastic flexible conduit have the same characteristic, strength, and relationship to embrittlement in cold weather or weakening in hot environments. The panel has not been shown that there were tensile tests performed to confirm their equivalency. Also note that in Article 348, the allowance is embedded in Exception 4, whereas in Article 350, it is left more generically as a statement to all of the Exceptions. They are not consistently applied in the Articles referenced.

Public Input No. 4096-NFPA 70-2023 [Section No. 362.30(A)]

(A) Securely Fastened.

(1) Lenghts. ENT shall be securely fastened at intervals not exceeding 900 mm (3 ft). In addition, ENT shall be securely fastened in place within 900 mm (3 ft) of each outlet box, device box, junction box, cabinet, or fitting where it terminates.

(2) Cable Ties. Where used, cable ties shall be listed for the application and for securing and supporting.

Exception No. 1: Lengths not exceeding a distance of 1.8 m (6 ft) from a luminaire terminal connection for tap connections to lighting luminaires shall be permitted without being secured.

Exception No. 2: Lengths not exceeding 1.8 m (6 ft) from the last point where the raceway is securely fastened for connections within an accessible ceiling to luminaire(s) or other equipment.

Exception No. 3: For concealed work in finished buildings or prefinished wall panels where such securing is impracticable, unbroken lengths (without coupling) of ENT shall be permitted to be fished.

Statement of Problem and Substantiation for Public Input

Breaking up 362.30(A) into a list item format to facilitate understanding for Code users. In accordance with NFPA Style Manual section 3.5.1.2 additional subdivisions shall be used where multiple requirements can be broken into independent requirements.

Submitter Information Verification

Submitter Full Name: Mike Holt
Organization: Mike Holt Enterprises Inc
Street Address:
City:
State:
Zip:

Submittal Date: Wed Sep 06 16:29:07 EDT 2023
Committee: NEC-P08

Committee Statement

Resolution: The term cable ties already exists within and would cause redundancy within the section. The section consists of a single requirement with multiple parts. Additional subdivisions or lists shall be used to express independent requirements.

Public Input No. 3219-NFPA 70-2023 [Section No. 362.48]

~~**362.48** Joints.~~

~~All joints between lengths of tubing and between tubing and couplings, fittings, and boxes shall be by an approved method.~~

Statement of Problem and Substantiation for Public Input

Delete this requirement because its already required for ENT to use fittings listed and specifically designed for the raceway. See 362.6 and 300.15.

Submitter Information Verification

Submitter Full Name: Mike Holt

Organization: Mike Holt Enterprises Inc

Street Address:

City:

State:

Zip:

Submittal Date: Wed Aug 30 11:51:49 EDT 2023

Committee: NEC-P08

Committee Statement

Resolution: Removal of this section would remove requirements needed in this Article. See UL category FKHU - The outside diameters of ENT are such that standard connectors, couplings and outlet boxes for rigid PVC conduit can be employed for ENT that is also constructed of PVC. Installation instructions are provided with each bundle or coil of ENT outlining the procedure to be used when employing cemented-on PVC conduit fittings and outlet boxes. These techniques include the specific cement to be used as well as its application method. The requested language change doesn’t appear to be related to the comments explaining the change.

Public Input No. 4098-NFPA 70-2023 [Section No. 362.56]

~~**362.56** Splices and Taps.~~

~~Splices and taps shall be made only in accordance with 300.15 .~~

Statement of Problem and Substantiation for Public Input

Delete 362.56 because it only references a requirement that is already covered in 300.15. Removing this section will improve redundancy for Code users.

Submitter Information Verification

Submitter Full Name: Mike Holt
Organization: Mike Holt Enterprises Inc
Street Address:
City:
State:
Zip:
Submittal Date: Wed Sep 06 16:31:02 EDT 2023
Committee: NEC-P08

Committee Statement

Resolution: FR-7634-NFPA 70-2024

Statement: Splices and taps are applicable to conductors, not the raceway. These requirements for splicing conductors are already addressed in Sections 110.14(B) and 300.15.

Public Input No. 148-NFPA 70-2023 [Section No. 362.60]

~~**362.60** Grounding.~~

~~Where equipment grounding is required, a separate grounding conductor shall be installed in the raceway in compliance with Article 250, Part VI.~~

~~*Exception No. 1: The equipment grounding conductor shall be permitted to be run separately from the raceway where used for grounding dc circuits as permitted in 250.134 , Exception No. 2.*~~

~~*Exception No. 2: The equipment grounding conductor shall not be required where the grounded conductor is used as part of the effective ground-fault path as permitted in 250.142 .*~~

Statement of Problem and Substantiation for Public Input

Grounding and bonding requirements belong in Article 250. It makes absolutely no sense to have grounding requirements in an Article about a nonmetallic wiring method that provides no grounding or bonding. Article 250 adequately covers grounding and bonding requirements. This requirement is superfluous, incomplete and may cause conflicts with Article 250 requirements.

Related Public Inputs for This Document

Related Input	Relationship
Public Input No. 147-NFPA 70-2023 [Section No. 356.60]	Grounding requirements belongs in Article 250
Public Input No. 146-NFPA 70-2023 [Section No. 355.60]	Grounding requirements belongs in Article 250
Public Input No. 145-NFPA 70-2023 [Section No. 354.60]	Grounding requirements belongs in Article 250
Public Input No. 144-NFPA 70-2023 [Section No. 353.60]	Grounding requirements belongs in Article 250
Public Input No. 143-NFPA 70-2023 [Section No. 352.60]	Grounding requirements belongs in Article 250
Public Input No. 149-NFPA 70-2023 [Section No. 378.60]	
Public Input No. 150-NFPA 70-2023 [Section No. 388.60]	

Submitter Information Verification

Submitter Full Name: Russ Leblanc
Organization: Leblanc Consulting Services
Street Address:
City:
State:
Zip:
Submittal Date: Thu Jan 12 08:39:19 EST 2023
Committee: NEC-P08

Committee Statement

Resolution: FR-7578-NFPA 70-2024

Statement: Section 250.118 does not permit non-conductive raceways to be used as an equipment grounding conductor (EGC). The requirements for having a wire type equipment grounding conductor complying with Article 250 Part VI for this wiring method is already provided in other parts of this Code.

Section 250.118 for permitted EGCs does not reference nonmetallic wiring methods and only allows metal raceways, cable tray, and similar metal wiring methods to be used as equipment grounding conductors. The xxx.60 section for this article is being removed to eliminate any confusion for installing an equipment grounding conductor with this non-metallic wiring method. Changing the title in this section and adding ‘of the wire type’ does not add clarity.

Public Input No. 2359-NFPA 70-2023 [Section No. 362.60]

362.~~60~~ 60 Equipment Grounding Conductor .

Where equipment grounding is required, a separate grounding conductor shall be installed in the raceway in compliance with Article 250, Part VI.

Exception No. 1: The equipment grounding conductor shall be permitted to be run separately from the raceway where used for grounding dc circuits as permitted in 250.134, Exception No. 2.

Exception No. 2: The equipment grounding conductor shall not be required where the grounded conductor is used as part of the effective ground-fault path as permitted in 250.142.

Statement of Problem and Substantiation for Public Input

The section title must be revised to match the technical requirement. In accordance with NEC style manual section 2.1.3.2 the title must be descriptive and concise with the intent of the requirement. See 215.6 Feeder Equipment Grounding Conductor, 320.108 Equipment Grounding Conductor, 330.108 Equipment Grounding Conductor, 334.108 Equipment Grounding Conductor, 410.182 Equipment Grounding Conductor, 547.27 Separate Equipment Grounding Conductor, 555.37 Equipment Grounding Conductor, and 690.45 Size of Equipment Grounding Conductors.

Submitter Information Verification

Submitter Full Name: Mike Holt
Organization: Mike Holt Enterprises Inc
Street Address:
City:
State:
Zip:
Submittal Date: Wed Aug 16 14:20:01 EDT 2023
Committee: NEC-P08

Committee Statement

Resolution: FR-7578-NFPA 70-2024

Statement: Section 250.118 does not permit non-conductive raceways to be used as an equipment grounding conductor (EGC). The requirements for having a wire type equipment grounding conductor complying with Article 250 Part VI for this wiring method is already provided in other parts of this Code.

Section 250.118 for permitted EGCs does not reference nonmetallic wiring methods and only allows metal raceways, cable tray, and similar metal wiring methods to be used as equipment grounding conductors. The xxx.60 section for this article is being removed to eliminate any confusion for installing an equipment grounding conductor with this non-metallic wiring method. Changing the title in this section and adding 'of the wire type' does not add clarity.

Public Input No. 3570-NFPA 70-2023 [Section No. 362.60]

362.60 Grounding <u>and Bonding</u> .

Where equipment grounding is required, a separate <u>equipment</u> grounding conductor ~~shall~~ <u>of the wire type shall</u> be installed in the raceway in compliance with Article 250, Part VI.

Exception No. 1: The equipment grounding conductor shall be permitted to be run separately from the raceway where used for grounding dc circuits as permitted in 250.134, Exception No. 2.

Exception No. 2: The equipment grounding conductor shall not be required where the grounded conductor is used as part of the effective ground-fault path as permitted in 250.142.

Statement of Problem and Substantiation for Public Input

There are 23 sections in Chapter 3 that have a .60 section. 19 of these sections are titled "Grounding." 3 of these sections are titled "Grounding and Bonding." 1 of these sections is titled "Equipment Grounding Conductor."
My suggestion is to rename all of these sections with "Grounding and Bonding."

Also, added 'of the wire type' for consistency

Submitter Information Verification

Submitter Full Name: Eric Stromberg
Organization: Los Alamos National Laboratory
Affiliation: Self
Street Address:
City:
State:
Zip:

Submittal Date: Mon Sep 04 20:02:30 EDT 2023
Committee: NEC-P08

Committee Statement

Resolution: CMP-8 maintains its position from the previous cycle. The submitter's Public Input is editorial in nature and has not provided a technical substantiation to change the title of this section. Changing the title does not add clarity. The purpose is to address equipment grounding conductors for connection to earth and ground fault management, not equipotential bonding.

Public Input No. 695-NFPA 70-2023 [Section No. 362.60]

362.60 Grounding.

Where equipment grounding is required, ~~a separate~~ an equipment grounding conductor shall be installed in the raceway in compliance with Article 250, Part VI.

Exception No. 1: The equipment grounding conductor shall be permitted to be run separately from the raceway where used for grounding dc circuits as permitted in 250.134, Exception No. 2.

Exception No. 2: The equipment grounding conductor shall not be required where the grounded conductor is used as part of the effective ground-fault path as permitted in 250.142.

Statement of Problem and Substantiation for Public Input

The term "grounding conductor" has not been used in the NEC for over a decade. It was deleted because it had no value and the NEC does not indicate how to install it, size it, or protect it...because there is no such term.

Related Public Inputs for This Document

Related Input	Relationship
Public Input No. 689-NFPA 70-2023 [Section No. 352.60]	Same issue
Public Input No. 690-NFPA 70-2023 [Section No. 353.60]	Same issue
Public Input No. 692-NFPA 70-2023 [Section No. 354.60]	Same issue
Public Input No. 693-NFPA 70-2023 [Section No. 355.60]	Same issue
Public Input No. 694-NFPA 70-2023 [Section No. 356.60]	Same issue
Public Input No. 696-NFPA 70-2023 [Section No. 378.60]	
Public Input No. 697-NFPA 70-2023 [Section No. 388.60]	

Submitter Information Verification

Submitter Full Name: Ryan Jackson
Organization: Self-employed
Affiliation: Steel Tube Institute
Street Address:
City:
State:
Zip:

Submittal Date: Thu Apr 20 15:30:26 EDT 2023
Committee: NEC-P08

Committee Statement

Resolution: FR-7578-NFPA 70-2024

Statement: Section 250.118 does not permit non-conductive raceways to be used as an equipment grounding conductor (EGC). The requirements for having a wire type equipment grounding conductor complying with Article 250 Part VI for this wiring method is already

provided in other parts of this Code.

Section 250.118 for permitted EGCs does not reference nonmetallic wiring methods and only allows metal raceways, cable tray, and similar metal wiring methods to be used as equipment grounding conductors. The xxx.60 section for this article is being removed to eliminate any confusion for installing an equipment grounding conductor with this non-metallic wiring method. Changing the title in this section and adding ‘of the wire type’ does not add clarity.

Public Input No. 2865-NFPA 70-2023 [Section No. 366.6]

366.~~6~~ 2 Listing Requirements.

(A) Outdoors.

Nonmetallic auxiliary gutters installed outdoors shall be listed for all of the following conditions:

(1) Exposure to sunlight

(2) Use in wet locations

(3) Maximum ambient temperature of the installation

(B) Indoors.

Nonmetallic auxiliary gutters installed indoors shall be listed for the maximum ambient temperature of the installation.

Statement of Problem and Substantiation for Public Input

Per the 2023 NEC style manual, clause 2.2.1, "Required Parallel Numbering Format" Listing requirements should be moved from 366.6 to 366.2.

Submitter Information Verification

Submitter Full Name: David Gerstetter

Organization: Ul Solutions

Affiliation: UL Solutions

Street Address:

City:

State:

Zip:

Submittal Date: Fri Aug 25 17:47:48 EDT 2023

Committee: NEC-P08

Committee Statement

Resolution: FR-7842-NFPA 70-2024

Statement: The language from existing 366.6 is relocated without change as a new 366.2. This revision complies with the NEC Style Manual Section 2.2.1 regarding Listing Requirements and provides correlation and parallel numbering throughout the document.

Public Input No. 3528-NFPA 70-2023 [Section No. 366.6]

366.~~6~~ 2 Listing Requirements.

(A) Outdoors.

Nonmetallic auxiliary gutters installed outdoors shall be listed for all of the following conditions:

(1) Exposure to sunlight

(2) Use in wet locations

(3) Maximum ambient temperature of the installation

(B) Indoors.

Nonmetallic auxiliary gutters installed indoors shall be listed for the maximum ambient temperature of the installation.

Statement of Problem and Substantiation for Public Input

This Public Input is being submitted on behalf of the NEC Correlating Committee Usability Task Group in order to provide correlation throughout the document. A new section is added to comply with the NEC Style Manual Section 2.2.1 regarding Listing Requirements.
2.2.1 Parallel Numbering Required. Technical committees shall use the following section numbers for the same purposes within articles. This requirement shall not apply to Articles 90, 100, and 110. If the article does not contain listing or reconditioning requirements, the subdivisions shall not be included in the article.
Required Parallel Numbering Format
XXX.1 Scope.
XXX.2 Listing Requirements.
XXX.3 Reconditioned Equipment.
XXX.3(A) Permitted to be Installed.
XXX.3(B) Not Permitted to be Installed.
The Usability Task Group members are: Derrick Atkins, David Hittinger, Richard Holub, Dean Hunter, Chad Kennedy and David Williams.

Submitter Information Verification

Submitter Full Name:	David Williams
Organization:	Delta Charter Township
Street Address:	
City:	
State:	
Zip:	
Submittal Date:	Mon Sep 04 17:41:26 EDT 2023
Committee:	NEC-P08

Committee Statement

Resolution: FR-7842-NFPA 70-2024

Statement: The language from existing 366.6 is relocated without change as a new 366.2. This revision complies with the NEC Style Manual Section 2.2.1 regarding Listing

Requirements and provides correlation and parallel numbering throughout the document.

Public Input No. 1293-NFPA 70-2023 [Section No. 366.23(A)]

(A) Sheet Metal Auxiliary Gutters.

The adjustment factors in 310.15(C)(1) shall be applied only where the number of current-carrying conductors, including neutral conductors classified as current-carrying under 310.15(E), exceeds 30 at any cross section of the sheet metal auxiliary gutter. Conductors for signaling circuits or controller conductors between a motor and its starter and used only for starting duty shall not be considered as current-carrying conductors. ~~The current carried continuously in bare copper bars in sheet metal auxiliary gutters shall not exceed 1.55 amperes/mm~~ $\cancel{^2}$ ~~(1000 amperes/in.~~ $\cancel{^2}$ ~~) of cross section of the conductor. For aluminum bars, the current carried continuously shall not exceed 1.09 amperes/mm~~ $\cancel{^2}$ ~~(700 amperes/in.~~ $\cancel{^2}$ ~~) of cross section of the conductor.~~ _

Statement of Problem and Substantiation for Public Input

The ampacity of Busbars is inserted in a location that is working on the derating of the ampacity for the number of conductors in the auxiliary gutter. This part should be moved to article 310. The location is hard to find since it has to deal with ampacity which should be in with other conductor ampacity ratings of conductors in article 310.

Related Public Inputs for This Document

Related Input	Relationship
Public Input No. 1291-NFPA 70-2023 [New Section after 310.21]	moving of section
Public Input No. 1291-NFPA 70-2023 [New Section after 310.21]	

Submitter Information Verification

Submitter Full Name: IEC National
Organization: IEC
Affiliation: Lowell Reith IEC
Street Address:
City:
State:
Zip:
Submittal Date: Thu Jul 06 15:52:08 EDT 2023
Committee: NEC-P08

Committee Statement

Resolution: The proposed revision of relocating this requirement from Article 366 to Article 310 would have the unintended consequence of expanding the requirements to more than Auxiliary Gutters.

Public Input No. 341-NFPA 70-2023 [Section No. 366.23(A)]

(A) Sheet Metal Auxiliary Gutters.

The adjustment factors in 310.15(C)(1) shall be applied only where the number of current-carrying conductors, including neutral conductors classified as current-carrying under 310.15(E), exceeds 30 at any cross section of the sheet metal auxiliary gutter. Conductors for signaling circuits or controller conductors between a motor and its starter and used only for starting duty shall not be considered as current-carrying conductors. ~~The current carried continuously in bare copper bars in sheet metal auxiliary gutters shall not exceed 1.55 amperes/mm ^{2} (1000 amperes/in. ^{2}) of cross section of the conductor. For aluminum bars, the current carried continuously shall not exceed 1.09 amperes/mm ^{2} (700 amperes/in. ^{2}) of cross section of the conductor.~~

Statement of Problem and Substantiation for Public Input

The ampacity of Busbars is inserted in a location that is working on the derating of the ampacity for the number of conductors in the auxiliary gutter. This part should be moved to article 310. The location is hard to find since it has to deal with ampacity which should be in with other conductor ampacity ratings of conductors in article 310.

Related Public Inputs for This Document

Related Input	Relationship
Public Input No. 342-NFPA 70-2023 [New Section after 310.21]	
Public Input No. 342-NFPA 70-2023 [New Section after 310.21]	

Submitter Information Verification

Submitter Full Name:	Lowell Reith
Organization:	Interstates Inc.
Affiliation:	IEC
Street Address:	
City:	
State:	
Zip:	
Submittal Date:	Thu Feb 16 08:59:41 EST 2023
Committee:	NEC-P08

Committee Statement

Resolution: The proposed revision of relocating this requirement from Article 366 to Article 310 would have the unintended consequence of expanding the requirements to more than Auxiliary Gutters.

Public Input No. 2823-NFPA 70-2023 [Section No. 366.60]

366.~~60~~ 60 Equipment Grounding Conductor .

Metal auxiliary gutters shall be connected to an equipment grounding conductor(s), to an equipment bonding jumper, or to the grounded conductor where permitted or required by 250.92(B)(1) or 250.142.

Statement of Problem and Substantiation for Public Input

The section title must be revised to match the technical requirement. In accordance with NEC style manual section 2.1.3.2 the title must be descriptive and concise with the intent of the requirement. See 215.6 Feeder Equipment Grounding Conductor, 320.108 Equipment Grounding Conductor, 330.108 Equipment Grounding Conductor, 334.108 Equipment Grounding Conductor, 410.182 Equipment Grounding Conductor, 547.27 Separate Equipment Grounding Conductor, 555.37 Equipment Grounding Conductor, and 690.45 Size of Equipment Grounding Conductors.

Submitter Information Verification

Submitter Full Name: Mike Holt
Organization: Mike Holt Enterprises Inc
Street Address:
City:
State:
Zip:
Submittal Date: Fri Aug 25 14:13:44 EDT 2023
Committee: NEC-P08

Committee Statement

Resolution: Changing the title does not add clarity. The current title is not in violation of the current NFPA Style Manual nor the 2023 NEC Style Manual. The grounding is not exclusive to Equipment Grounding Conductor. The Section is in place to address any grounding or bonding requirements. Section 250.118 does not have installation requirements for the equipment grounding conductors.

Public Input No. 3571-NFPA 70-2023 [Section No. 366.60]

366.60 Grounding and Bonding .

Metal auxiliary gutters shall be part of an effective ground-fault current path by being connected to an equipment grounding conductor(s), to an equipment bonding jumper, or to the grounded conductor where permitted or required by 250.92(B)(1) or 250.142.

Statement of Problem and Substantiation for Public Input

There are 23 sections in Chapter 3 that have a .60 section. 19 of these sections are titled "Grounding." 3 of these sections are titled "Grounding and Bonding." 1 of these sections is titled "Equipment Grounding Conductor."
My suggestion is to rename all of these sections with "Grounding and Bonding."

also, added 'part of an effective ground-fault current path. That is actually the intention of the remaining text.

Submitter Information Verification

Submitter Full Name: Eric Stromberg
Organization: Los Alamos National Laboratory
Affiliation: Self
Street Address:
City:
State:
Zip:
Submittal Date: Mon Sep 04 20:07:22 EDT 2023
Committee: NEC-P08

Committee Statement

Resolution: CMP-8 maintains its position from the previous cycle. The submitter's Public Input is editorial in nature and has not provided a technical substantiation to change the title of this section. Changing the title does not add clarity. The purpose is to address equipment grounding conductors for connection to earth and ground fault management, not equipotential bonding.

Public Input No. 627-NFPA 70-2023 [New Section after 368.1]

368.2 Reconditioned Equipment

Mylar Wrapped, and Powder Coated Busways shall not be reconditioned

Statement of Problem and Substantiation for Public Input

Busways, Boxes, Conductors, Raceways, Strut-type Channel Raceways, Fixture Wires, Cablebus, Cables, Conduits, Tubings, Flexible Cords, Flexible Cables, Cable Trays, MV Cables, Wireways, etc. etc. are not permitted to be reconditioned per the NEMA Technical Position on Reconditioned Equipment (NEMA CS 100-2020, Appendix B.1)

Submitter Information Verification

Submitter Full Name: Russ Leblanc

Organization: Leblanc Consulting Services

Street Address:

City:

State:

Zip:

Submittal Date: Sun Apr 16 09:12:24 EDT 2023

Committee: NEC-P08

Committee Statement

Resolution: FR-7664-NFPA 70-2024

Statement: The panel is not aware of any established programs that provide an acceptable approach to reconditioning for this type of equipment. Section 110.20 indicates that equipment is permitted to be reconditioned unless otherwise prohibited.

Public Input No. 1537-NFPA 70-2023 [New Section after 368.17(D)]

TITLE OF NEW CONTENT

Type your content here ...

368.18 Field Identification Required.

(A) Circuit Directory

Circuit identification shall be included in a circuit directory that is located on the face of the Overcurrent protection device enclosure suppling the Busway by means of a sleeve holder.

(B) Circuit Identification

Every circuit plug-in device when installed or modified within the length of the busway shall be legibly identified as to its clear, evident, and specific purpose or use. The identification shall include an approved degree of detail that allows each circuit to be distinguished from all others. Spare positions that contain unused plug-in devices shall be described in the circuit directory accordingly. No circuit shall be described in a manner that depends on transient conditions of occupancy.

(C) Source of Supply.

All busways shall be permanently marked at the point of connection where the busway is supplied to indicate each device or equipment where the power originates. The label shall be permanently affixed, of sufficient durability to withstand the environment involved, and not handwritten.

Statement of Problem and Substantiation for Public Input

There are no requirements to track circuits and spares located along the length of a busway. busway's can be installed hundreds of feet long with dozens of slots for plug in devices. it would be helpful to have a circuit directory listing the spare and circuit (loads) that are supplied by the busway in the form of a directory just like a panelboard. Additionally in order to facilitate a shut down of the busway, the identification of the power supply would be readily available. The 408.4 language was modified to fit the busway application.

Submitter Information Verification

Submitter Full Name: Alfio Torrisi
Organization: Triad National Security, LLC.
Street Address:
City:
State:
Zip:
Submittal Date: Mon Jul 24 14:37:29 EDT 2023
Committee: NEC-P08

Committee Statement

Resolution: The proposed requirements are overly restrictive and not necessary for all installations. Unlike panels where switches and circuit breakers are located in relatively close proximity to the directory, busway plug in unit locations can vary widely along the length of the busway. Plug in units and tap boxes are generally located close to the associated loads and are not grouped together near the proposed directory. Various circuit identification methods are readily available and utilized in facilities, including product markings, source identification labels, color coding, up to date single line diagrams, digital twins, and training on electrical work practices and procedures.

Public Input No. 2825-NFPA 70-2023 [Section No. 368.60]

368.~~60~~ 60 Equipment Grounding Conductor .

Busway shall be connected to an equipment grounding conductor(s), to an equipment bonding jumper, or to the grounded conductor where permitted or required by 250.92(B)(1) or 250.142.

Statement of Problem and Substantiation for Public Input

The section title must be revised to match the technical requirement. In accordance with NEC style manual section 2.1.3.2 the title must be descriptive and concise with the intent of the requirement. See 215.6 Feeder Equipment Grounding Conductor, 320.108 Equipment Grounding Conductor, 330.108 Equipment Grounding Conductor, 334.108 Equipment Grounding Conductor, 410.182 Equipment Grounding Conductor, 547.27 Separate Equipment Grounding Conductor, 555.37 Equipment Grounding Conductor, and 690.45 Size of Equipment Grounding Conductors.

Submitter Information Verification

Submitter Full Name: Mike Holt
Organization: Mike Holt Enterprises Inc
Street Address:
City:
State:
Zip:
Submittal Date: Fri Aug 25 14:15:43 EDT 2023
Committee: NEC-P08

Committee Statement

Resolution: Changing the title does not add clarity. The current title is not in violation of the current NFPA Style Manual nor the 2023 NEC Style Manual. The grounding is not exclusive to Equipment Grounding Conductor. The Section is in place to address any grounding or bonding requirements. Section 250.118 does not have installation requirements for the equipment grounding conductors.

Public Input No. 3572-NFPA 70-2023 [Section No. 368.60]

368.60 Grounding and Bonding .

Busway shall ~~be~~ part of an effective ground-fault current path by being connected to an equipment grounding conductor(s), to an equipment bonding jumper, or to the grounded conductor where permitted or required by 250.92(B)(1) or 250.142.

Statement of Problem and Substantiation for Public Input

There are 23 sections in Chapter 3 that have a .60 section. 19 of these sections are titled "Grounding." 3 of these sections are titled "Grounding and Bonding." 1 of these sections is titled "Equipment Grounding Conductor."
My suggestion is to rename all of these sections with "Grounding and Bonding."

Also, added to be part of an effective ground-fault current path

Submitter Information Verification

Submitter Full Name: Eric Stromberg
Organization: Los Alamos National Laboratory
Affiliation: Self
Street Address:
City:
State:
Zip:

Submittal Date: Mon Sep 04 20:14:07 EDT 2023
Committee: NEC-P08

Committee Statement

Resolution: CMP-8 maintains its position from the previous cycle. The submitter’s Public Input is editorial in nature and has not provided a technical substantiation to change the title of this section. Changing the title does not add clarity. The purpose is to address equipment grounding conductors for connection to earth and ground fault management, not equipotential bonding.

Public Input No. 1324-NFPA 70-2023 [Section No. 369.2]

369.2 Reconditioned Equipment.

Reconditioned IBP and ~~IBP~~ reconditioned IBP systems shall not be ~~reconditioned~~ permitted .

Statement of Problem and Substantiation for Public Input

This public input is a part of a series of public inputs that seeks to align the language found across the NEC pertaining to how reconditioned equipment is addressed in the NEC.

The following sections us the language that says “Reconditioned ______ shall not be permitted.” 404.16, 406.2, 408.2,410.2, 470.2, 495.2, 495.49,695.2,700.2,701.2,702.2,708.2,

This change suggests the appropriate way to address reconditioned equipment in the NEC. The NEC is an installation code governing the installation of solutions and in many locations throughout the NEC the solution is either permitted or not permitted. This suggested language would bring all references towards reconditioned equipment in alignment.

Submitter Information Verification

Submitter Full Name: Thomas Domitrovich
Organization: Eaton Corporation
Street Address:
City:
State:
Zip:
Submittal Date: Sat Jul 08 11:36:42 EDT 2023
Committee: NEC-P08

Committee Statement

Resolution: FR-7648-NFPA 70-2024

Statement: The panel is not aware of any established programs that provide an acceptable approach to reconditioning for this type of equipment and maintain its listing. Section 110.20 indicates that equipment is permitted to be reconditioned unless otherwise prohibited. Renumbered to comply with the NEC Style Manual 2.2.1 regarding reconditioned equipment.

Public Input No. 2605-NFPA 70-2023 [Section No. 369.2]

369. ~~2~~ **3** Reconditioned Equipment.

Reconditioned IBP and IBP systems shall not be ~~reconditioned~~ installed .

Statement of Problem and Substantiation for Public Input

This Public Input is being submitted on behalf of the NEC Correlating Committee Usability Task Group in order to provide correlation throughout the document. The text is revised to comply with the NEC Style Manual Section 2.2.1 regarding reconditioned equipment.
2.2.1 Parallel Numbering Required. Technical committees shall use the following section numbers for the same purposes within articles. This requirement shall not apply to Articles 90, 100, and 110. If the article does not contain listing or reconditioning requirements, the subdivisions shall not be included in the article.
Required Parallel Numbering Format
XXX.1 Scope.
XXX.2 Listing Requirements.
XXX.3 Reconditioned Equipment.
XXX.3(A) Permitted to be Installed.
XXX.3(B) Not Permitted to be Installed.
The Usability Task Group members are: Derrick Atkins, David Hittinger, Richard Holub, Dean Hunter, Chad Kennedy and David Williams.

Submitter Information Verification

Submitter Full Name: David Williams

Organization: Delta Charter Township

Street Address:

City:

State:

Zip:

Submittal Date: Wed Aug 23 19:42:26 EDT 2023

Committee: NEC-P08

Committee Statement

Resolution: FR-7648-NFPA 70-2024

Statement: The panel is not aware of any established programs that provide an acceptable approach to reconditioning for this type of equipment and maintain its listing. Section 110.20 indicates that equipment is permitted to be reconditioned unless otherwise prohibited. Renumbered to comply with the NEC Style Manual 2.2.1 regarding reconditioned equipment.

Public Input No. 2866-NFPA 70-2023 [Section No. 369.2]

369.~~2~~ 3 Reconditioned Equipment.

IBP and IBP systems shall not be reconditioned.

Statement of Problem and Substantiation for Public Input

Per the 2023 NEC style manual, clause 2.2.1, "Required Parallel Numbering Format" Reconditioned Equipment " requirements should be moved from 369.2 to 369.3.

Submitter Information Verification

Submitter Full Name: David Gerstetter

Organization: Ul Solutions

Affiliation: UL Solutions

Street Address:

City:

State:

Zip:

Submittal Date: Fri Aug 25 17:51:49 EDT 2023

Committee: NEC-P08

Committee Statement

Resolution: FR-7648-NFPA 70-2024

Statement: The panel is not aware of any established programs that provide an acceptable approach to reconditioning for this type of equipment and maintain its listing. Section 110.20 indicates that equipment is permitted to be reconditioned unless otherwise prohibited. Renumbered to comply with the NEC Style Manual 2.2.1 regarding reconditioned equipment.

Public Input No. 2867-NFPA 70-2023 [Section No. 369.6]

369.~~6~~ 2 Listing Requirements.

IBP and IBP systems shall be listed.

Statement of Problem and Substantiation for Public Input

Per the 2023 NEC style manual, clause 2.2.1, "Required Parallel Numbering Format" Listing requirements should be moved from 369.6 to 369.2.

Submitter Information Verification

Submitter Full Name: David Gerstetter
Organization: Ul Solutions
Affiliation: UL Solutions
Street Address:
City:
State:
Zip:
Submittal Date: Fri Aug 25 17:54:02 EDT 2023
Committee: NEC-P08

Committee Statement

Resolution: FR-7890-NFPA 70-2024
Statement: Renumbered to comply with the 2023 NEC Style Manual Section 2.2.1 regarding Listing Requirements.

Public Input No. 3529-NFPA 70-2023 [Section No. 369.6]

~~369.6~~ 2 Listing Requirements.

IBP and IBP systems shall be listed.

Statement of Problem and Substantiation for Public Input

This Public Input is being submitted on behalf of the NEC Correlating Committee Usability Task Group in order to provide correlation throughout the document. A new section is added to comply with the NEC Style Manual Section 2.2.1 regarding Listing Requirements.
2.2.1 Parallel Numbering Required. Technical committees shall use the following section numbers for the same purposes within articles. This requirement shall not apply to Articles 90, 100, and 110. If the article does not contain listing or reconditioning requirements, the subdivisions shall not be included in the article.
Required Parallel Numbering Format
XXX.1 Scope.
XXX.2 Listing Requirements.
XXX.3 Reconditioned Equipment.
XXX.3(A) Permitted to be Installed.
XXX.3(B) Not Permitted to be Installed.
The Usability Task Group members are: Derrick Atkins, David Hittinger, Richard Holub, Dean Hunter, Chad Kennedy and David Williams.

Submitter Information Verification

Submitter Full Name:	David Williams
Organization:	Delta Charter Township
Street Address:	
City:	
State:	
Zip:	
Submittal Date:	Mon Sep 04 17:42:39 EDT 2023
Committee:	NEC-P08

Committee Statement

Resolution: FR-7890-NFPA 70-2024

Statement: Renumbered to comply with the 2023 NEC Style Manual Section 2.2.1 regarding Listing Requirements.

Public Input No. 615-NFPA 70-2023 [New Section after 370.1]

370.2 Reconditioned Equipment

Cablebus shall not be reconditioned.

Statement of Problem and Substantiation for Public Input

Cablebus, Cables, Raceways, Conduits, Tubings, flexible Cords, Flexible Cables, Cable Trays, MV Cables, Wireways, etc. etc. are not permitted to be reconditioned per the NEMA Technical Position on Reconditioned Equipment (NEMA CS 100-2020, Appendix B.1)

Related Public Inputs for This Document

Related Input	Relationship
Public Input No. 624-NFPA 70-2023 [New Section after 388.1]	

Submitter Information Verification

Submitter Full Name: Russ Leblanc

Organization: Leblanc Consulting Services

Street Address:

City:

State:

Zip:

Submittal Date: Sun Apr 16 08:33:57 EDT 2023

Committee: NEC-P08

Committee Statement

Resolution: FR-7666-NFPA 70-2024

Statement: The panel is not aware of any established programs that provide an acceptable approach to reconditioning for this type of equipment. Section 110.20 indicates that equipment is permitted to be reconditioned unless otherwise prohibited.

Public Input No. 2668-NFPA 70-2023 [Section No. 370.60]

370.60 Grounding.

A cablebus system shall be grounded and/or bonded as applicable:

(1) Cablebus framework, where bonded, shall be permitted to be used as the equipment grounding conductor for branch circuits and feeders.

(2) A cablebus installation shall be grounded and bonded in accordance with Article 250, Part V and Part VI ~~of Article 250~~ , excluding 250.86, Exception No. 2.

Statement of Problem and Substantiation for Public Input

This Public Input is being submitted on behalf of the NEC Correlating Committee Usability Task Group in order to provide correlation throughout the document. The text is revised to to comply with the NEC Style Manual Section 4.1.4, regarding the use of Parts.
4.1.4 References to an Entire Article. References shall not be made to an entire article, except for the Article 100 or where referenced to provide the necessary context. References to specific parts within articles shall be permitted. References to all parts of an article shall not be permitted. The article number shall precede the part number.
The Usability Task Group members are: Derrick Atkins, David Hittinger, Richard Holub, Dean Hunter, Chad Kennedy and David Williams.

Submitter Information Verification

Submitter Full Name: David Williams
Organization: Delta Charter Township
Street Address:
City:
State:
Zip:
Submittal Date: Thu Aug 24 08:25:37 EDT 2023
Committee: NEC-P08

Committee Statement

Resolution: FR-7849-NFPA 70-2024

Statement: The text is revised to comply with the NEC Style Manual Section 4.1.4. As revised, the article number will precede the part number.

Public Input No. 2827-NFPA 70-2023 [Section No. 370.60]

370.~~60~~ 60 Equipment Grounding Conductor .

A cablebus system shall be grounded and/or bonded as applicable:

(1) Cablebus framework, where bonded, shall be permitted to be used as the equipment grounding conductor for branch circuits and feeders.

(2) A cablebus installation shall be grounded and bonded in accordance with Part V and Part VI of Article 250, excluding 250.86, Exception No. 2.

Statement of Problem and Substantiation for Public Input

The section title must be revised to match the technical requirement. In accordance with NEC style manual section 2.1.3.2 the title must be descriptive and concise with the intent of the requirement. See 215.6 Feeder Equipment Grounding Conductor, 320.108 Equipment Grounding Conductor, 330.108 Equipment Grounding Conductor, 334.108 Equipment Grounding Conductor, 410.182 Equipment Grounding Conductor, 547.27 Separate Equipment Grounding Conductor, 555.37 Equipment Grounding Conductor, and 690.45 Size of Equipment Grounding Conductors.

Submitter Information Verification

Submitter Full Name: Mike Holt

Organization: Mike Holt Enterprises Inc

Street Address:

City:

State:

Zip:

Submittal Date: Fri Aug 25 14:16:46 EDT 2023

Committee: NEC-P08

Committee Statement

Resolution: Changing the title does not add clarity. The current title is not in violation of the current NFPA Style Manual nor the 2023 NEC Style Manual. The grounding is not exclusive to Equipment Grounding Conductor. The Section is in place to address any grounding or bonding requirements. Section 250.118 does not have installation requirements for the equipment grounding conductors.

Public Input No. 3573-NFPA 70-2023 [Section No. 370.60]

370.60 Grounding and Bonding .

A cablebus system shall be grounded and/or bonded as applicable:

(1) Cablebus framework, where bonded, shall be permitted to be used as the equipment grounding conductor for branch circuits and feeders.

(2) A cablebus installation shall be grounded and bonded in accordance with Part V and Part VI of Article 250, excluding 250.86, Exception No. 2.

Statement of Problem and Substantiation for Public Input

There are 23 sections in Chapter 3 that have a .60 section. 19 of these sections are titled "Grounding." 3 of these sections are titled "Grounding and Bonding." 1 of these sections is titled "Equipment Grounding Conductor."
My suggestion is to rename all of these sections with "Grounding and Bonding."

Submitter Information Verification

Submitter Full Name:	Eric Stromberg
Organization:	Los Alamos National Laboratory
Affiliation:	Self
Street Address:	
City:	
State:	
Zip:	
Submittal Date:	Mon Sep 04 20:18:50 EDT 2023
Committee:	NEC-P08

Committee Statement

Resolution: CMP-8 maintains its position from the previous cycle. The submitter's Public Input is editorial in nature and has not provided a technical substantiation to change the title of this section. Changing the title does not add clarity. The purpose is to address equipment grounding conductors for connection to earth and ground fault management, not equipotential bonding.

Public Input No. 2868-NFPA 70-2023 [Section No. 371.6]

371.~~6~~ 2 Listing Requirements.

Flexible bus systems shall be listed.

Statement of Problem and Substantiation for Public Input

Per the 2023 NEC style manual, clause 2.2.1, “Required Parallel Numbering Format” Listing requirements should be moved from 371.6 to 371.2.

Submitter Information Verification

Submitter Full Name: David Gerstetter
Organization: Ul Solutions
Affiliation: UL Solutions
Street Address:
City:
State:
Zip:

Submittal Date: Fri Aug 25 17:57:02 EDT 2023
Committee: NEC-P08

Committee Statement

Resolution: FR-7850-NFPA 70-2024

Statement: The language from existing 371.6 is relocated without change as a new 371.2. This revision complies with the NEC Style Manual Section 2.2.1 regarding Listing Requirements and provides correlation and parallel numbering throughout the document.

Public Input No. 3530-NFPA 70-2023 [Section No. 371.6]

371.~~6~~ 2 Listing Requirements.

Flexible bus systems shall be listed.

Statement of Problem and Substantiation for Public Input

This Public Input is being submitted on behalf of the NEC Correlating Committee Usability Task Group in order to provide correlation throughout the document. A new section is added to comply with the NEC Style Manual Section 2.2.1 regarding Listing Requirements.
2.2.1 Parallel Numbering Required. Technical committees shall use the following section numbers for the same purposes within articles. This requirement shall not apply to Articles 90, 100, and 110. If the article does not contain listing or reconditioning requirements, the subdivisions shall not be included in the article.
Required Parallel Numbering Format
XXX.1 Scope.
XXX.2 Listing Requirements.
XXX.3 Reconditioned Equipment.
XXX.3(A) Permitted to be Installed.
XXX.3(B) Not Permitted to be Installed.
The Usability Task Group members are: Derrick Atkins, David Hittinger, Richard Holub, Dean Hunter, Chad Kennedy and David Williams.

Submitter Information Verification

Submitter Full Name: David Williams
Organization: Delta Charter Township
Street Address:
City:
State:
Zip:

Submittal Date: Mon Sep 04 17:43:36 EDT 2023
Committee: NEC-P08

Committee Statement

Resolution: FR-7850-NFPA 70-2024

Statement: The language from existing 371.6 is relocated without change as a new 371.2. This revision complies with the NEC Style Manual Section 2.2.1 regarding Listing Requirements and provides correlation and parallel numbering throughout the document.

Public Input No. 4459-NFPA 70-2023 [Section No. 371.10]

371.10 Uses Permitted.

Flexible bus systems shall be permitted for the following:

(1) Services, feeders, and branch circuits

(2) Indoors

(3) Outdoors where identified for outdoor use

(4) Installed in corrosive, wet, or damp locations where identified for use

(5) Exposed

(6) Behind access panels where the space behind the access panel is not used for air-handling purposes

(7) To penetrate through walls and floors in accordance with 371.18

(8) Air-handling spaces, as permitted by the listing

Statement of Problem and Substantiation for Public Input

There are applications in which all or a portion of a Flexible Bus System is advantageous to be installed in air-handling spaces. This is especially true for the Flexible Insulated Bus and any Support Brackets and Support Tray. For example, the terminations to distribution equipment may be outside air-handling space, but the conductor (Flexible Insulated Bus) and supports are positioned in air-handling space.

This rating is straightforward to manage within the scope of a listing through material ratings and testing.

Related Public Inputs for This Document

Related Input	Relationship
Public Input No. 4463-NFPA 70-2023 [Section No. 371.12]	
Public Input No. 4463-NFPA 70-2023 [Section No. 371.12]	

Submitter Information Verification

Submitter Full Name:	Ward Judson
Organization:	nVent Electric
Street Address:	
City:	
State:	
Zip:	
Submittal Date:	Thu Sep 07 15:45:37 EDT 2023
Committee:	NEC-P08

Committee Statement

Resolution: Insufficient substantiation has been provided to expand the "uses permitted" to include air handling spaces. Additionally, Section 1.5 of UL 1386 states that "These requirements do not cover the use of flexible bus systems in spaces used for environmental air handling as provided in 300.22 of NFPA 70."

Public Input No. 4463-NFPA 70-2023 [Section No. 371.12]

371.12 Uses Not Permitted.

Flexible bus systems shall not be permitted to be installed in the following:

(1) Hoistways

(2) Where exposed to severe physical damage

(3) Hazardous (classified) locations, unless specifically permitted in Chapter 5

(4) ~~Air-handling spaces~~

Statement of Problem and Substantiation for Public Input

This PI is coordinated with PI 4459 to move air-handling spaces to Uses Permitted.

There are applications in which it would be advantageous for at least a portion of the Flexible Bus System, especially the conductor and supports, to be routed in air-handling spaces.

The evaluation of this can be managed as part of the listing in terms of material ratings and testing.

Related Public Inputs for This Document

Related Input	Relationship
Public Input No. 4459-NFPA 70-2023 [Section No. 371.10]	
Public Input No. 4459-NFPA 70-2023 [Section No. 371.10]	

Submitter Information Verification

Submitter Full Name: Ward Judson
Organization: nVent Electric
Street Address:
City:
State:
Zip:
Submittal Date: Thu Sep 07 15:55:37 EDT 2023
Committee: NEC-P08

Committee Statement

Resolution: Insufficient substantiation has been provided to remove air handling spaces from the "uses not permitted". Additionally, Section 1.5 of UL 1386 states that "These requirements do not cover the use of flexible bus systems in spaces used for environmental air handling as provided in 300.22 of NFPA 70."

Public Input No. 3575-NFPA 70-2023 [Section No. 371.60]

371.60 Grounding and Bonding .

Conductive associated fitting supports for flexible bus systems shall be bonded together and grounded.

Statement of Problem and Substantiation for Public Input

There are 23 sections in Chapter 3 that have a .60 section. 19 of these sections are titled "Grounding." 3 of these sections are titled "Grounding and Bonding." 1 of these sections is titled "Equipment Grounding Conductor."
My suggestion is to rename all of these sections with "Grounding and Bonding."

Submitter Information Verification

Submitter Full Name:	Eric Stromberg
Organization:	Los Alamos National Laboratory
Affiliation:	Self
Street Address:	
City:	
State:	
Zip:	
Submittal Date:	Mon Sep 04 20:20:59 EDT 2023
Committee:	NEC-P08

Committee Statement

Resolution: CMP-8 maintains its position from the previous cycle. The submitter’s Public Input is editorial in nature and has not provided a technical substantiation to change the title of this section. Changing the title does not add clarity. The purpose is to address equipment grounding conductors for connection to earth and ground fault management, not equipotential bonding.

Public Input No. 2869-NFPA 70-2023 [Section No. 374.6]

~~374.6~~ 2 Listing Requirements.

Cellular metal floor raceways and associated fittings shall be listed.

Statement of Problem and Substantiation for Public Input

Per the 2023 NEC style manual, clause 2.2.1, "Required Parallel Numbering Format" Listing requirements should be moved from 374.6 to 374.2.

Submitter Information Verification

Submitter Full Name:	David Gerstetter
Organization:	UI Solutions
Affiliation:	UL Solutions
Street Address:	
City:	
State:	
Zip:	
Submittal Date:	Fri Aug 25 17:59:23 EDT 2023
Committee:	NEC-P08

Committee Statement

Resolution:	FR-7856-NFPA 70-2024
Statement:	The language from existing 374.6 is relocated without change as a new 374.2. This revision complies with the 2023 NEC Style Manual Section 2.2.1 regarding Listing Requirements and provides correlation and parallel numbering throughout the document.

Public Input No. 3531-NFPA 70-2023 [Section No. 374.6]

~~374.6~~ 2 Listing Requirements.

Cellular metal floor raceways and associated fittings shall be listed.

Statement of Problem and Substantiation for Public Input

This Public Input is being submitted on behalf of the NEC Correlating Committee Usability Task Group in order to provide correlation throughout the document. A new section is added to comply with the NEC Style Manual Section 2.2.1 regarding Listing Requirements.
2.2.1 Parallel Numbering Required. Technical committees shall use the following section numbers for the same purposes within articles. This requirement shall not apply to Articles 90, 100, and 110. If the article does not contain listing or reconditioning requirements, the subdivisions shall not be included in the article.
Required Parallel Numbering Format
XXX.1 Scope.
XXX.2 Listing Requirements.
XXX.3 Reconditioned Equipment.
XXX.3(A) Permitted to be Installed.
XXX.3(B) Not Permitted to be Installed.
The Usability Task Group members are: Derrick Atkins, David Hittinger, Richard Holub, Dean Hunter, Chad Kennedy and David Williams.

Submitter Information Verification

Submitter Full Name:	David Williams
Organization:	Delta Charter Township
Street Address:	
City:	
State:	
Zip:	
Submittal Date:	Mon Sep 04 17:44:37 EDT 2023
Committee:	NEC-P08

Committee Statement

Resolution: FR-7856-NFPA 70-2024

Statement: The language from existing 374.6 is relocated without change as a new 374.2. This revision complies with the 2023 NEC Style Manual Section 2.2.1 regarding Listing Requirements and provides correlation and parallel numbering throughout the document.

Public Input No. 620-NFPA 70-2023 [New Section after 376.1]

376.2 Reconditioned Equipment

Metal Wireways shall not be reconditioned.

Statement of Problem and Substantiation for Public Input

Fixture Wires, Cablebus, Cables, Raceways, Conduits, Tubings, Flexible Cords, Flexible Cables, Cable Trays, MV Cables, Wireways, etc. etc. are not permitted to be reconditioned per the NEMA Technical Position on Reconditioned Equipment (NEMA CS 100-2020, Appendix B.1)

Related Public Inputs for This Document

Related Input	Relationship
Public Input No. 624-NFPA 70-2023 [New Section after 388.1]	

Submitter Information Verification

Submitter Full Name:	Russ Leblanc
Organization:	Leblanc Consulting Services
Street Address:	
City:	
State:	
Zip:	
Submittal Date:	Sun Apr 16 08:45:09 EDT 2023
Committee:	NEC-P08

Committee Statement

Resolution: FR-7651-NFPA 70-2024

Statement: The panel is not aware of any established programs that provide an acceptable approach to reconditioning for this type of equipment. Section 110.20 indicates that equipment is permitted to be reconditioned unless otherwise prohibited.

Public Input No. 339-NFPA 70-2023 [Section No. 376.22(A)]

(A) Cross-Sectional Areas of Wireway.

The sum of the cross-sectional areas of all contained conductors and cables at any cross section of a wireway shall not exceed 20 percent of the interior cross-sectional area of the wireway.
<u>When calculating the maximum number of conductors or cables permitted in a wireway, all of the same size (total cross-sectional area including insulation), the next higher whole number shall be used to determine the maximum number of conductors permitted when the calculation results in a decimal greater than or equal to 0.8.</u>

Statement of Problem and Substantiation for Public Input

Note 7 to Table 1 in Chapter 9 permits this method for calculating the number of conductors permitted in conduit or tubing. With the maximum permitted fill for wireways set at one half of that for conduit and tubing, it seems this same rounding method should be permitted for the wireway conductor fill.

Submitter Information Verification

Submitter Full Name: Don Ganiere
Organization: none
Street Address:
City:
State:
Zip:
Submittal Date: Wed Feb 15 17:05:50 EST 2023
Committee: NEC-P08

Committee Statement

Resolution: The existing language is clear, and the proposed additional language is not necessary. Additional substantiation is required to modify the fill limits.

Public Input No. 3160-NFPA 70-2023 [Section No. 376.23(B)]

(B) Metal Wireways Used as Pull Boxes.

Where insulated conductors 4 AWG or larger are pulled through a wireway, the ~~distance between raceway and cable entries enclosing the same conductor~~ wireway shall not be less than that required by 314.28(A)(1) for straight pulls ~~and~~ , 314.28(A)(2) for angle pulls, and 314 .28(A)(2) for the distance between raceway and cable entries enclosing the same conductor. When transposing cable size into raceway size, the minimum metric designator (trade size) raceway required for the number and size of conductors in the cable shall be used.

Statement of Problem and Substantiation for Public Input

The revised text is intended to make the rule clear for Code users on how to properly size the wireway. Relocating text about “the distance between raceway and cable entries enclosing the same conductor” to properly reference 314.28(A)(2) for this requirement.

Submitter Information Verification

Submitter Full Name: Mike Holt
Organization: Mike Holt Enterprises Inc
Street Address:
City:
State:
Zip:
Submittal Date: Tue Aug 29 20:22:54 EDT 2023
Committee: NEC-P08

Committee Statement

Resolution: The proposed revision would add requirements for wireway size to this section in lieu of pulling distance between the conduit entries.

Public Input No. 2277-NFPA 70-2023 [Section No. 376.30]

376.30 ~~Securing and~~ Supporting.

Metal wireways shall be supported in accordance with 376.30(A) and (B).

(A) Horizontal Support.

Wireways shall be supported where run horizontally at each end and at intervals not to exceed 1.5 m (5 ft) or for individual lengths longer than 1.5 m (5 ft) at each end or joint, unless listed for other support intervals. The distance between supports shall not exceed 3 m (10 ft).

(B) Vertical Support.

Vertical runs of wireways shall be securely supported at intervals not exceeding 4.5 m (15 ft) and shall not have more than one joint between supports. Adjoining wireway sections shall be securely fastened together to provide a rigid joint.

Statement of Problem and Substantiation for Public Input

Both 376.30A(A) and (B) only have supporting requitements. Removing ‘Securing’ would make the title technically correct.

Submitter Information Verification

Submitter Full Name: Mike Holt
Organization: Mike Holt Enterprises Inc
Street Address:
City:
State:
Zip:
Submittal Date: Tue Aug 15 15:16:11 EDT 2023
Committee: NEC-P08

Committee Statement

Resolution: The proposed change is not necessary. The requirements are clear and the title of 376.30 is consistent with most of the other x.30 sections for wiring methods in Chapter 3.

Public Input No. 2278-NFPA 70-2023 [Section No. 376.56(B)(1)]

(1) Installation.

Power distribution blocks installed in metal wireways shall be listed. ~~Power distribution blocks installed on the line side of the service equipment shall be marked "suitable for use on the line side of service equipment" or equivalent.~~

Statement of Problem and Substantiation for Public Input

Deleting this language would remove redundancy with 230.46 which already requires the power distribution blocks on service conductors to be marked. This proposed revision will remove redundancy for Code users.

Submitter Information Verification

Submitter Full Name: Mike Holt
Organization: Mike Holt Enterprises Inc
Street Address:
City:
State:
Zip:
Submittal Date: Tue Aug 15 15:17:59 EDT 2023
Committee: NEC-P08

Committee Statement

Resolution: FR-7860-NFPA 70-2024
Statement: The second sentence of 376.56(B)(1) is removed as it is redundant with the requirements of 230.46.

Public Input No. 3576-NFPA 70-2023 [Section No. 376.60]

376.60 Grounding and Bonding .

Listed metal wireway shall be permitted as an equipment grounding conductor in accordance with 250.118(A)(13).

Statement of Problem and Substantiation for Public Input

There are 23 sections in Chapter 3 that have a .60 section. 19 of these sections are titled "Grounding." 3 of these sections are titled "Grounding and Bonding." 1 of these sections is titled "Equipment Grounding Conductor."
My suggestion is to rename all of these sections with "Grounding and Bonding."

Submitter Information Verification

Submitter Full Name: Eric Stromberg
Organization: Los Alamos National Laboratory
Affiliation: Self
Street Address:
City:
State:
Zip:

Submittal Date: Mon Sep 04 20:23:05 EDT 2023
Committee: NEC-P08

Committee Statement

Resolution: CMP-8 maintains its position from the previous cycle. The submitter’s Public Input is editorial in nature and has not provided a technical substantiation to change the title of this section. Changing the title does not add clarity. The purpose is to address equipment grounding conductors for connection to earth and ground fault management, not equipotential bonding.

Public Input No. 621-NFPA 70-2023 [New Section after 378.1]

378.2 Reconditioned Equipment

Nonmetallic Wireways shall not be reconditioned.

Statement of Problem and Substantiation for Public Input

Fixture Wires, Cablebus, Cables, Raceways, Conduits, Tubings, Flexible Cords, Flexible Cables, Cable Trays, MV Cables, Wireways, etc. etc. are not permitted to be reconditioned per the NEMA Technical Position on Reconditioned Equipment (NEMA CS 100-2020, Appendix B.1)

Related Public Inputs for This Document

Related Input	Relationship
Public Input No. 624-NFPA 70-2023 [New Section after 388.1]	

Submitter Information Verification

Submitter Full Name: Russ Leblanc

Organization: Leblanc Consulting Services

Street Address:

City:

State:

Zip:

Submittal Date: Sun Apr 16 08:46:25 EDT 2023

Committee: NEC-P08

Committee Statement

Resolution: FR-7644-NFPA 70-2024

Statement: The panel is not aware of any established programs that provide an acceptable approach to reconditioning for this type of equipment and maintain its listing. Section 110.20 indicates that equipment is permitted to be reconditioned unless otherwise prohibited.

Public Input No. 2870-NFPA 70-2023 [Section No. 378.6]

~~378.6~~ 2 Listing Requirements.

Nonmetallic wireways and associated fittings shall be listed.

Statement of Problem and Substantiation for Public Input

Per the 2023 NEC style manual, clause 2.2.1, "Required Parallel Numbering Format" Listing requirements should be relocated from 378.6 to 378.2.

Submitter Information Verification

Submitter Full Name: David Gerstetter
Organization: Ul Solutions
Affiliation: UL Solutions
Street Address:
City:
State:
Zip:

Submittal Date: Fri Aug 25 18:05:17 EDT 2023
Committee: NEC-P08

Committee Statement

Resolution: FR-7504-NFPA 70-2024

Statement: Updated to comply with 2023 NEC style manual, clause 2.2.1, "Required Parallel Numbering Format" Listing requirements should be relocated from 378.6 to 378.2.

Public Input No. 3532-NFPA 70-2023 [Section No. 378.6]

378.~~6~~ 2 Listing Requirements.

Nonmetallic wireways and associated fittings shall be listed.

Statement of Problem and Substantiation for Public Input

This Public Input is being submitted on behalf of the NEC Correlating Committee Usability Task Group in order to provide correlation throughout the document. A new section is added to comply with the NEC Style Manual Section 2.2.1 regarding Listing Requirements.
2.2.1 Parallel Numbering Required. Technical committees shall use the following section numbers for the same purposes within articles. This requirement shall not apply to Articles 90, 100, and 110. If the article does not contain listing or reconditioning requirements, the subdivisions shall not be included in the article.
Required Parallel Numbering Format
XXX.1 Scope.
XXX.2 Listing Requirements.
XXX.3 Reconditioned Equipment.
XXX.3(A) Permitted to be Installed.
XXX.3(B) Not Permitted to be Installed.
The Usability Task Group members are: Derrick Atkins, David Hittinger, Richard Holub, Dean Hunter, Chad Kennedy and David Williams.

Submitter Information Verification

Submitter Full Name:	David Williams
Organization:	Delta Charter Township
Street Address:	
City:	
State:	
Zip:	
Submittal Date:	Mon Sep 04 17:48:12 EDT 2023
Committee:	NEC-P08

Committee Statement

Resolution: FR-7504-NFPA 70-2024

Statement: Updated to comply with 2023 NEC style manual, clause 2.2.1, “Required Parallel Numbering Format” Listing requirements should be relocated from 378.6 to 378.2.

Public Input No. 1539-NFPA 70-2023 [Section No. 378.44]

378.44 Expansion Fittings.

Expansion fittings for nonmetallic wireway shall be provided to compensate for thermal expansion and contraction where the length change, in accordance with Table 352.44(A), is expected to be 6 mm (0.25 in.) or greater in a straight run.

~~Informational Note: See Table 352.44(A) for expansion characteristics of PVC conduit. The expansion characteristics of PVC nonmetallic wireway are identical.~~

Statement of Problem and Substantiation for Public Input

By adding this reference to the parent text of 378.44, clarity is added and the informational note is no longer needed. The reference to Table 352.44(A) is now enforceable.

Submitter Information Verification

Submitter Full Name:	John McCamish
Organization:	NECA IBEW Electrical Training
Affiliation:	Self
Street Address:	
City:	
State:	
Zip:	
Submittal Date:	Mon Jul 24 17:24:49 EDT 2023
Committee:	NEC-P08

Committee Statement

Resolution: FR-7507-NFPA 70-2024

Statement: Transitioned from informational note to text within 378.44 and clarified the reference to table 352.44(A) applies to non-metallic wireways.

Public Input No. 149-NFPA 70-2023 [Section No. 378.60]

~~**378.60** Grounding.~~

~~Where equipment grounding is required, a separate grounding conductor shall be installed in the nonmetallic wireway. A separate equipment grounding conductor shall not be required where the grounded conductor is used to ground equipment as permitted in 250.142 .~~

Statement of Problem and Substantiation for Public Input

Grounding and bonding requirements belong in Article 250. It makes absolutely no sense to have grounding requirements in an Article about a nonmetallic wiring method that provides no grounding or bonding. Article 250 adequately covers grounding and bonding requirements. This requirement is superfluous, incomplete and may cause conflicts with Article 250 requirements.

Related Public Inputs for This Document

Related Input	Relationship
Public Input No. 148-NFPA 70-2023 [Section No. 362.60]	Grounding requirements belongs in Article 250
Public Input No. 147-NFPA 70-2023 [Section No. 356.60]	Grounding requirements belongs in Article 250
Public Input No. 146-NFPA 70-2023 [Section No. 355.60]	Grounding requirements belongs in Article 250
Public Input No. 145-NFPA 70-2023 [Section No. 354.60]	Grounding requirements belongs in Article 250
Public Input No. 144-NFPA 70-2023 [Section No. 353.60]	Grounding requirements belongs in Article 250
Public Input No. 143-NFPA 70-2023 [Section No. 352.60]	Grounding requirements belongs in Article 250
Public Input No. 150-NFPA 70-2023 [Section No. 388.60]	

Submitter Information Verification

Submitter Full Name: Russ Leblanc
Organization: Leblanc Consulting Services
Street Address:
City:
State:
Zip:
Submittal Date: Thu Jan 12 08:41:53 EST 2023
Committee: NEC-P08

Committee Statement

Resolution: FR-7580-NFPA 70-2024

Statement: Section 250.118 does not permit non-conductive raceways to be used as an equipment grounding conductor (EGC). The requirements for having a wire type equipment grounding conductor complying with Article 250 Part VI for this wiring method is already provided in other parts of this Code.

Section 250.118 for permitted EGCs does not reference nonmetallic wiring methods and only allows metal raceways, cable tray, and similar metal wiring methods to be used as equipment grounding conductors. The xxx.60 section for this article is being removed to eliminate any confusion for installing an equipment grounding conductor with this non-metallic wiring method. Changing the title in this section and adding ‘of the wire type’ does not add clarity.

Public Input No. 2828-NFPA 70-2023 [Section No. 378.60]

378.~~60~~ 60 Equipment Grounding Conductor .

Where equipment grounding is required, a separate grounding conductor shall be installed in the nonmetallic wireway. A separate equipment grounding conductor shall not be required where the grounded conductor is used to ground equipment as permitted in 250.142.

Statement of Problem and Substantiation for Public Input

The section title must be revised to match the technical requirement. In accordance with NEC style manual section 2.1.3.2 the title must be descriptive and concise with the intent of the requirement. See 215.6 Feeder Equipment Grounding Conductor, 320.108 Equipment Grounding Conductor, 330.108 Equipment Grounding Conductor, 334.108 Equipment Grounding Conductor, 410.182 Equipment Grounding Conductor, 547.27 Separate Equipment Grounding Conductor, 555.37 Equipment Grounding Conductor, and 690.45 Size of Equipment Grounding Conductors.

Submitter Information Verification

Submitter Full Name: Mike Holt
Organization: Mike Holt Enterprises Inc
Street Address:
City:
State:
Zip:
Submittal Date: Fri Aug 25 14:17:47 EDT 2023
Committee: NEC-P08

Committee Statement

Resolution: FR-7580-NFPA 70-2024

Statement: Section 250.118 does not permit non-conductive raceways to be used as an equipment grounding conductor (EGC). The requirements for having a wire type equipment grounding conductor complying with Article 250 Part VI for this wiring method is already provided in other parts of this Code.

Section 250.118 for permitted EGCs does not reference nonmetallic wiring methods and only allows metal raceways, cable tray, and similar metal wiring methods to be used as equipment grounding conductors. The xxx.60 section for this article is being removed to eliminate any confusion for installing an equipment grounding conductor with this non-metallic wiring method. Changing the title in this section and adding 'of the wire type' does not add clarity.

Public Input No. 3577-NFPA 70-2023 [Section No. 378.60]

378.60 Grounding and Bonding .

Where equipment grounding is required, a separate equipment grounding conductor of the wire type shall be installed in the nonmetallic wireway. A separate equipment grounding conductor shall not be required where the grounded conductor is used to ground equipment as permitted in 250.142.

Statement of Problem and Substantiation for Public Input

There are 23 sections in Chapter 3 that have a .60 section. 19 of these sections are titled "Grounding." 3 of these sections are titled "Grounding and Bonding." 1 of these sections is titled "Equipment Grounding Conductor."
My suggestion is to rename all of these sections with "Grounding and Bonding."

Also, added 'of the wire type' for consistency

Submitter Information Verification

Submitter Full Name: Eric Stromberg
Organization: Los Alamos National Laboratory
Affiliation: Self
Street Address:
City:
State:
Zip:

Submittal Date: Mon Sep 04 20:24:19 EDT 2023
Committee: NEC-P08

Committee Statement

Resolution: FR-7580-NFPA 70-2024

Statement: Section 250.118 does not permit non-conductive raceways to be used as an equipment grounding conductor (EGC). The requirements for having a wire type equipment grounding conductor complying with Article 250 Part VI for this wiring method is already provided in other parts of this Code.

Section 250.118 for permitted EGCs does not reference nonmetallic wiring methods and only allows metal raceways, cable tray, and similar metal wiring methods to be used as equipment grounding conductors. The xxx.60 section for this article is being removed to eliminate any confusion for installing an equipment grounding conductor with this non-metallic wiring method. Changing the title in this section and adding ‘of the wire type’ does not add clarity.

Public Input No. 696-NFPA 70-2023 [Section No. 378.60]

378.60 Grounding.

Where equipment grounding is required, ~~a separate~~ an equipment grounding conductor shall be installed in the nonmetallic wireway. A separate equipment grounding conductor shall not be required where the grounded conductor is used to ground equipment as permitted in 250.142.

Statement of Problem and Substantiation for Public Input

The term "grounding conductor" has not been used in the NEC for over a decade. It was deleted because it had no value and the NEC does not indicate how to install it, size it, or protect it...because there is no such term.

Related Public Inputs for This Document

Related Input	Relationship
Public Input No. 689-NFPA 70-2023 [Section No. 352.60]	Same issue
Public Input No. 690-NFPA 70-2023 [Section No. 353.60]	Same issue
Public Input No. 692-NFPA 70-2023 [Section No. 354.60]	Same issue
Public Input No. 693-NFPA 70-2023 [Section No. 355.60]	Same issue
Public Input No. 694-NFPA 70-2023 [Section No. 356.60]	Same issue
Public Input No. 695-NFPA 70-2023 [Section No. 362.60]	Same issue
Public Input No. 697-NFPA 70-2023 [Section No. 388.60]	

Submitter Information Verification

Submitter Full Name: Ryan Jackson

Organization: Self-employed

Affiliation: Steel Tube Institute

Street Address:

City:

State:

Zip:

Submittal Date: Thu Apr 20 15:32:10 EDT 2023

Committee: NEC-P08

Committee Statement

Resolution: FR-7580-NFPA 70-2024

Statement: Section 250.118 does not permit non-conductive raceways to be used as an equipment grounding conductor (EGC). The requirements for having a wire type equipment grounding conductor complying with Article 250 Part VI for this wiring method is already provided in other parts of this Code.

Section 250.118 for permitted EGCs does not reference nonmetallic wiring methods and only allows metal raceways, cable tray, and similar metal wiring methods to be used as equipment grounding conductors. The xxx.60 section for this article is being removed to eliminate any confusion for installing an equipment grounding conductor with this non-metallic wiring method. Changing the title in this section and adding ‘of the wire type’ does not add clarity.

Public Input No. 622-NFPA 70-2023 [New Section after 384.1]

384.2 Reconditioned Equipment

Strut-type channel raceways shall not be reconditioned.

Statement of Problem and Substantiation for Public Input

Strut-type Channel Raceways, Fixture Wires, Cablebus, Cables, Raceways, Conduits, Tubings, Flexible Cords, Flexible Cables, Cable Trays, MV Cables, Wireways, etc. etc. are not permitted to be reconditioned per the NEMA Technical Position on Reconditioned Equipment (NEMA CS 100-2020, Appendix B.1)

Related Public Inputs for This Document

Related Input	Relationship
Public Input No. 624-NFPA 70-2023 [New Section after 388.1]	

Submitter Information Verification

Submitter Full Name: Russ Leblanc

Organization: Leblanc Consulting Services

Street Address:

City:

State:

Zip:

Submittal Date: Sun Apr 16 08:47:57 EDT 2023

Committee: NEC-P08

Committee Statement

Resolution: FR-7652-NFPA 70-2024

Statement: The panel is not aware of any established programs that provide an acceptable approach to reconditioning for this type of equipment and maintain its listing. Section 110.20 indicates that equipment is permitted to be reconditioned unless otherwise prohibited.

Public Input No. 2873-NFPA 70-2023 [Section No. 384.6]

~~384.6~~ 2 Listing Requirements.

Strut-type channel raceways and accessories shall be listed and identified for such use.

Statement of Problem and Substantiation for Public Input

Per the 2023 NEC style manual, clause 2.2.1, “Required Parallel Numbering Format” Listing requirements should be relocated from 384.6 to 384.2.

Submitter Information Verification

Submitter Full Name:	David Gerstetter
Organization:	Ul Solutions
Affiliation:	UL Solutions
Street Address:	
City:	
State:	
Zip:	
Submittal Date:	Fri Aug 25 18:20:45 EDT 2023
Committee:	NEC-P08

Committee Statement

Resolution: FR-7892-NFPA 70-2024

Statement: Per the 2023 NEC style manual, clause 2.2.1, “Required Parallel Numbering Format” Listing requirements should be relocated from 384.6 to 384.2.

Public Input No. 3534-NFPA 70-2023 [Section No. 384.6]

384.~~6~~ 2 Listing Requirements.

Strut-type channel raceways and accessories shall be listed and identified for such use.

Statement of Problem and Substantiation for Public Input

This Public Input is being submitted on behalf of the NEC Correlating Committee Usability Task Group in order to provide correlation throughout the document. A new section is added to comply with the NEC Style Manual Section 2.2.1 regarding Listing Requirements.
2.2.1 Parallel Numbering Required. Technical committees shall use the following section numbers for the same purposes within articles. This requirement shall not apply to Articles 90, 100, and 110. If the article does not contain listing or reconditioning requirements, the subdivisions shall not be included in the article.
Required Parallel Numbering Format
XXX.1 Scope.
XXX.2 Listing Requirements.
XXX.3 Reconditioned Equipment.
XXX.3(A) Permitted to be Installed.
XXX.3(B) Not Permitted to be Installed.
The Usability Task Group members are: Derrick Atkins, David Hittinger, Richard Holub, Dean Hunter, Chad Kennedy and David Williams.

Submitter Information Verification

Submitter Full Name: David Williams
Organization: Delta Charter Township
Street Address:
City:
State:
Zip:

Submittal Date: Mon Sep 04 17:51:08 EDT 2023
Committee: NEC-P08

Committee Statement

Resolution: FR-7892-NFPA 70-2024

Statement: Per the 2023 NEC style manual, clause 2.2.1, “Required Parallel Numbering Format” Listing requirements should be relocated from 384.6 to 384.2.

Public Input No. 2830-NFPA 70-2023 [Section No. 384.60]

384.~~60~~ 60 Equipment Grounding Conductor .

Strut-type channel raceway enclosures providing a transition to or from other wiring methods shall have a means for connecting an equipment grounding conductor. Strut-type channel raceways shall be permitted as an equipment grounding conductor in accordance with 250.118(A)(13). Where a snap-fit metal cover for strut-type channel raceways is used to achieve electrical continuity in accordance with the listing, this cover shall not be permitted as the means for providing electrical continuity for a receptacle mounted in the cover.

Statement of Problem and Substantiation for Public Input

The section title must be revised to match the technical requirement. In accordance with NEC style manual section 2.1.3.2 the title must be descriptive and concise with the intent of the requirement. See 215.6 Feeder Equipment Grounding Conductor, 320.108 Equipment Grounding Conductor, 330.108 Equipment Grounding Conductor, 334.108 Equipment Grounding Conductor, 410.182 Equipment Grounding Conductor, 547.27 Separate Equipment Grounding Conductor, 555.37 Equipment Grounding Conductor, and 690.45 Size of Equipment Grounding Conductors.

Submitter Information Verification

Submitter Full Name: Mike Holt

Organization: Mike Holt Enterprises Inc

Street Address:

City:

State:

Zip:

Submittal Date: Fri Aug 25 14:18:50 EDT 2023

Committee: NEC-P08

Committee Statement

Resolution: Changing the title does not add clarity. The current title is not in violation of the current NFPA Style Manual nor the 2023 NEC Style Manual. The grounding is not exclusive to Equipment Grounding Conductor. The Section is in place to address any grounding or bonding requirements. Section 250.118 does not have installation requirements for the equipment grounding conductors.

Public Input No. 3578-NFPA 70-2023 [Section No. 384.60]

384.60 Grounding and Bonding .

Strut-type channel raceway enclosures providing a transition to or from other wiring methods shall have a means for connecting an equipment grounding conductor. Strut-type channel raceways shall be permitted as an equipment grounding conductor in accordance with 250.118(A)(13). Where a snap-fit metal cover for strut-type channel raceways is used to achieve electrical continuity in accordance with the listing, this cover shall not be permitted as the means for providing electrical continuity for a receptacle mounted in the cover.

Statement of Problem and Substantiation for Public Input

There are 23 sections in Chapter 3 that have a .60 section. 19 of these sections are titled "Grounding." 3 of these sections are titled "Grounding and Bonding." 1 of these sections is titled "Equipment Grounding Conductor."
My suggestion is to rename all of these sections with "Grounding and Bonding."

Submitter Information Verification

Submitter Full Name: Eric Stromberg
Organization: Los Alamos National Laboratory
Affiliation: Self
Street Address:
City:
State:
Zip:

Submittal Date: Mon Sep 04 20:27:42 EDT 2023
Committee: NEC-P08

Committee Statement

Resolution: CMP-8 maintains its position from the previous cycle. The submitter’s Public Input is editorial in nature and has not provided a technical substantiation to change the title of this section. Changing the title does not add clarity. The purpose is to address equipment grounding conductors for connection to earth and ground fault management, not equipotential bonding.

Public Input No. 623-NFPA 70-2023 [New Section after 386.1]

386.2 Reconditioned Equipment
Surface Metal Raceways shall not be reconditioned.

Statement of Problem and Substantiation for Public Input

Raceways, Strut-type Channel Raceways, Fixture Wires, Cablebus, Cables, Conduits, Tubings, Flexible Cords, Flexible Cables, Cable Trays, MV Cables, Wireways, etc. etc. are not permitted to be reconditioned per the NEMA Technical Position on Reconditioned Equipment (NEMA CS 100-2020, Appendix B.1)

Related Public Inputs for This Document

Related Input	Relationship
Public Input No. 624-NFPA 70-2023 [New Section after 388.1]	

Submitter Information Verification

Submitter Full Name: Russ Leblanc
Organization: Leblanc Consulting Services
Street Address:
City:
State:
Zip:

Submittal Date: Sun Apr 16 08:49:59 EDT 2023
Committee: NEC-P08

Committee Statement

Resolution: FR-7653-NFPA 70-2024

Statement: The panel is not aware of any established programs that provide an acceptable approach to reconditioning for this type of equipment and maintain its listing. Section 110.20 indicates that equipment is permitted to be reconditioned unless otherwise prohibited.

Public Input No. 2874-NFPA 70-2023 [Section No. 386.6]

386.~~6~~ 2 Listing Requirements.

Surface metal raceway and associated fittings shall be listed.

Statement of Problem and Substantiation for Public Input

Per the 2023 NEC style manual, clause 2.2.1, "Required Parallel Numbering Format" Listing requirements should be relocated from 386.6 to 386.2.

Submitter Information Verification

Submitter Full Name: David Gerstetter
Organization: UI Solutions
Affiliation: UL Solutions
Street Address:
City:
State:
Zip:

Submittal Date: Fri Aug 25 18:23:05 EDT 2023
Committee: NEC-P08

Committee Statement

Resolution: FR-7893-NFPA 70-2024

Statement: Renumbered to comply with the 2023 NEC Style Manual Section 2.2.1 regarding Listing Requirements.

Public Input No. 3535-NFPA 70-2023 [Section No. 386.6]

386.~~6~~ 2 Listing Requirements.

Surface metal raceway and associated fittings shall be listed.

Statement of Problem and Substantiation for Public Input

This Public Input is being submitted on behalf of the NEC Correlating Committee Usability Task Group in order to provide correlation throughout the document. A new section is added to comply with the NEC Style Manual Section 2.2.1 regarding Listing Requirements.
2.2.1 Parallel Numbering Required. Technical committees shall use the following section numbers for the same purposes within articles. This requirement shall not apply to Articles 90, 100, and 110. If the article does not contain listing or reconditioning requirements, the subdivisions shall not be included in the article.
Required Parallel Numbering Format
XXX.1 Scope.
XXX.2 Listing Requirements.
XXX.3 Reconditioned Equipment.
XXX.3(A) Permitted to be Installed.
XXX.3(B) Not Permitted to be Installed.
The Usability Task Group members are: Derrick Atkins, David Hittinger, Richard Holub, Dean Hunter, Chad Kennedy and David Williams.

Submitter Information Verification

Submitter Full Name: David Williams
Organization: Delta Charter Township
Street Address:
City:
State:
Zip:

Submittal Date: Mon Sep 04 17:51:46 EDT 2023
Committee: NEC-P08

Committee Statement

Resolution: FR-7893-NFPA 70-2024

Statement: Renumbered to comply with the 2023 NEC Style Manual Section 2.2.1 regarding Listing Requirements.

Public Input No. 2832-NFPA 70-2023 [Section No. 386.60]

386.~~60~~ 60 Equipment Grounding Conductor .

Surface metal raceway enclosures providing a transition from other wiring methods shall have a means for connecting an equipment grounding conductor.

Statement of Problem and Substantiation for Public Input

The section title must be revised to match the technical requirement. In accordance with NEC style manual section 2.1.3.2 the title must be descriptive and concise with the intent of the requirement. See 215.6 Feeder Equipment Grounding Conductor, 320.108 Equipment Grounding Conductor, 330.108 Equipment Grounding Conductor, 334.108 Equipment Grounding Conductor, 410.182 Equipment Grounding Conductor, 547.27 Separate Equipment Grounding Conductor, 555.37 Equipment Grounding Conductor, and 690.45 Size of Equipment Grounding Conductors.

Submitter Information Verification

Submitter Full Name: Mike Holt
Organization: Mike Holt Enterprises Inc
Street Address:
City:
State:
Zip:
Submittal Date: Fri Aug 25 14:20:08 EDT 2023
Committee: NEC-P08

Committee Statement

Resolution: Changing the title does not add clarity. The current title is not in violation of the current NFPA Style Manual nor the 2023 NEC Style Manual. The grounding is not exclusive to Equipment Grounding Conductor. The Section is in place to address any grounding or bonding requirements. Section 250.118 does not have installation requirements for the equipment grounding conductors.

Public Input No. 3579-NFPA 70-2023 [Section No. 386.60]

386.60 Grounding and Bonding .

Surface metal raceway enclosures providing a transition from other wiring methods shall have a means for connecting an equipment grounding conductor.

Statement of Problem and Substantiation for Public Input

There are 23 sections in Chapter 3 that have a .60 section. 19 of these sections are titled "Grounding." 3 of these sections are titled "Grounding and Bonding." 1 of these sections is titled "Equipment Grounding Conductor."
My suggestion is to rename all of these sections with "Grounding and Bonding."

Submitter Information Verification

Submitter Full Name: Eric Stromberg
Organization: Los Alamos National Laboratory
Affiliation: Self
Street Address:
City:
State:
Zip:
Submittal Date: Mon Sep 04 20:29:45 EDT 2023
Committee: NEC-P08

Committee Statement

Resolution: CMP-8 maintains its position from the previous cycle. The submitter’s Public Input is editorial in nature and has not provided a technical substantiation to change the title of this section. Changing the title does not add clarity. The purpose is to address equipment grounding conductors for connection to earth and ground fault management, not equipotential bonding.

Public Input No. 624-NFPA 70-2023 [New Section after 388.1]

388.2 Reconditioned Equipment

Surface Nonmetallic Raceways shall not be reconditioned.

Statement of Problem and Substantiation for Public Input

Raceways, Strut-type Channel Raceways, Fixture Wires, Cablebus, Cables, Conduits, Tubings, Flexible Cords, Flexible Cables, Cable Trays, MV Cables, Wireways, etc. etc. are not permitted to be reconditioned per the NEMA Technical Position on Reconditioned Equipment (NEMA CS 100-2020, Appendix B.1)

Related Public Inputs for This Document

Related Input	Relationship
Public Input No. 598-NFPA 70-2023 [New Section after 356.1]	Reconditioned Equipment
Public Input No. 599-NFPA 70-2023 [New Section after 360.1]	Reconditioned Equipment
Public Input No. 600-NFPA 70-2023 [New Section after 352.1]	Reconditioned Equipment
Public Input No. 602-NFPA 70-2023 [New Section after 353.1]	Reconditioned Equipment
Public Input No. 601-NFPA 70-2023 [New Section after 354.1]	Reconditioned Equipment
Public Input No. 603-NFPA 70-2023 [New Section after 355.1]	Reconditioned Equipment
Public Input No. 604-NFPA 70-2023 [New Section after 320.1]	Reconditioned Equipment
Public Input No. 605-NFPA 70-2023 [New Section after 322.1]	Reconditioned Equipment
Public Input No. 606-NFPA 70-2023 [New Section after 324.1]	Reconditioned Equipment
Public Input No. 607-NFPA 70-2023 [New Section after 326.1]	Reconditioned Equipment
Public Input No. 608-NFPA 70-2023 [New Section after 330.1]	Reconditioned Equipment
Public Input No. 609-NFPA 70-2023 [New Section after 332.1]	Reconditioned Equipment
Public Input No. 610-NFPA 70-2023 [New Section after 334.1]	Reconditioned Equipment
Public Input No. 611-NFPA 70-2023 [New Section after 337.1]	Reconditioned Equipment
Public Input No. 612-NFPA 70-2023 [New Section after 338.1]	Reconditioned Equipment
Public Input No. 613-NFPA 70-2023 [New Section after 336.1]	Reconditioned Equipment
Public Input No. 614-NFPA 70-2023 [New Section after 340.1]	Reconditioned Equipment
Public Input No. 615-NFPA 70-2023 [New Section after 370.1]	Reconditioned Equipment
Public Input No. 616-NFPA 70-2023 [New Section after 392.1]	Reconditioned Equipment
Public Input No. 617-NFPA 70-2023 [New Section after 400.6]	Reconditioned Equipment
Public Input No. 618-NFPA 70-2023 [New Section after 402.14]	Reconditioned Equipment
Public Input No. 619-NFPA 70-2023 [New Section after 315.1]	Reconditioned Equipment
Public Input No. 620-NFPA 70-2023 [New Section after 376.1]	Reconditioned Equipment
Public Input No. 621-NFPA 70-2023 [New Section after 378.1]	Reconditioned Equipment
Public Input No. 622-NFPA 70-2023 [New Section after 384.1]	Reconditioned Equipment
Public Input No. 623-NFPA 70-2023 [New Section after 386.1]	Reconditioned Equipment
Public Input No. 625-NFPA 70-2023 [New Section after 310.1]	

Submitter Information Verification

Submitter Full Name: Russ Leblanc
Organization: Leblanc Consulting Services
Street Address:
City:
State:
Zip:
Submittal Date: Sun Apr 16 08:52:18 EDT 2023
Committee: NEC-P08

Committee Statement

Resolution: FR-7654-NFPA 70-2024

Statement: The panel is not aware of any established programs that provide an acceptable approach to reconditioning for this type of equipment and maintain its listing. Section 110.20 indicates that equipment is permitted to be reconditioned unless otherwise prohibited.

Public Input No. 2875-NFPA 70-2023 [Section No. 388.6]

388.~~6~~ 2 Listing Requirements.

Surface nonmetallic raceway and associated fittings shall be listed.

Statement of Problem and Substantiation for Public Input

Per the 2023 NEC style manual, clause 2.2.1, "Required Parallel Numbering Format" Listing requirements should be relocated from 388.6 to 388.2.

Submitter Information Verification

Submitter Full Name: David Gerstetter
Organization: Ul Solutions
Affiliation: UL Solutions
Street Address:
City:
State:
Zip:

Submittal Date: Fri Aug 25 18:24:56 EDT 2023
Committee: NEC-P08

Committee Statement

Resolution: FR-7894-NFPA 70-2024

Statement: Per the 2023 NEC style manual, clause 2.2.1, "Required Parallel Numbering Format" Listing requirements should be relocated from 388.6 to 388.2.

Public Input No. 3536-NFPA 70-2023 [Section No. 388.6]

388.~~6~~ 2 Listing Requirements.

Surface nonmetallic raceway and associated fittings shall be listed.

Statement of Problem and Substantiation for Public Input

This Public Input is being submitted on behalf of the NEC Correlating Committee Usability Task Group in order to provide correlation throughout the document. A new section is added to comply with the NEC Style Manual Section 2.2.1 regarding Listing Requirements.
2.2.1 Parallel Numbering Required. Technical committees shall use the following section numbers for the same purposes within articles. This requirement shall not apply to Articles 90, 100, and 110. If the article does not contain listing or reconditioning requirements, the subdivisions shall not be included in the article.
Required Parallel Numbering Format
XXX.1 Scope.
XXX.2 Listing Requirements.
XXX.3 Reconditioned Equipment.
XXX.3(A) Permitted to be Installed.
XXX.3(B) Not Permitted to be Installed.
The Usability Task Group members are: Derrick Atkins, David Hittinger, Richard Holub, Dean Hunter, Chad Kennedy and David Williams.

Submitter Information Verification

Submitter Full Name: David Williams
Organization: Delta Charter Township
Street Address:
City:
State:
Zip:

Submittal Date: Mon Sep 04 17:52:23 EDT 2023
Committee: NEC-P08

Committee Statement

Resolution: FR-7894-NFPA 70-2024

Statement: Per the 2023 NEC style manual, clause 2.2.1, “Required Parallel Numbering Format” Listing requirements should be relocated from 388.6 to 388.2.

Public Input No. 150-NFPA 70-2023 [Section No. 388.60]

~~**388.60** Grounding.~~

~~Where equipment grounding is required, a separate grounding conductor shall be installed in the raceway.~~

Statement of Problem and Substantiation for Public Input

Grounding and bonding requirements belong in Article 250. It makes absolutely no sense to have grounding requirements in an Article about a nonmetallic wiring method that provides no grounding or bonding. Article 250 adequately covers grounding and bonding requirements. This grounding requirement is superfluous, incomplete and may cause conflicts with Article 250 requirements.

Related Public Inputs for This Document

Related Input	Relationship
Public Input No. 149-NFPA 70-2023 [Section No. 378.60]	Grounding requirements belongs in Article 250
Public Input No. 148-NFPA 70-2023 [Section No. 362.60]	Grounding requirements belongs in Article 250
Public Input No. 147-NFPA 70-2023 [Section No. 356.60]	Grounding requirements belongs in Article 250
Public Input No. 146-NFPA 70-2023 [Section No. 355.60]	Grounding requirements belongs in Article 250
Public Input No. 145-NFPA 70-2023 [Section No. 354.60]	Grounding requirements belongs in Article 250
Public Input No. 144-NFPA 70-2023 [Section No. 353.60]	Grounding requirements belongs in Article 250
Public Input No. 143-NFPA 70-2023 [Section No. 352.60]	Grounding requirements belongs in Article 250

Submitter Information Verification

Submitter Full Name: Russ Leblanc
Organization: Leblanc Consulting Services
Street Address:
City:
State:
Zip:
Submittal Date: Thu Jan 12 08:44:51 EST 2023
Committee: NEC-P08

Committee Statement

Resolution: FR-7582-NFPA 70-2024
Statement: Section 250.118 does not permit non-conductive raceways to be used as an equipment grounding conductor (EGC). The requirements for having a wire type equipment

grounding conductor complying with Article 250 Part VI for this wiring method is already provided in other parts of this Code.

Section 250.118 for permitted EGCs does not reference nonmetallic wiring methods and only allows metal raceways, cable tray, and similar metal wiring methods to be used as equipment grounding conductors. The xxx.60 section for this article is being removed to eliminate any confusion for installing an equipment grounding conductor with this non-metallic wiring method. Changing the title in this section and adding ‘of the wire type’ does not add clarity.

Public Input No. 2834-NFPA 70-2023 [Section No. 388.60]

388.~~60~~ 60 Equipment Grounding Conductor .

Where equipment grounding is required, a separate grounding conductor shall be installed in the raceway.

Statement of Problem and Substantiation for Public Input

The section title must be revised to match the technical requirement. In accordance with NEC style manual section 2.1.3.2 the title must be descriptive and concise with the intent of the requirement. See 215.6 Feeder Equipment Grounding Conductor, 320.108 Equipment Grounding Conductor, 330.108 Equipment Grounding Conductor, 334.108 Equipment Grounding Conductor, 410.182 Equipment Grounding Conductor, 547.27 Separate Equipment Grounding Conductor, 555.37 Equipment Grounding Conductor, and 690.45 Size of Equipment Grounding Conductors.

Submitter Information Verification

Submitter Full Name: Mike Holt

Organization: Mike Holt Enterprises Inc

Street Address:

City:

State:

Zip:

Submittal Date: Fri Aug 25 14:23:23 EDT 2023

Committee: NEC-P08

Committee Statement

Resolution: FR-7582-NFPA 70-2024

Statement: Section 250.118 does not permit non-conductive raceways to be used as an equipment grounding conductor (EGC). The requirements for having a wire type equipment grounding conductor complying with Article 250 Part VI for this wiring method is already provided in other parts of this Code.

Section 250.118 for permitted EGCs does not reference nonmetallic wiring methods and only allows metal raceways, cable tray, and similar metal wiring methods to be used as equipment grounding conductors. The xxx.60 section for this article is being removed to eliminate any confusion for installing an equipment grounding conductor with this non-metallic wiring method. Changing the title in this section and adding ‘of the wire type’ does not add clarity.

Public Input No. 3580-NFPA 70-2023 [Section No. 388.60]

388.60 Grounding and Bonding .

Where equipment grounding is required, a separate equipment grounding conductor of the wire type shall be installed in the raceway.

Statement of Problem and Substantiation for Public Input

There are 23 sections in Chapter 3 that have a .60 section. 19 of these sections are titled "Grounding." 3 of these sections are titled "Grounding and Bonding." 1 of these sections is titled "Equipment Grounding Conductor."
My suggestion is to rename all of these sections with "Grounding and Bonding."

Also added "of the wire type" for consistency

Submitter Information Verification

Submitter Full Name:	Eric Stromberg
Organization:	Los Alamos National Laboratory
Affiliation:	Self
Street Address:	
City:	
State:	
Zip:	
Submittal Date:	Mon Sep 04 20:31:45 EDT 2023
Committee:	NEC-P08

Committee Statement

Resolution: Section 250.118 does not permit non-conductive raceways to be used as an equipment grounding conductor (EGC). The requirements for having a wire type equipment grounding conductor complying with Article 250 Part VI for this wiring method is already provided in other parts of this Code. Section 250.118 for permitted EGCs does not reference nonmetallic wiring methods and only allows metal raceways, cable tray, and similar metal wiring methods to be used as equipment grounding conductors. The xxx.60 section for this article is being removed to eliminate any confusion for installing an equipment grounding conductor with this non-metallic wiring method. Changing the title in this section and adding ‘of the wire type’ does not add clarity.

Public Input No. 697-NFPA 70-2023 [Section No. 388.60]

388.60 Grounding.

Where equipment grounding is required, ~~a separate~~ an equipment grounding conductor shall be installed in the raceway.

Statement of Problem and Substantiation for Public Input

The term "grounding conductor" has not been used in the NEC for over a decade. It was deleted because it had no value and the NEC does not indicate how to install it, size it, or protect it...because there is no such term.

Related Public Inputs for This Document

Related Input	Relationship
Public Input No. 689-NFPA 70-2023 [Section No. 352.60]	Same issue
Public Input No. 690-NFPA 70-2023 [Section No. 353.60]	Same issue
Public Input No. 692-NFPA 70-2023 [Section No. 354.60]	Same issue
Public Input No. 693-NFPA 70-2023 [Section No. 355.60]	Same issue
Public Input No. 694-NFPA 70-2023 [Section No. 356.60]	Same issue
Public Input No. 695-NFPA 70-2023 [Section No. 362.60]	Same issue
Public Input No. 696-NFPA 70-2023 [Section No. 378.60]	Same issue

Submitter Information Verification

Submitter Full Name: Ryan Jackson
Organization: Self-employed
Affiliation: Steel Tube Institute
Street Address:
City:
State:
Zip:
Submittal Date: Thu Apr 20 15:34:05 EDT 2023
Committee: NEC-P08

Committee Statement

Resolution: FR-7582-NFPA 70-2024

Statement: Section 250.118 does not permit non-conductive raceways to be used as an equipment grounding conductor (EGC). The requirements for having a wire type equipment grounding conductor complying with Article 250 Part VI for this wiring method is already provided in other parts of this Code.

Section 250.118 for permitted EGCs does not reference nonmetallic wiring methods and only allows metal raceways, cable tray, and similar metal wiring methods to be used as equipment grounding conductors. The xxx.60 section for this article is being removed to eliminate any confusion for installing an equipment grounding conductor with this nonmetallic wiring method. Changing the title in this section and adding ‘of the wire type’ does not add clarity.

Public Input No. 664-NFPA 70-2023 [Section No. 390.57]

390.~~57~~ 58 Discontinued Outlets.

When an outlet is abandoned, discontinued, or removed, the sections of circuit conductors supplying the outlet shall be removed from the raceway. No splices or reinsulated conductors, such as would be the case with abandoned outlets on loop wiring, shall be allowed in raceways.

Statement of Problem and Substantiation for Public Input

A change of this section for Discontinued Outlets in Article 390 will match the parallel language found in Article 372 - Cellular Concrete Floor Raceways (372.58), and Article 374 - Cellular Floor Raceways (374.58).

Submitter Information Verification

Submitter Full Name: Steven Worsley
Organization: NECA IBEW Electrical JATC
Street Address:
City:
State:
Zip:

Submittal Date: Thu Apr 20 11:14:47 EDT 2023
Committee: NEC-P08

Committee Statement

Resolution: FR-7896-NFPA 70-2024

Statement: Renumbered to comply with the 2023 NEC Style Manual Section 2.2.1 regarding parallel numbering within similar articles when possible.

Public Input No. 616-NFPA 70-2023 [New Section after 392.1]

392.2 Reconditioned Equipment

Cable Trays shall not be reconditioned.

Statement of Problem and Substantiation for Public Input

Cablebus, Cable Trays, Cables, Raceways, Conduits, Tubings, flexible Cords, Flexible Cables, Cable Trays, MV Cables, Wireways, etc. etc. are not permitted to be reconditioned per the NEMA Technical Position on Reconditioned Equipment (NEMA CS 100-2020, Appendix B.1)

Related Public Inputs for This Document

Related Input	Relationship
Public Input No. 624-NFPA 70-2023 [New Section after 388.1]	

Submitter Information Verification

Submitter Full Name: Russ Leblanc

Organization: Leblanc Consulting Services

Street Address:

City:

State:

Zip:

Submittal Date: Sun Apr 16 08:35:43 EDT 2023

Committee: NEC-P08

Committee Statement

Resolution: FR-7655-NFPA 70-2024

Statement: The panel is not aware of any established programs that provide an acceptable approach to reconditioning for this type of equipment. Section 110.20 indicates that equipment is permitted to be reconditioned unless otherwise prohibited.

Public Input No. 1305-NFPA 70-2023 [Section No. 392.1]

392.1 Scope.

This article covers cable tray systems, including ladder, ventilated trough, ventilated channel, solid bottom, and other similar structures.

Informational Note: See ANSI/NEMA–VE 1~~-2017~~ , *Metal Cable Tray Systems*, ~~and~~ NECA/NEMA 105~~-2015~~ , *Standard for Installing Metal Cable Tray Systems*, <u>and NEMA VE 2, *Cable Tray Installation Guidelines,*</u> for further information on cable trays.

Statement of Problem and Substantiation for Public Input

This public input deletes the edition dates for ANSI/NEMA VE 1 and NECA/NEMA 105 since the reference is to be considered as the latest edition of the standard and in accordance to 90.5(C). NEMA VE 2 was added as an additional installation guideline.

Submitter Information Verification

Submitter Full Name: Megan Hayes
Organization: NEMA
Street Address:
City:
State:
Zip:
Submittal Date: Fri Jul 07 16:00:03 EDT 2023
Committee: NEC-P08

Committee Statement

Resolution: FR-7726-NFPA 70-2024

Statement: Adding reference to NEMA VE 2 and UL 568 for additional information on cable trays. Document edition dates are required per the 2023 NFPA Manual of Style Section 6.1.3.2 and should not be deleted.

Public Input No. 4452-NFPA 70-2023 [Section No. 392.1]

392.1 Scope.

This article covers cable tray systems, including ladder, ventilated trough, ventilated channel, solid bottom, and other similar structures.

Informational Note: See the following standards for further information on cable trays:

(1) ANSI/NEMA–VE 1~~-2017~~ , *Metal Cable Tray Systems*~~, and~~

(2) NECA/NEMA 105~~-2015~~ , *Standard for Installing Metal Cable Tray Systems*~~, for further information on cable trays.~~

Statement of Problem and Substantiation for Public Input

Revised informational Note removing the date to maintain shelf life of the reference. The reference will be maintained referring to the most recently published edition of the standard.

Submitter Information Verification

Submitter Full Name:	Kyle Krueger
Organization:	NECA
Affiliation:	NECA
Street Address:	
City:	
State:	
Zip:	
Submittal Date:	Thu Sep 07 15:39:16 EDT 2023
Committee:	NEC-P08

Committee Statement

Resolution: FR-7726-NFPA 70-2024

Statement: Adding reference to NEMA VE 2 and UL 568 for additional information on cable trays. Document edition dates are required per the 2023 NFPA Manual of Style Section 6.1.3.2 and should not be deleted.

Public Input No. 3900-NFPA 70-2023 [Section No. 392.10(A)]

(A) Wiring Methods.

The wiring methods in Table 392.10(A) shall be permitted to be installed in cable tray systems under the conditions described in their respective articles and sections.

Table 392.10(A) Wiring Methods

Wiring Method	Article
Armored cable: Type AC	320
CATV cables	800 and 820
Class 2 and Class 3 cables	722 and 725
Class 4 cables	722 and 726
Communications cables	800 and 805
Communications raceways	800
Electrical metallic tubing: EMT	358
Electrical nonmetallic tubing: ENT	362
Fire alarm cables	722 and 760
Flexible metal conduit: FMC	348
Flexible metallic tubing: FMT	360
Instrumentation tray cable: Type ITC	341
Intermediate metal conduit: IMC	342
Liquidtight flexible metal conduit: LFMC	350
Liquidtight flexible nonmetallic conduit: LFNC	356
Metal-clad cable: Type MC	330
Mineral-insulated, metal-sheathed cable: Type MI	332
Network-powered broadband communications cables	800 and 830
Nonmetallic-sheathed cable: Types NM, NMC, and NMS	334
Non–power-limited fire alarm cable	722 and 760
Optical fiber cables	722 and 770
Other factory-assembled, multiconductor control, signal, or power cables that are specifically approved for installation in cable trays	-
Power and control tray cable: Type TC	336
Power-limited fire alarm cable	722 and 760
Power-limited tray cable	725
Rigid metal conduit: RMC	344
Rigid polyvinyl chloride conduit: PVC	352
Reinforced thermosetting resin conduit: RTRC	355
Service-entrance cable: Types SE and USE	338
Underground feeder and branch-circuit cable: Type UF	340

Statement of Problem and Substantiation for Public Input

Class 4 systems were added in the 2023 code and are allowed installed in cable trays. It was an oversight to not add Class 4 to table 392.10(A) at that time.

Submitter Information Verification

Submitter Full Name: Chad Jones
Organization: Cisco Systems
Street Address:
City:
State:
Zip:
Submittal Date: Wed Sep 06 09:28:58 EDT 2023
Committee: NEC-P08

Committee Statement

Resolution: FR-7727-NFPA 70-2024

Statement: 4.1.4 2023 NEC Style Manual References shall not be made to an entire article. References to specific parts within articles shall be permitted. References to all parts of an article shall not be permitted. Changing table to a List and all references to articles were removed. Class 4 systems are added as they are allowed in cable trays in accordance with NEC 2023.

Public Input No. 456-NFPA 70-2023 [Section No. 392.10(A)]

(A) Wiring Methods.

The wiring methods in Table 392.10(A) shall be permitted to be installed in cable tray systems under the conditions described in their respective articles and sections.

Table 392.10(A) Wiring Methods

Wiring Method	Article
Armored cable: Type AC	320
CATV cables	800 and 820
Class 2 and Class 3 cables	722 and 725
Communications cables	800 and 805
Communications raceways	800
Electrical metallic tubing: EMT	358
Electrical nonmetallic tubing: ENT	362
Fire alarm cables	722 and 760
Flexible metal conduit: FMC	348
Flexible metallic tubing: FMT	360
Instrumentation tray cable: Type ITC	~~341~~ 335
Intermediate metal conduit: IMC	342
Liquidtight flexible metal conduit: LFMC	350
Liquidtight flexible nonmetallic conduit: LFNC	356
Metal-clad cable: Type MC	330
Mineral-insulated, metal-sheathed cable: Type MI	332
Network-powered broadband communications cables	800 and 830
Nonmetallic-sheathed cable: Types NM, NMC, and NMS	334
Non–power-limited fire alarm cable	722 and 760
Optical fiber cables	722 and 770
Other factory-assembled, multiconductor control, signal, or power cables that are specifically approved for installation in cable trays	-
Power and control tray cable: Type TC	336
Power-limited fire alarm cable	722 and 760
Power-limited tray cable	725
Rigid metal conduit: RMC	344
Rigid polyvinyl chloride conduit: PVC	352
Reinforced thermosetting resin conduit: RTRC	355
Service-entrance cable: Types SE and USE	338
Underground feeder and branch-circuit cable: Type UF	340

Statement of Problem and Substantiation for Public Input

Table is referencing a article that doesn't exist. It should be referencing article 335 (Instrumentation Tray Cable: Type ITC)

Submitter Information Verification

Submitter Full Name: Tim McGovern
Organization: Jacobs
Street Address:
City:
State:
Zip:
Submittal Date: Tue Mar 14 15:14:03 EDT 2023
Committee: NEC-P08

Committee Statement

Resolution: 2023 NEC Style Manual 4.1.4 states that references shall not be made to an entire article therefore, the Table was converted to a list format and all reference to articles were deleted.

Public Input No. 994-NFPA 70-2023 [Section No. 392.10(A)]

(A) Wiring Methods.

The following wiring methods ~~in Table 392.10(A)~~ shall be permitted to be installed in cable tray systems, under the conditions described in their respective articles and sections~~.~~ :

~~Table 392.10(A) Wiring Methods~~

~~Wiring Method~~	~~Article~~
1. Armored cable: Type AC	~~320~~
2. CATV cables	~~800 and 820~~
3. Class 2 and Class 3 cables	~~722 and 725~~
4. Communications cables	~~800 and 805~~
5. Communications raceways	~~800~~
6. Electrical metallic tubing: EMT	~~358~~
7. Electrical nonmetallic tubing: ENT	~~362~~
8. Fire alarm cables	~~722 and 760~~
9. Flexible metal conduit: FMC	~~348~~
10. Flexible metallic tubing: FMT	~~360~~
~~Instrumentation~~ 11. Instrumentation tray cable: Type ITC	~~341~~
12. Intermediate metal conduit: IMC	~~342~~
13. Liquidtight flexible metal conduit: LFMC	~~350~~
14. Liquidtight flexible nonmetallic conduit: LFNC	~~356~~
15. Metal-clad cable: Type MC	~~330~~
16. Mineral-insulated, metal-sheathed cable: Type MI	~~332~~
17. Network-powered broadband communications cables	~~800 and 830~~
18. Nonmetallic-sheathed cable: Types NM, NMC, and NMS	~~334~~
19. Non–power-limited fire alarm cable	~~722 and 760~~
20. Optical fiber cables	~~722 and 770~~
21. Other factory-assembled, multiconductor control, signal, or power cables that are specifically approved for installation in cable trays	-
22. Power and control tray cable: Type TC	~~336~~
23. Power-limited fire alarm cable	~~722 and 760~~
24. Power-limited tray cable	~~725~~
25. Rigid metal conduit: RMC	~~344~~
26. Rigid polyvinyl chloride conduit: PVC	~~352~~
27. Reinforced thermosetting resin conduit: RTRC	~~355~~
28. Service-entrance cable: Types SE and USE	~~338~~
29. Underground feeder and branch-circuit cable: Type UF	~~340~~

Statement of Problem and Substantiation for Public Input

Section 4.1.4 of the NEC(r) Style Manual prohibits referencing an entire article with the exception of Article 100 or where required for context. As such, it is recommended here to convert this to a list format. There is no change in meaning, here, as the charging language already directs the user to apply the language in the respective wiring method articles so nothing is lost. The index or the table of contents can easily lead the user to the correct article. As an alternative, the committee could also reference the specific part or section in the article as an alternative, but converting to a list would follow what many other articles are already doing, such as the hazardous location articles, Article 501 to 506, for instance.

Submitter Information Verification

Submitter Full Name:	Richard Holub
Organization:	The DuPont Company, Inc.
Street Address:	
City:	
State:	
Zip:	
Submittal Date:	Thu Jun 08 13:40:16 EDT 2023
Committee:	NEC-P08

Committee Statement

Resolution:	FR-7727-NFPA 70-2024
Statement:	4.1.4 2023 NEC Style Manual References shall not be made to an entire article. References to specific parts within articles shall be permitted. References to all parts of an article shall not be permitted. Changing table to a List and all references to articles were removed. Class 4 systems are added as they are allowed in cable trays in accordance with NEC 2023.

Public Input No. 3544-NFPA 70-2023 [Section No. 392.18(F)]

(F) ~~Adequate~~ Access.

~~Sufficient space shall~~ The minimum space of 300mm (12 in.) access headroom shall be provided and maintained about cable trays to ~~permit adequate access~~ permit access for installing and maintaining the cables.

Informational Note: Care shall be taken to ensure that other building components (e.g., air conditioning ducts) do not restrict access to trays or wireways.

Additional Proposed Changes

File Name	Description	Approved
Cabling_Standard_-_ANSI-TIA-EIA_569_A_-_Commercial_Building_Standard_for_Telecom_Pathway_Spaces_FULL_VERSION_.pdf	ANSI/TIA/EIA 569-A	

Statement of Problem and Substantiation for Public Input

This is to correlate with ANSI/TIA/EIA – 569 – A Instillations
"Adequate Access and Sufficient space" are ambiguous terms without definition of space. The 300mm (12in) was inserted to define the amount of space using the ANSI Standard for reference. (ANSI/TIA/EIA-569-A) In a previous panel statement, "The intent of the current text is clear and allows judgment by the designer/installer and AHJ", this is as clear as mud. When was the last time a judgment by an installer and an inspector were the same in the absence of definable code language? What is adequate to a 6' 180lb installer may not be adequate to a 5'10" 300lb inspector.

The NEC style manual is very clear that the NEC shall not contain references or requirements that are unenforceable or vague. There is in section 3.2.1 and table 3.2.1 in the NEC style manual that lists possibly unenforceable or vague terms and adequate and sufficient are word included in this table. The NEC style manual requires that the terms contained in this table be reviewed in context and if the resulting requirement is unenforceable or vague, the term shall not be used. To promote uniform consistency, the NEC should contain defined and enforceable code language, not language that is subjective to individual opinion.

Submitter Information Verification

Submitter Full Name: Richard Hollander
Organization: Shums Coda Associates
Street Address:
City:
State:
Zip:
Submittal Date: Mon Sep 04 18:31:38 EDT 2023
Committee: NEC-P08

Committee Statement

Resolution: FR-7740-NFPA 70-2024

Statement: The ambiguous terms are replaced with minimum dimensions as recommended by the (ANSI/TIA/EIA-569-A) to be in compliance with section 3.2.1 and table 3.2.1 in the NEC style manual. Also, to address concerns with the minimum dimensions prescribed exceptions which include special permissions for smaller requirements and relaxations for industrial locations.

Standards

ANSI/TIA/EIA 569-A

Commercial Building Standard for Telecommunication Pathways and Spaces

Standards Preservation
This section is not part of the original standards documentation. The purpose of this document is to provide an easy to understand, condensed version of the original document. A basic level of telecommunications is assumed. For further information on terms and definitions see our Glossary of Terms section. Whether you are renovating your existing cable plant or installing a new one, Cablingdb.com urges you to investigate a standards based solution. This document is not meant to replace the original standards developed by the various standards bodies and we urge you to purchase the original documents through www.tiaonline.com.

Table of Contents

Addendums

ACCESS FLOOR

All fire-stop assemblies shall retain their integrity if penetrated by cables wires etc.

Access Floor Definition *A flooring system that consists of a raised floor, supported by a system of vertical and horizontal supports and removable tiles. The tiles allow access to the space under the flooring system for the storage and routing of cables.*

There is a variety of support equipment that may be located below the flooring such as raceway and tray for the placement of cables.

Types

Stringered

Stringers shall be fastened to the pedestal head.

definition *Access floor (raised) systems which employ a lateral bracing unit between the pedestal supports. Stringers allow frequent removal of panels by providing additional support.*

Free standing

Shall be restricted to finished floor heights of 300mm.

definition *A raised flooring system which employs pedestal supports as the only form of support. Free standing flooring systems are restricted to finished heights of no more than 150mm (6").*

Cornerlock

Shall have panels fastened to the pedestals at each corner.

Loading Performance and Testing

Loading performance parameters can be found in Annex B of the original standards document.

Panels and understructure shall be tested and meet the requirements of Ceilings and Interior Systems Construction Association (CISCA) test methods (Ref D.12)

Fire Rating

- Floor panels (not including covering) shall have a Class A flame spread rating.
- Panels shall be made of non combustible materials when cabling is not in conduit.
- Cutting of the panels shall not affect the flame spread rating.

Building Structure

Depressed Slab

definition *A construction technique where the initial floor level is lower than the finished floor. The depth of the depression is equal to the finished level of the floor.*

Normal Slab

Building codes shall be followed for both ramp and step assemblies.

Design Guidelines and Procedures for Access Flooring

Work Areas

Penetrations through the floor shall:

- Not be placed in a way so as to create hazards to the occupants.

- Take into consideration the type and number of work areas and may be located anywhere on the access floor.

Specific Design Information

Minimum Height

General office 150mm (6")

Telecommunications room 300mm (12") not less than 150mm (6")

Cable management

Shall be provided by one, or all of:

- dedicated routes
- zone distribution system
- raceway primary distribution
- cable tray

Installation

Layout

Floor layout shall be determined prior to the installation of any equipment or telecommunications cabling.

Linkage to Telecommunications Closet

Telecommunications closets and access florr area served should be located adjacent to each other and connected by threaded sleeves or conduits.

Service Fittings

The manufacturer shall be consulted to ensure compatability of the service fittings.

Grounding and Bonding Access Flooring

Consult the manufacturer's instructions. Also see Annex B.5 in the original standards documentation.

CABLE TRAYS AND WIREWAYS

Definition *The rigid support system that is used to route, support and protect both power and telecommunications cable.*

The tray usually has sides to prevent the cable from falling out. If power and data are to be run in the same tray, a separator must be used to minimize EMI on the data cable. In the past few years, a mesh tray has appeared that is easier to cut and route.

shall be installed in accordance with the applicable electrical code.

Types

Examples of cable trays and wireways are:

Channel Cable Tray A ventilated or solid bottom cable support system, usually not exceeding 150mm (6") in width.

Ladder Cable Tray A device resembling a section of ladder used to support communications and power cables. The structure comes in a variety of widths and heights, with fittings available to suite a variety of environments.

Ladder rack has almost become a generic term for a type of tray used in the communications industry because it resembles a ladder. There are various forms and names for ladder racking and a variety of manufacturers.

Solid Bottom Cable Tray A cable support system with side rails and a solid bottom used to route, support and protect cables.

Fittings such as "tees", corners and transitions are available for a variety of environments.

Ventilated or Trough Cable Tray A support structure with side rails cross members used to support, route and protect cables. The bottom portion is open to allow for air circulation. Generally this type of structure is greater than 100mm (4").

Spine Cable Tray A cabling support structure consisting of a rail or rails, from which horizontal "ribs" protrude that support the cable.

This cable tray comes in several styles depending on the amount of cables being supported. There may be one rail with ribs on one, or both sides, two rails held together with the ribs, or multiple levels of spines and ribes.

Fittings to change direction are also available.

Wireway A cable support structure with sides, bottom and a hinged top used to route, protect and support cables.

Accessories available may be covers, adapters and dividers.

Location

Trays and wireways may be located:

- above or below the ceiling
- within an access floor
- in a plenum or non plenum space

If non metallic products are located in a plenum area, they shall be plenum rated

General Horizontal Design Information

General design practices:

- assume 3 outlets per work area

- assume each work area is $10m^2$ ($100\ ft^2$)
- provide $650mm^2$ ($1in^2$) cross sectional area of the tray or wireway per $10m^2$ of usable floor space
- for increased outlet density, increase size accordingly
- there shall be no more than 50% fill ratio in tray or wireway.
- tray and wireway shall not cause cable to break bend radius rules

Support

Cable trays may be supported by:

- cantilever brackets
- trapeze
- individual rod suspension
- spacers in access floors to elevate trays above floor level

Supports shall meet load and span requirements of applicable electrical code.

Supports shall be placed on 1500 mm (5ft) centers.

Accessories

May be used to change direction of run, and include:

- elbows
- reducers
- crossovers
- tees

Installation

Cable Tray and Wireways shall:

- be free of burrs, sharp edges or other projections that may damage cable or personnel
- have abrasive supports within the tray protected with a smooth coating
- be one solid, unbroken piece when passing through a partition
- exceed fill ratios
- be properly fire-stopped when going through a fire rated partition
- have dividers between power and telecommunications cables as per applicable electrical code
- not be used as walkways
- have a minimum 300mm (12 in) of headroom above the tray

CEILING PATHWAYS

Ceiling distribution systems shall:

- not be permanently sealed, eg: drywall, plaster, locked in ceiling tiles
- use lay in type tiles
- have adequate space available
- use raceways where required by design or local code
- not permit cables to be laid on ceiling tiles or support structures
- provide a support mechanism from the telecommunications room to the serving area
- have a minimum vertical clearance of 75mm (3 in) above the ceiling tiles

Utility columns

- applicable codes shall be followed when power and communications are run in the same pole
- should be supported by main ceiling support channels, not transverse or short length channels
- when attached to main ceiling channels, the channels will be supported so as not to move vertically or horizontally

Zones

"Zoning" the serving area facilitates a structured distribution of pathways and cables.

Steps in Zoning:

1. divide the serving area in sections approximated $35m^2$ to $82m^2$, or use the space between 4 columns.

2. cable placement to each zone may be accomplished with, or without the use of raceway if permitted by code

3. conduit may be used when run from the telecommunications closet to the midpoint of the zone

4. cables then extend to utility columns and down to the work area.

Trays

When a tray is used in the ceiling area, conduits from the tray to outlets or zones shall be provided unless otherwise permitted by code.

Telecommunications Closet Termination

Trays and zone conduit shall

- protrude into a telecommunications room a minimum of 75mm (3 in) before the first bend.
- enter the telecommunications room at a minimum height of 2.4 m (8 ft)

Wall and Partition Cabling

Where partitions are used to conceal the cables, a snap-in panel or cover shall be provided, or, a hollow wall may be used to conceal the cable if an accessible space or conduit of sufficient size is provided.

Cable Supports

- shall be placed on 1220-1525mm (46-60 in) centers

- shall be designed to support the cable load
- may be attached to ceiling support rods provided the total weight of the cable does not exceed the loading rate of the rod
- may be attached to a T-Bar rail to support a cable load of 0.7 kg/m (0.45 lb/ft), and does not interfere with tile removal

CONDUIT

Types of conduit

- Electrical metallic and nonmetallic tubing
- Nonmetallic flexible conduit and nonmetallic flexible tubing
- Rigid metal conduit
- Rigid nonmetallic conduit; and
- Other types.

Conduit shall be permitted under the appropriate electrical codes.

Flexible metal conduit lengths should be less than 6m (20 ft) for each run.

Use of conduit

Conduit should be used when:

- it is required by code
- outlet locations are permanent
- device densities are low
- flexibility is not required

Design Guidelines

Minimum requirements

are found in the appropriate electrical codes

Pull Boxes and Bends

- the maximum conduit length shall be 30m (100 ft) between pull points
- a pull point shall be provided if there are more than 2 90^{o} bends, or equivalent
- a pull box shall be installed if there is a reverse U-shaped bend
- the bend radius of a conduit shall be 6 times the internal diameter of the conduit

Sizing

		Maximum Number of Cables Allowed Based on Fill Rates								
		Cable Outside Diameter, mm(in)								
		3.3	4.6	5.6	6.1	7.4	7.9	9.4	13.5	15.8
Trade Size		(.13)	(1.8)	(.22)	(.24)	(.29)	(.31)	(.37)	(.53)	(.62)
16	1/2"	1	1	0	0	0	0	0	0	0
21	3/4"	6	5	4	3	2	2	1	0	0
27	1"	8	8	7	6	3	3	2	1	0
41	1.25"	20	18	16	15	7	6	4	2	1

53	2"	30	26	22	20	14	12	7	4	3
78	3"	70	60	50	40	20	20	17	7	6
103	4"	0	0	0	0	0	0	30	14	12
Note: This table does not represent all cable and conduit sizes. Check the original standards documentation for additional cable and conduit sizes.										

A conduit run

- shall serve no more than 3 outlet boxes
- should increase in size as it approaches the telecommunications room

Telecommunications Room Termination

Conduits protruding through the floor in a telecommunications room shall be terminated 25-75mm (1-3") above the floor surface.

Wall-Mounted Public Telephone Locations

- minimum 21 (3/4") trade size conduit should be provided from the telecommunications closet to serve each wall-mounted public telephone
- where it is necessary to conceal the outlet box directly behind a surface-mounted telephone, the center of the outlet box shall be placed 1220 mm (48 in) above the floor for recessed applications, the conduit and box shall be installed to suit the specific type of mounting

The Americans with Disabilities Act (ADA) should be consulted.

Hazardous Locations

If it is necessary to place conduit in a hazardous location, the applicable electrical code shall apply

Outdoor Locations

- Nonmetallic conduit shall be UV resistant and marked as such
- Do not allow moisture to collect in low spots which may freeze and damage the cable.

Installation

Conduit Termination

Conduits shall:

- be reamed to prevent sharp edges
- be terminated with an insulated bushing (metallic)

Conduit System Identification

ANSI/TIA/EIA-606 should be consulted for administration of the conduit system.

Pull Strings

Pull string or rope shall be placed in installed conduits

Outlet Boxes

maxmimum conduit trade size vs outlet box size.

Width x Height X Depth (mm)	Maximum Conduit Trade Size
50 x 75 x 64	21
100 x 100 x 57	27
120 x 120 x 64	35

Pull boxes

Pull boxes shall be used when

- Fishing the conduit run.
- Installing a pull string or cable.
- Pulling the cable to the box and then looping the cable to be pulled into the next length of conduit.

Pull boxes that are used within horizontal distribution shall comply with the pull box requirements of clause 5.2.3 in the original standards documentation.

ENTRANCE FACILITIES

Definition *The area of the building where public and private networks enter the building. The entrance facility includes the entrance wall and the entrance room/space.*

When outdoor cables enter the building, local codes must be followed in transitioning to indoor cables. The use of conduit may extend the distance outdoor cable may be brought into the building. Always check your local codes.

- shall meet seismic zone requirements

In determining entrance facility location, the designer shall:

- contact all telecommunication service providers to establish requirements
- consider location of gas, electrical and other building services
- provide an alternate entrance facility where security and continuous service are necessary
- avoid line of sight and signal interference with antennae

Service Entry Pathway

A service entry pathway shall be provided by:

- underground
- buried
- aerial
- tunnel

The designer should consider:

- type and use of building
- growth
- type and size of cables being installed, or which could be installed
- alternate entrance
- difficulty of adding future pathways

Entrance Pathway Methods

Underground planning shall include:

- land development
- grading of underground facilities for drainage
- venting of gases
- vehicular traffic to determine depth of cover and protection

Underground facilities should not be in the same vertical plane as other utilities.

Aerial

The designer should consider:

- aesthetics
- storm loading
- applicable codes

- clearances of all types
- protection
- span length
- building and pole attachments
- number of cables

Entrance Point

Definition The entrance point is a sub component of the entrance facility. While the entrance facility is the entire space that housed the incoming cables and services, the entrance point is the actual place within the entrance facility where the cables emerge from the wall, floor or end of a conduit run.

Conduit entrance consist of several 103mm (4"0) and 53mm (2") trade size conduits. Conduits should be sized for the cables to be installed in them. Innerduct may also be used.

A minimum of three 103 (4) trades size conduits should be put at each entrance point.

The conduit shall:

- extend into undisturbed earth for a minimum of 600mm (24") beyond the exterior foundation wall
- be reamed and bushed if terminated inside the building
- have a smooth bell shaped finish if terminated outside the building
- be securely fastened to the building
- slope downwards from the exterior of the building
- have a drainage box install if water problems are anticipated
- be plugged to prevent gas, water and animals from entering the building

A pull box shall be installed and used when:

- the building conduit is extended from the entrance conduit
- the conduit is too long
- the total quantity of bends is greater than two 90 degree bends.

See 5.2.3 and 5.2-2 of the original standard documentation.

Entrance Space

Definition

The entrance space is a sub system of the entrance facility, where the protectors are placed and terminated, and, where other network interface devices are placed.

The entrance space will be increased if other services are to be terminated, such as PBX or other terminal equipment.

The entrance space shall be sized for the services contained in the space, as per section 8 of the original standard documentation.

Pathway Sizes

he pathway between the entrance point and the entrance room shall be the same size as the entrance pathways.

Antenna Field Entrance Rooms

- shall be designed per applicable codes
- antenna pathway from the antenna field to the entrance space shall provide isolation for the antenna cables from the other backbone cables
- shall be located as close to the antenna field as possible.

Location

The entrance room shall be located:

- in a dry area not subject to flooding.
- close to the building entrance point
- next to the electrical service

Design

- If the building is larger than 2000m^2 (20,000 ft^2) should be in an enclosed room
- sizing shall meet the requirements of the protectors
- sizing shall take into account future requirements
- at least one wall shall be covered with a 20 mm (3/4") A-C plywood, void free and 2440mm (8ft) high
- the plywood should be fire retardant or covered with 2 coats of fire retardant paint
- lighting shall be a minimum of 50 lx (50 foot candles) when measured 1m (3ft) above the finished floor and mounted 2600mm (8.5 ft) above the finished floor.
- Lighting and telecommunications equipment should not be powered from the same electrical panel
- Dimmer switches should not be used and emergency exit lights should be used
- A false ceiling shall not be installed
- The doorway shall be a minimum of 910mm (36in) wide and 2000mm(80") high, and equipped with a lock
- Floors, walls and ceilings shall be treated to minimize dust
- A minimum of 2 dedicated 120V, 20 Amp, non switched, ac duplex electrical outlets on separate circuits shall be provided
- Access to the grounding system shall be provided

EQUIPMENT ROOM

Definition

The equipment room shall:

- house only equipment directly related to the telecommunications system and its environmental support systems.
- be designed for the applicable seismic zone requirements.

Design Considerations

Site Selection

Location of the equipment room should take into consideration:

- building elements such as elevators, core, fixed walls, both inside and outside
- accessibility for the delivery of equipment
- access to shared use space
- sources of vibration
- all planned equipment so the room can be sized properly

and shall:

- have access to HVAC system
- be located away from electromechanical interference such as transformers, generators, x-ray machines, radio transmitters and induction sealing devices.
- **Floor Loading**
- the minimum distributed load rating shall be 4.8 kPa(100lbf/ft^2)
- the minimum concentrated load rating of a least 8.8 kN (2000lbf)

Water Ingress

The equipment room shall:

- not be located below the water level
- not contain water or drain pipes that do not support the equipment within the room
- contain a floor drain if there is a risk of water ingress

Size

The guideline is to provide 0.07 m^2 (0.75 ft^2) of equipment room for every 10 m^2 (100 ft^2) of work space.

The equipment room shall have a minimum size of 14m^2 (150 ft^2)

If the building has multiple tenants the decision has to be made if all tenants will have their equipment in the equipment room. If so, the size will have to be increased.

Special Use Buildings (hotels, hospitals)

Equipment room floor space shall be based on the known number of work not on usable floor area.

Number of Work Areas	Area

	(m^2)	(ft^2)
Up to 100	14	150
101 - 400	37	400
401 - 800	74	800
801-1,200	111	1,00

Miscellaneous Equipment

Other equipment that is permitted in the equipment room

Environmental control equipment such as:

- power distribution
- conditioner systems
- UPS up to 100KVA (larger UPS systems should be located in a separate room)

Equipment not permitted

- equipment not related to the support of the equipment in the room
- ductwork, pneumatic tubing etc shall not enter or pass through the room

Provisioning

Layouts

Equipment rooms:

- should not have doors leading to other areas of the building
- shall have an overall height clearance minimum of 2440mm (8ft)
- shall be protected from contaminants and pollutants that could affect operation and material integrity of the installed equipment. If contaminants are present in concentrations higher than table then vapor barriers, positive room pressure or absolute filters shall be provided.
- shall be connected to the terminal space and telecommunications rooms via the backbone pathway.
- Should have noisy equipment located outside the equipment room.

Fire Suppression

The equipment room shall have

- sprinklers (if required) with cages over the heads
- drainage troughs under sprinkler pipes
- portable fire extinguishers maintained within the equipment room per applicable code.

Environmental Control

- shall be provided 24 hours per day 365 days per year by either the building system or a stand alone unit for the equipment room. If a standby power supply is available, consideration should be given to connecting the HVAC system to it

- shall provide continuous operating temperature range of 18 ºC –24 ºC (64ºF-75ºF) with 33%-55% humidity measured at 1.5 meters (5 ft) above the floor level
- positive pressure differential compared to surrounding areas should be provided
- adequate ventilation shall be provided if backup batteries are used

Interior finishes

- The floor, walls, and ceiling shall be sealed to reduce dust.
- Finishes shall be light in color
- Flooring materials shall have antistatic properties.

Lighting

Shall be:

- a minimum of 500 lx (50 foot candles), measured 1 m (3 ft) above the finished floor in middle of all aisles between cabinets.
- controlled by one or more switches (not dimmer switches) located near the entrance door(s) to the room.
- Lighting fixtures and telecommunications equipment should be on separate circuits.

Power

A separate supply circuit serving the equipment room shall be provided and terminated in its own electrical panel. Electric power provisioning for the equipment room is not specified herein because it is dependent upon the equipment load and supporting facilities.

If a standby power source is available in the building, the equipment room panel should be connected to the standby supply.

Door

Shall be:

- minimum of 910mm (36 in) wide and 2000mm (80 in) high, without doorsill
- fitted with a lock

Double doors should be installed if unusually large equipment is anticipated.

Equipment grounding

The telecommunications grounding shall be made accessible.

Main Terminal Space **definition**

The main terminal space shall:

- support two-level backbone topology
- only house facilities directly related to the telecommunications systems and its environmental control systems.
- Shall be increased in size if both the terminal and entrance facility are contained in the same area. The requirements of clauses 8.1, 8.2 and 9 of the original standards documentation must also be satisfied.

Design consideration

- shall be located as close as practicable to the vertical backbone pathways

- should be adequate to service large reels of cable
- should be controlled by the building owner in the case of multi tenant use.
- for special use buildings (hospitals, hotels, schools) the main terminal space shall be based on the known number of backbone cables to be terminated, together with any cable extending to the equipment room (not on usable floor area).
- Shall not have other building facilities not related to the MDF or cross connect terminals enter, pass through or be installed in or above it.

Water infiltration

The main terminal space shall:

- not be located below water level unless preventive measures against water infiltration are employed.
- Not have water or drain pipes above or within 1 m (3 ft) of the telecommunications main terminal
- Have a floor drain provided if there is a danger of water ingress.

Size

The main terminal space shall be sized to meet the known requirements of a specific main distribution frame or wall terminals based on

- incoming service provider cables
- interbuilding cables
- intrabuilding cables

Buildings with floor area greater than 10,000m^2 (100,000 ft^2) may require free-standing frames for cable terminations, otherwise, wall mounted terminations are acceptable.

Refer to tables 8.3.1 and 8.3-2 of the original standard for space requirements.

Provisioning

The main terminal space:

- shall have layouts verified for weight and distance requirements for all equipment
- should avoid having doors providing access to other areas of the building through the main terminal space.
- should have walls covered with rigidly fixed 20mm (3/4”) A-C plywood, preferably void free, 2440mm (8 ft) high, and capable of supporting attached connecting hardware.
- should not have suspended ceilings installed.
- shall be protected from accumulation of dust.
- shall have a minimum clear height in the space of 2440mm (8 ft) without obstructions.
- shall have sprinkler heads (if required) with wire cages installed
- shall have drainage troughs located under the sprinkler pipes
- shall have a minimum lighting intensity of 500 lx (50 foot candles}, measured 1m (3 ft) above the finished floor. (light switches should not be dimmers).

- should have an emergency exit light installed.
- shall have convenience duplex receptacles placed along the wall, spaced 1.8m (6 ft) and 150mm (6 in) above the floor.
- shall have a door with a minimum size of 910mm (36 in) wide and 2000mrn (80 in) high, without doorsill, and fitted with a lock
- have access to the telecommunications grounding system

Minimum Termination Wall Length				Minimum Floor Area			
Gross Floor Space Served		Wall Length		Gross Floor Space Served		Floor Area	
m^2	ft^2	mm	in	m^2	ft^2	mm	ft
1000	10,000	990	39	10000	100000	3660 x 1930	12 x 6.5
2000	20,000	1060	42	20000	200000	3660 x 2750	12 x 9
4000	40,000	1725	68	40000	400000	3660 x 3970	12 x 13
5000	50,000	2295	90	50000	500000	3660 x 4775	12 x 15.5
6000	60,000	2400	96	60000	600000	3660 x 5600	12 x 18.5
8000	80,000	3015	120	80000	800000	3660 x 6810	12 x 22.5
10,000	100,000	3630	144	100000	1000000	3660 x 8440	12 x 27.5

Backbone pathways

Backbone pathways shall:

- be connected to the main terminal space
- be the same size be the same size between the entrance space and main terminal space as the entrance pathway.
- have the quantity and/or sizes of conduits between the terminal space, telecommunications rooms and equipment rooms based on possible future requirements

INTRABUILDING PATHWAYS AND RELATED SPACES

Intrabuilding Pathways Definition

Interbuilding Pathways Definition

- bonding and grounding shall meet applicable electrical codes and standards and also ANSI/TIA/EIA-607.
- pathway specifications shall accommodate the applicable seismic zone requirements

Precautions should be taken to ensure that water will not penetrate the pathway system. See ANSI/NFPA-70 Article 100 for definitions.

Design Guidelines

The backbone pathway shall:

- be connected to the equipment room
- have conduits and trays(when applicable) that protrude into the closet from 25-75mm (1-3 in), without a bend, and above the 2.4m (8 ft) level.
- Not be routed through gaps between the floor or ceiling structure and a curtain wall.
- Not be located in elevator shafts
- Follow applicable rules for environmental air plenums

Pathway Design Guidelines

Pathways shall:

- *Be designed to handle all telecommunications media recognized by ANSI/TIA/EIA 568-A*
- *Be sized for current and future requirements*
- *Have additional conduits, sleeves, trays and slot installed if a large number of cables are planned for.*

Sleeves

Quantities:

There shall be one sleeve or conduit (Trade Size 4) for every 5000m^2 of usable floor space, plus 2 spares for a total of 3 sleeves or conduits. The sleeve shall extend 25-75mm above the floor.

If a slot is used it shall have a 25mm (1") curb around it.

Conduits

- Shall comply with 4.4 of the original standards documentation
- Backbone conduit fill should be based on the specifications identified in table 5.2-1 of the original standards documentation

Innerduct definition

- may be for installation of cable to facilitate subsequent placement of additional cable in a single pathway.

Cable Trays & Wireways:

When used as intrabuilding backbone pathways, their design and installation shall comply with the clause 4.5 of the original standards documentation.

The integrity of all fire-stop assemblies shall be maintained when penetrated by cable, wires, and pathways

Design Guidelines for Pull and Splice Boxes

Purpose

Pull boxes are used for

- Fishing the conduit run
- Installing a pull string or cable
- Acting as an egress point from the conduit where the cable is looped (sometimes called figure 8'ing), and then pulled into the next conduit run
- Pull boxes shall not be used for splicing cable
- Splice boxes are intended to be used for splicing in addition to pulling cable

Pull/Splice boxes shall

- be readily accessible
- not be placed in a fixed false ceiling space unless it is above a marked access panel
- be placed in a conduit run where:
    - the length is over 30m (100 ft)
    - there are more than two 90^{o} bends, or equivalent
    - there is a reverse (U-shaped) bend in the run.
- not be used to change direction of the conduit
- conduit fittings shall not be used in place of pull or splice boxes
- pull and splice boxes shall be labeled per ANSI/TIA/EIA-606.

Sizing

An outlet may be used as a pull box if the conduit is less than trade size 35 (1.25")

For Conduit Greater than 35 (1.25") Trade Size

For straight pull through, have a length of at least 8 times the trade-size diameter of the largest conduit.

Angle and U Pulls

Shall have:

- a distance between each conduit entry inside the box and the opposite wall of the box of at least 6 times the trade-size diameter of the largest conduit, and add to that the sum of the trade-size diameters of the other conduits on the same wall of the box.
- a distance between the nearest edges of each conduit entry enclosing the same conductor of at least
    - six times the trade-size diameter of the conduit; or
    - six times the trade-size diameter of the larger conduit if they are different sizes

For a conduit entering the wall of a pull box opposite to a removable cover, the distance from the wall to the cover shall not be less than the trade-size diameter of the largest conduit plus 6 times the diameter of the largest conduit.

Splice Boxes

Splice boxes used with conduit, shall be sized per table 5.2-3 of the original standards documents.

MISCELLANEOUS ITEMS

- All fire-stopping shall comply with applicable codes
- A 21 (3/4 in) trade size conduit shall be provided from the telecommunications room to a suitable device box for elevator telecommunications

Horizontal Pathway Separation from EMI Sources

Article 800-52 of ANSI/NFPA 70 shall apply for separation

- From power cables
- And barriers within raceways
- Within outlet boxes or compartments

Other Related Requirements

- The building shall be protected from lightning (see ANSI/NFPA 780, ref D.4)
- Surge protection shall be provided at the electrical service entrance
- ANSI/TIA/EIA 607 shall be followed
- Faulty wiring shall be corrected

Reducing Noise Coupling

The following additional precautions should be considered when locating close to large sources of potential noise

- Increase physical separation
- Branch circuit (line, neutral and grounding) conductors should be kept close together; ie: in their original sheath
- Use of surge protectors
- Use of fully enclosed, grounded, metallic raceway.

PERIMETER PATHWAYS

Definition

NOTE: See ANSI/TIA/EIA 569 A-1 (addendum 1) for revised information

Perimeter pathways shall comply with 10.3 of the original standards documentation which refers to EMI and power separation.

Types

Surface Raceway **definition**

Recessed Raceway **definition**

Molding Raceway **definition**

Multichannel Raceway **definition**

- dividers shall be bonded to ground

Design Guidelines and Procedures

Pathway Sizing

- practical fill capacity for perimeter raceway is 20%-40%
- fill capacity shall be the calculation of the cross sectional area of all cables in the raceway divided by the percent of fill

Physical Limitations

- metal and non metal shall be limited to use in dry locations

Miscellaneous

Undercarpet

Transition Points **definition**

- shall not be mounted in walls that could be moved

Design Guidelines

- conduit from the telecommunications closet serving the transition box shall be sized per table 4.4-2 of the original standards documentation.

Transition Boxes

Transition Boxes shall:

- be sized per table 4.8-1 of the original standards documentation
- have the bottom of the cover of the transition box immediately above the top of the baseboard molding
- have the bottom of the box placed within the wall cavity with the bottom of the box being open to the level of the floor.
- serve a usable floor area no larger than 80 m^2 (800 ft^2), based on the assumption of one work area per 10m^2 (100 ft^2).
- be located so as to minimize the crossover of electrical and telecommunications undercarpet cable. If they must be crossed, the telecommunications cable shall pass over the power cable

The wall shall have (from the floor level) a 25mm (2 in) high by the width-of-the-box cutout extending from the exterior wall finish to the interior cavity.

Consolidation Points **definition**

Consolidation points shall:

- be located in fully accessible, permanent locations.
- not be located in any obstructed area.
- not be installed in furniture systems unless that unit of furniture is permanently secured to the building structure.
- conform to applicable codes if used in plenum spaces used for environmental air
- follow administration procedures as per ANSI/TIA/EIA 606.
- serve a usable floor area no larger than the telecommunications zone as per section 4.6.2.4 of the original standards documentation

Suspended ceiling space or access floor space may be used for consolidation points, provided that the space is accessible without moving building fixtures, equipment, or heavy furniture and without disturbing building occupants.

Multi-user Telecommunications Outlet Assemblies definition

MUTOAs shall:

- be located in fully accessible permanent locations such as building columns walls or furniture.
- not be located in ceiling spaces, under access flooring, or any obstructed area
- not be installed in furniture systems unless that unit of furniture is permanently secured to the building structure
- be mounted in such a way that it does not obstruct the intended pathway cabling capacity
- be administered in the same manner as telecommunications cabling, hardware, pathways and spaces as described in ANSI/TIA/EIA-606.

Design Guidelines

See Design Guidelines for Consolidation Points

Interstud definition

Bushings shall be installed over sharp edges or objects.

Overfloor raceway, exposed cabling, and poke through systems are not covered by this Standard.

Note: Poke through devices are now covered by ANSI/TIA/EIA 569 A-4 (Addendum 4)

Pathways shall not be routed through gaps between the floor or ceiling structure and the curtain wall.

TELECOMMUNICATIONS ROOM

The Telecommunications Room:

- is the cross connect location for the horizontal and backbone cabling
- shall be able to contain telecommunications equipment, terminations and related wiring
- shall be located as close as possible to the center of the area served
- shall be the termination point for horizontal pathways for the area being served
- shall be seismic rated where applicable

Design

The telecommunications room:

- shall be dedicated to telecommunications related functions and should not be shared with electrical facilities
- shall not have duct work not associated to the telecommunications system pass through or enter the telecommunications room
- shall be interconnected with another telecommunications room on the same floor by a conduit (trade size 3), or equal.

Size and Spacing

There shall be one telecommunications room per floor except when:

- the floor area served is greater than 1000m^2
- the horizontal distance is greater than 90m

Add one Telecommunications Room for every of 1000m^2 floor area.

Floor Loading

Telecommunications rooms shall be located on floor areas designed with a minimum floor loading of 2.4 kPa (50 Ibf/ft^2)

Provisioning

Telecommunications Rooms shall:

- have a minimum of two walls should be covered with 20mm (3/4 in) plywood, preferably void free, 2440mm (8 ft) high, capable of supporting attached equipment. Plywood should be either fire-rated or covered with two coats of fire retardant paint
- have lighting that is minimum of 500 Ix (50 foot candles) measured 1 m (3 ft) above the finished floor, mounted 2600 mm (8.5 ft) minimum above finished floor and should not be powered by the same circuit as the telecommunications equipment. Dimmer switches shall not be used
- not have a false ceiling
- have a door which is 910mm (36”) wide and 2000mm (80”) high without a door sill. It shall open outward, side to side or be removable and lockable.
- have floors and ceilings treated to eliminate dust
- have 2 dedicated 120V, 20 AMP, non switched, ac duplex outlets located at 6ft intervals around the perimeter wall at a height of 150 mm (6”) above the floor
- have access to the telecommunications grounding system

- should have pulling sleeves and slots located next to the doorway (see 5.2.2.2 of the original standards documentation)
- have fire protection equipment as per local codes
- have sprinkler heads with wire cages
- have HVAC in its design to maintain a temperature equal to that of the adjacent offices.

UNDERFLOOR PATHWAYS

definition

General

- Pull boxes are part of pathways.
- All pathway designs shall be designed to meet ANSI/TIA/EIA 607, Grounding and Bonding. They shall also be designed to handle all approved cables in ANSI/TIA/EIA 568B.
- Horizontal pathways shall not be located in elevator shafts, and shall be located in dry areas to protect from moisture.

Underfloor Pathways

Underfloor Duct Systems **definition**

Flush Duct Systems **definition**

Multichannel Raceway **definition**

Floor Structure

The depth and type of pour affect the duct system that can be used.

- *Monolithic Pour* Install the duct system in the midpoint of the slab
- *Slab on Grade* Maintain the level of the UDS
- *Double Pour* Install the UDS on the structural slab and bury it with the second pour.
- *Post Tensioned* Preset inserts shall be used

When using prefab concrete members, the UDS is buried in the concrete topping.

Design

The standard assumes 3 devices per work area, and one work area per 10 m^2 (100 ft^2). The design criteria is to provide 650mm^2 (1in^2) of cross sectional underfloor duct per 10m^2 of useable floor space.

Duct Spacing

1520 -1825 mm (5-6 ft) separation at mid point

450 - 600 mm (18-24") at perimeter walls

The above ducts are run parallel to each other.

Header ducts should be spaced 18m (60 ft), and enclosed header ducts shall connect the system to the telecommunications room.

Duct Types

Distribution Ducts **definition**

Header Ducts **definition**

Telecommunication header ducts shall terminate in the telecommunications room with a slot or elbow.

Trench Duct

- shall have removable cover plates through its entire length
- shall have access from the trench duct to distribution duct via the bottom or side of trenchduct
- shall have cover plates with a means for levelling to the intended finished floor surface and shall have a gasket to prevent moisture ingress.
- shall be installed when an enclosed header duct approaches the telecommunications room from a directions requiring horizontal bends into the closet.
- shall extend out far enough to allow access to enclosed header ducts

Handhole Access Unit **definition**

Access units shall

- be partitioned to allow separation of systems in a multiduct layout
- have cover plates with gaskets to prevent moisture ingress
- have a means of levelling it to surrounding floor level

Layout

After determining the quantity and distribution of all types of ducts, the allocation of enclosed header to distribution ducts shall be determined as follows:

1. Note the number of enclosed header ducts required to serve that floor area.
2. Note note the number of distribution ducts to be served.
3. Divide both quantities by their highest common factor so that the ratio of enclosed header ducts to distribution ducts are either: 1 to 1, 1 to 2 , 1 to 3, etc., or 2 to 3, and as a last resort, 3 to 4.
4. If the ratio does not meet the above, deduct 1,2 or 3 from the number of distribution ducts derived in step 2, then repeat step 3. In this case, the ducts deducted shall be treated as a separate unit to be served by additional enclosed header(s).

eg: Step 1 header ducts = 8

Step 2 distribution ducts = 24

Step 3 divide by highest factor (8) = 1/3

Where the number of enclosed headers in step 1 is greater than the distribution ducts in step 2

1. provide one or two enclosed headers to serve each distribution duct; and,
2. allocate the remainder required as in step 3,4 and 5.

Installation (underfloor duct)

Single and / or Two Level

Duct runs with preset inserts:

- shall be leveled so that the top of the insert is 3 mm (0.125 in) below-the finished pour
- marker screws identifying the duct runs shall be placed at each duct end, on either side of permanent partitions, and in the first insert adjacent to access units,

Trenchduct Header

- sections shall be coupled together and leveled making the top surface flush with the concrete pour
- openings from the base of the trench to the appropriate distribution duct shall be cut, and grommets shall be installed
- all openings and joints on the top cover plate shall be sealed with tape prior to concrete pour
- after the concrete pour, the trench top rail shall be leveled to the concrete finish.
- adjustable partitions shall be raised to the underside of the cover plate and tack welded in place to add support to the cover and assure complete separation of the systems. Tack welds shall be painted to prevent rusting.
- floor finish trim shall be installed

Inserts (underfloor duct)

Preset definition

Afterset definition

Capping definition

Service Fittings (underfloor duct)

General

f electrical power is one of the services in a combined fitting, the fitting shall be fully partitioned.

Dedicated in-Floor definition

Cellular Floor definition

Types (cellular floor)

Steel

Are available

- in 2 or 3 cell configurations
- in 38, 50 or 75 mm (1.5, 2 or 3”) depths
- in various cellular configurations

Concrete

Available

- in 2 or 3 cell configurations
- in 100, 150 and 200 mm (4, 6, or 8”) depths
- in circular or elliptical

Design Guidelines and Procedures (cellular floor)

General Design Information

Where the work area density is not known, the general practice is to assume 3 outlets per work area, and each work area is assumed to be $10m^2$ ($100\ ft^2$). The designer shall allow $650mm^2$ (1^2 inch) of cross sectional cellular floor per $10m^2$ ($100\ ft^2$). If the density will be greater, then the design will have to be modified accordingly.

Service to Work Areas

- shall be on 4'-5' centers
- shall use a 50% blend of cellular and non cellular sections for flexibility

Distribution Cells (cellular floor)

General definition

Preset Inserts

- can be single or multiservice type preset inserts
- center-to-center spacing shall be a minimum of 600mm (24 in) along the length of the cell.

Blank Cell definition

Access to blank cells shall be provided by core drilling through the concrete and cutting through the top surface of the cell.

Header Duct (cellular floor)

General definition

- enclosed headers shall be provided separate ducts for electrical power and telecommunications services, or as a single trenchduct equipped with a barrier for each service.
- Access units shall be spaced to fall directly-above the selected cells.
- Jack-header ducts shall be provided to maintain coverage of floor areas that would otherwise be isolated, e.g., by stairwells or columns.

Flushduct

Flushduct shall have:

- a two piece flush header duct installed when used in concrete flooring system
- a bottom section that has pre punched holes to align with the channels directly below it
- a grommet inserted into a core drilled hole through the concrete
- a top section of a "top hat" design that comes with a means to level the section flush with the top of the floor
- access units located over the opening of each of the cells
- each service in a separate header duct

Buried Duct

Buried duct shall have:

- an enclosed header duct in steel cellular floor systems
- header ducts that are pre punched on the bottom with grommets installed
- header ducts with adjustable access units on top

- services types in separate header ducts

Trenchduct

Shall have:

- removable cover plates through the entire length
- access to the distribution cells through the holes in the bottom of the trench
- separate vertical dividers for different services
- a means of leveling the cover plates with the floor finish
- void closures installed if the trenchduct is bottomless

Underslab duct

Shall:

- Be rectangular with a hinged lid
- Be attached to the underside of cellular units
- Provide access via holes from the duct to the cell
- Have cable hangers to support the cabling
- Have fire-stop installed in all openings through fire rated partitions

Access or Handhole Units (cellular floor) **definition**

Shall prevent water ingress by way of a gasket on the cover plate

Layout (cellular floor)

Distribution Cells

- Should run the entire length of the building
- Shall have telecommunications routed in the largest cell, and electrical in the smallest cell (when multiple cells are used)

Enclosed Header Duct

Consider adding more header ducts when the length of distribution cells is greater than 18m (60 ft)

After determining the quantity and distribution of all types of cells, the allocation of enclosed header to distribution ducts shall be determined as follows:

1) Note the number of enclosed header ducts required to serve that floor area.

2) Note note the number of distribution ducts to be served.

3) Divide both quantities by their highest common factor so that the ratio of enclosed header ducts to distribution ducts are either: 1 to 1,1 to 2 , 1 to 3, etc., or 2 to 3, and as a last resort, 3 to 4.

4) If the ratio does not meet the above, deduct 1,2 or 3 from the number of distribution ducts derived in step 2, then repeat step 3. In this case, the ducts deducted shall be treated as a separate unit to be served by additional enclosed header(s).

eg: Step 1 header ducts = 8

Step 2 distribution cells = 24

Step 3 divide by highest factor (8) = 1/3

5) You may have to round up the number of enclosed headers in step one.

6) If the number of enclosed header ducts and distribution cells are nearly equal, it is usually more economical to increase the quantity of enclosed header ducts by 1,2 or 3 so that they are equal.

7) If step 1 is greater than step 2

a) provide one or two enclosed headers to serve each distribution cell; and,

b) allocate the remainder required as in step 3,4 and 5.

Installation (cellular floor)

Two Level - (cellular steel)

Shall have:

- header ducts installed on top of floor cells
- ducts secured by hold down straps
- marker assemblies installed
- access via a fitted grommet between the header duct and cell after the concrete is set

Trenchduct Header

Shall:

- be level with the top of the finished concrete
- have openings cut and fitted with a grommet
- have all openings sealed with tape prior to the concrete pour
- have a final leveling after the final pour
- have tack welds painted

Flushduct - (cellular concrete)

Shall:

- have be installed on top of the floor cells with pre-punched holes over the cells to be activated
- have holes fitted with a grommet
- be fastened to the cellular unit with concrete screws
- have knock out and access plates installed as required

Underslab Duct

Shall:

- have the top portion of the duct attached to the underside of the floor cells
- have the pre-punched holes fitted with a grommet
- have pre-punched holes centered under cells to be activated
- be fastened with concrete screws
- use cable hangers for support when the covers are open
- have all openings through fire rated partitions fire-stopped

Telecommunications Closet Termination

Inserts (cellular floor)

Preset insert definition

Afterset insert definition

Multiservice insert definition

Service Fittings (cellular floor)

Above Floor

Shall be fully partitioned if electrical service is present in the fitting

Dedicated in-Floor definition

Floor Boxes definition

Shall be fully partitioned if electrical service is present in the fitting

WORK AREA

definition

Outlet Density

One outlet should be provided for each work area and where future planning is difficult such as private offices, board rooms etc, a minimum of 2 outlets should be allowed for, and, in planning the layout for these areas, maximum flexibility should be allowed for; eg: putting outlets on opposite walls.

Outlet Location

Outlets should be located near electrical outlets and at the same height and in conjunction with the furniture layout.

Furniture Pathways and Spaces

Application Planning

There should be no conflicting pathway issues between electrical and telecommunications pathways and outlets. New distribution designs should be tested to ensure minimum bend radius, pathway fill rates and outlet placement are satisfactory.

Building Interfaces

Where the building pathway transitions to the furniture pathway, the designer should consider:

- Safety
- Reliability
- Aesthetics
- Access to other covers or junction boxes

Raceways should be provided between furniture pathways and:

- Wall and column pathways
- Horizontal floor pathways
- Ceiling pathways

Application Planning

The designer and installer should be aware of the following information:

Work Area:

- number, type, and location of cable connections
- diameter and minimum bend radius of each cable type
- number of work areas in each furniture cluster.

Furniture Pathways

- strategy for connecting building pathways to furniture pathways, including number, placement, and cross sectional area of the required interfaces.
- cross sections and cable capacities

Pathway Fill Factor

A rough guide is to take the total cable cross section and calculate that number as a percentage of the total pathway cross section. The result should be somewhere between 20%-40%. This however does not take into account the reduced useable cross sectional area of any fittings, such as corners.

Furniture Pathway Capacity

Vertical pathway cross sectional areas in furniture should be equal to the horizontal pathways cross sectional area and other pathways within the furniture should have a cross sectional area of 9.5 cm^2. These measurements are based on the assumption of each work cluster serving four people, each with 3 connections.

Using fishing and pulling techniques should be avoided if possible. Using a cable lay in method will avoid tight pulls and reduced fill capacities.

Access

Furniture should be arranged to ensure easy access to telecommunications pathways.

Furniture Pathway Bend Radius

Furniture pathways must adhere to bend radius and routing. No more than two 90 degree bends are equivalents are allowed between pull points, and if a U shaped bend is present, a pull box shall be installed.

The inside radius of a bend in conduit shall be 6 times the internal diameter of the conduit. If laying cable into the pathway is used, sweeping bends are not required.

The minimum bend radius shall not be less than 25mm (1 inch), but may be larger for larger cables.

Care should be taken if using hybrid cables and the designer should contact the cable manufacturer for minimum bend radii.

Power/Telecommunications Separation

The power and telecommunications pathways shall be separated as per clause 10.3 of the original standards document and those separators shall be bonded to ground.

Furniture Spaces

Furniture designed for MUTOAs or consolidation points should provide for adequate security to prevent unwanted or malicious changes. MUTOAs and consolidation points shall only be installed on permanent building fixtures, or fixtures that are permanently secured to the building structure.

Internal Spaces

Furniture that houses MUTOAs or consolidation points shall provide space for strain relieving, terminating, and slack storage for the planned horizontal cables to service the work area.

Furniture Types

Furniture types that may support horizontal cable are:

- Cabinets
- Furniture partitions
- Utility columns

Furniture Telecommunications Outlet/Connector

The telecommunications outlet shall be located so that:

- the bend radius requirements are maintained in termination

- the location, mounting, or strain relief of the telecommunications outlet/connector should allow pathway covers and trim to be removed without disturbing the cable termination.

NOTE - The federal Americans with Disabilities **Act (ADA)** may affect mounting locations in some instances.

Furniture Telecommunications Outlet Openings

Two standard sizes of openings are specified:

- NEMA-equivalent opening. (NEMA OS 1 (Ref D.l4),WD-6 (Ref D.15)) openings. In addition, a minimum depth of 30.5 rnm (1.2 in} should be provided.
- Alternate (furniture-size) opening. These openings should have dimensions as:
    - Length 68.8 mm (2.71”)
    - Height 35.1 mm(1.38”)
    - Depth to first obstruction: 30.5 mm (1.2”)

Control Center, Attendant, and Reception Areas

Because of the special nature of reception areas, independent pathways or routes should be run directly back to the telecommunications room.

ADDENDUMS

ANSI/TIA/EIA 569 A-1

Commercial Building Standard for Telecommunications Pathways and Spaces

Addendum 1 Perimeter Pathways

PERIMETER PATHWAYS **DEFINITION**

Shall comply with clause 10.3 of the original standard, and with all other applicable codes.

Construction:

Surface raceways consist of:

- Bases
- Covers
- Fittings to change direction
- Miscellaneous fittings

Surface Raceway shall:

- Have a divider separating power and data in a multichannel dual use raceway
- Maintain proper bend radius requirements and shall not have a bend radius less than 25mm (1").

Design and Installation

Sizing

- The maximum fill rate design shall be a maximum of 40%, but up to 60% is allowed for unplanned moves adds and changes. This fill rate is based on the cross sectional area of all the cables, divided by the most restrictive cross sectional area of the raceway.
- Fittings shall take into account bend radius when calculated useable cross sectional area
- The useable cross sectional area is also reduced by outlets and connectors.

Installation

- All metal components of a metal raceway system shall be bonded and grounded as per ANSI/TIA/EIA 607.
- Power and telecommunications cables shall be installed in separate channels.

ANSI / TIA / EIA 569 A-2

Commercial Building Standard for Telecommunications Pathways and Spaces

Addendum 2 Furniture Pathways

FILL FACTOR

- The maximum fill rate design shall be a maximum of 40%, but up to 60% is allowed for unplanned moves adds and changes. This fill rate is based on the cross sectional area of all the cables, divided by the most restrictive cross sectional area of the raceway.

Furniture Pathway Capacity

The minimum straight cross sectional area in a furniture pathway shall be 9.5 cm^2 (1.5in^2), for a typical fill rate of 33%.

- Vertical pathways should have a cross sectional area equal to the cross sectional area of the horizontal path feeding it, (based on 4 users with 3 outlets at each work station)

Installation

- Fish and pull techniques should not be used
- Furniture should be arranged so access to pathways is not blocked
- Bend radius requirements as per 4.4.2.3 of the original document shall apply where cable is expected to be pulled in around corners.
- Minimum bend radius is 25m (1")
- Consult cable manufacturers for use and separation of hybrid cables.
- Separation between data and power cables shall meet the requirements of 10.3
- Any metallic dividers shall be bonded to ground.

ANSI / TIA / EIA 569-A-3

Commercial Building Standard for Telecommunications Pathways and Spaces

Addendum 3 – Access Floors

Access Floors **definition**

- Pathways shall be firestopped according to local codes

Types of Access Floors

- Low profile
- Standard height profile
- Stringered
- Free standing
- Cornerlock
- Integral

Loading performance is provided in Annex B of the original standards documentation.

Testing shall be done as per CISCA test methods, reference D.11.

Building Structure

Depressed Slab

- the slab shall be depressed to a depth equal to the height of the floor.

Partially Depressed or Normal Slab

- provisions for ramps and/or steps shall be made in accordance with ADA. Steps and ramps shall meet local building codes.

Design Guidelines

Work Area Service Fittings

- shall not be placed in traffic areas
- shall not be placed where they could create a hazard for the occupants

Clearance

- under an access floor shall be 20 mm (.75 in) from the bottom of the access panel to the slab or original floor.
- A minimum of 645 mm^2 (1 in^2) cross sectional area shall be provided per work area
- A minimum of 20 mm (.75 in) between the top of an electrical raceway (if used) under the access floor and the bottom of the access floor.
- Finished floor height in a telecommunications room shall be at least 150 mm (6").

Cable Management

- Some form of cable management shall be used, examples are:
    - Dedicated routes
    - Raceway distribution
    - Zone distribution
    - Cable tray

Installation

- No equipment shall be placed prior to the access floor layout being known
- Linkage to telecommunications rooms shall be provided
- Sizing shall be determined in accordance with the type and size of pathway used
- Fittings shall be compatible with the access flooring
- Grounding and bonding shall follow all applicable codes and manufacturer's specifications.

ANSI / TIA / EIA 569-A-4

Commercial Building Standard for Telecommunications Pathways and Spaces

Addendum 4 Poke Through Devices

Poke Thru Devices

definition The penetrating of a floor or ceiling (depending on which way you are going), which will facilitate the installation of electrical or communications cable from one floor to the next.

The designer and installer must adhere to all firestopping rules when adopting this method of installation.

The designer should also remember that a Telecommunications Room is recommended on each floor where possible.

Types

- single – contains power or data.
- dual – contains both power and data
- flush – is flush with the finished floor, and consists of a stem or stub which protrudes to the underneath the existing floor to the open area below it, a mounting plate, a method to secure the unit and finish trim.
- pedestal/tombstone – extends above the finished floor area with a box to house the electrical and/or communications outlets, a stem to the open area below the floor, a trim plate and a method to secure the unit to the floor material.

Applications

- Mounting power and telecommunications
- Distribute power and telecommunications

Design and Installation

- Determine the fire rating of the floor
- Determine purpose of poke thru
- The manufacturer shall provide relevant cable information
- Abandon poke thrus shall by properly firestopped

Location and density shall:

- be determined by a structural engineer
- documented
- adhere to all codes

ANSI / TIA / EIA 569-A-5

Commercial Building Standard for Telecommunications Pathways and Spaces

Addendum 5 In Floor Systems

General

Section 4.2 of the original standard is replaced by this document.

Underfloor Duct Systems

- ducts are manufactured in single or multi channel systems
- Junction boxes shall be used to permit changes in direction and provide access for pulling cables.

Single Level

- The minimum concrete depth is 64 mm (2.5") if placed on concrete slab, or other appropriate base.

Two Level

- The minimum concrete depth is 100 mm (4")
- Distribution ducts are usually on the upper level and feeder ducts on the lower level
- each two level junction box shall have only one type of service.

Flushduct *definition*

- Minimum concrete depth is 25mm (1")
- Shall not be over 102 mm (4") in width
- Shall be covered with linoleum or equivalent flooring that is not less than 1.6 mm (.625")

Multi Channel Raceway

Single Level

- Single level raceways may be used in concrete floors above grade and in slab on grade
- Minimum concrete depth is 75mm (3")

Two Level

- All access openings shall have a grommet installed
- See 4.2.1.6.2

Floor Structure Design

- In a monolithic pour, the top of the duct system shall be a minimum of 25mm (1") below the top of the slab. The underfloor duct shall be attached to the supporting surface below.
- In a double pour floor, the structural slab supports the duct system and the second pour contains the duct system.
- In a post tensioned pour, the underfloor duct shall not interfere with the post tensioned cables. Presets shall be used.
- In a precast environment, the underfloor duct is located within the concrete topping. The top of the duct system shall be located 25mm (1") below the top surface of the concrete.

General Recommendations

- Assume 3 devices per work area, and one work area per 10 m^2 (100ft^2)
- Provide a minimum of 650 mm^2 (1in^2) of cross sectional duct area per 10m^2 (100 ft^2) of usable floor space.
- If the quantity of devices in the work area is greater, increase the size as required.

Specific Calculation Method

Factors affecting raceway sizes:

- Area being served
- Quantity of work stations
- Size and quantity of cables
- Changes and future requirements

To calculate the distribution duct capacity:

1. calculate the floor area being served by multiplying the length X on center measurement of the duct
2. calculate number of work stations based on General Recommendations above, or from actuals.
3. moves adds and changes must be taken into account
4. multiply the cable diameter by the number of outlets at each work station
5. the result is the cross sectional area required to house the cables. Using a 40% fill rate, take this result and divide by .40 to get the overall cross sectional area required.

To calculate feeder duct capacity:

1. calculate the area being served by the feeder duct
2. calculate average workstation size
3. calculate potential moves
4. calculate cross sectional area of all cables serving workstations
5. divide by .40

Design and Layout Information

- distribution ducts for office buildings shall run on 1520-1825mm (5-6 ft)
- runs adjacent to exterior building walls shall be 450-600 mm (18-24”) from the walls or column lines.
- the service requirements and the area to be supplied determine the density and placement of feeder duct cross runs.
- spacing of feeder ducts shall not exceed 18m (60ft)
- spacing of trenchducts should not exceed 30m (100ft)
- underfloor ducts shall be placed to allow for a star toplolgy wiring scheme

Distribution Duct **definition**

Feeder Duct **definition See Header Duct**

Trenchduct

- Shall have removable cover plates
- In a single level system, access from the trenchduct to distribution duct shall be provided through the side of the trenchduct
- In a two level system access is provided through the bottom of the trenchduct
- Cover plates shall have a levelling means and gasket to prevent moisture ingress

Supplementary Feeders

Provide supplementary feeders when:

- Embedded ducts approaching telecommunications rooms require bends into the TR.

The trench duct shall

- Extend out from the telecommunications room far enough to connect all embedded ducts

Any fittings or tees shall have access openings

Jack Headers ***definition***

Access Units/Junction Boxes **definition** **see Handhole Access Unit**

- in multichannel units, there shall be a partition separating services
- the cover plate shall have a means for levelling
- the cover plate shall have a gasket to prevent moisture ingress

Installation

Duct runs shall:

- Be levelled so that the top of the preset insert is 3-9mm (.125-.375”) below the finished concrete floor
- Have marker screws placed at, or near the end of the duct run which shall extend through the surface of the floor.
- be secured to the sub slab
- Have junction boxes set to concrete screed level prior to pouring the floor, and then levelled to the surrounding floor after the concrete is set.

Trenchduct or Trench Header

Shall:

- Be coupled and levelled so that the cover plates are level with the concrete floor
- Have openings from the base of the trench to distribution duct cut and have grommets inserted
- Have all openings that may allow concrete to enter them sealed prior to the concrete pour.
- Have partitions level with the underside of the cover plate and secured in place
- Have welds painted

Inserts for Underfloor Duct Systems

Preset Inserts ***definition***

Afterset Inserts **definition**

Multiservice Insert **definition**

Service Fittings

Provide access to one or more services.

Shall be partitioned if power is one of the services.

Abandonment Fittings

The deactivation of a preset or afterset insert upon removal of a floor service fitting.

Temporary Abandonment Fittings

Removable covers installed in the preset or afterset inserts that temporarily replace removed floor service fittings.

Permanent Abandonment Fittings

Plates that are installed in the preset or afterset inserts when the floor service units are removed. All cables must be removed for permanent abandonment.

Floor Boxes for Single and Multiple Services

Shall:

- Be fully partitioned if electrical power is one of the services in the floor box
- Have a piece of conduit run from the floor box to the junction box, and use a conduit adapter when serving an isolated location

Cellular Floor ***definition***

Types

Steel and Concrete

Design Guidelines

Size

Cellular sections 600mm (2ft) wide

Non cellular sections 600-900mm (2.0-3.0 ft)

Centers are located on 1220-1525mm (4-5ft) using 50% combination of cellular and non cellular sections.

System Capacities

- Provide a minimum of 650mm^2 (1in^2) of cross sectional area per 10^{2}mtr (100 ft^2) of usable floor space, based on 3 devices per work area of 10mtr^2 (10 ft^2)
- Increase size if planned density in greater than above

Specific Calculation Method

To calculate the distribution cell capacity:

1. calculate the floor area being served by multiplying the length X on center measurement of the duct

2. calculate number of work stations based on System Capacities above, or from actuals
3. Moves adds and changes must be taken into account
4. multiply the cable diameter by the number of outlets at each work station
5. the result is the cross sectional area required to house the cables. Using a 40% fill rate, take this result and divide by .40 to get the overall cross sectional area required.

To calculate feeder duct capacity:

1. calculate the area being served by the feeder duct
2. calculate average workstation size
3. calculate potential moves
4. calculate cross sectional area of all cables serving workstations
5. divide by .40

Design & Layout Information

Concrete coverage:

Cellular steel 64mm (2.5")

Cellular concrete 38mm (1.5")

Distribution Cells in Cellular Floor ***definition***

Preset Inserts

Shall not be spaced less than 600mm (24 in) on center.

May be single or multiservice

Blank Cell **definition**

An afterset insert and service fitting shall be used after core drilling through the concrete topping and cutting through the surface of the cell.

Feeder Systems for Cellular Floor (see Header Duct) ***definition***

Flush Header Duct ***definition***

- Access shall be provided by core drilling through the concrete to the cell, and then fitting the opening with a grommet
- Access units shall be located over the openings to the cells
- Each service shall be located in a separate header duct

Header Duct **definition**

- Pre-punched holes in the header duct shall be aligned with the appropriate cell and a grommet provided.

Trench Header

- Shall have removeable cover plates through its entire length

Jack Header **definition**

Layout of Cellular Floor

Distribution Cells

- Should span the longest length of the building
- The direction of the span is determined by the structural layout

Allocating Distribution Cells

- A 3 cell cellular floor section shall have the two outside cells for telecommunications and the center cell for electrical service

Feeder

- Shall allow for a star topology connection to the telecommunications room

Installation of Cellular Floor Systems

Cellular Floor

- Sections shall be installed as per manufacturer's specifications
- Centreline dimensions of cellular sections shall facilitate locations of preset and afterset inserts.

Header Duct

Shall be installed:

- On top of and perpendicular to the floor cells
- With access units over the cells being activated
- In a secure fashion
- With openings that may allow concrete to flow into the cells covered.
- With access units levelled and fitted with grommets between the header duct and the cell

Trench Header

Shall be installed:

- on top of and perpendicular to floor cells
- with the top surface being level with the finished concrete
- with openings from the base of the trench to the distribution cell cut and fitted with grommets
- with pre-punched holes fitted with a grommet
- so that all services are separated

Shall:

- Secured with welds or rivets
- Have openings sealed prior to concrete pour
- Have the partitions raised to the underside of the cover plate
- Have welds painted with a rust preventing paint

Telecommunications Room Termination

Raceways terminating in the telecommunications room shall:

- Terminate with a slot or elbow
- Have a flange opening in the cover plate for trench headers

Inserts for Cellular Floor Systems

Preset Insert definition

Afterset Insert definition

Multiservice Insert definition

Service Fittings

- Shall be fully partitioned if electrical service is provided.

Types

- Above floor
- Flush floor
- Recessed

ANSI / TIA / EIA 569-A-6

Commercial Building Standard for Telecommunications Pathways and Spaces

Addendum 6 Multi-Tenant Pathways

Multi Tenant Pathways and Spaces

Are comprised of, but not limited to:

- Entrance room
- Access provider space
- Service provider space
- Common equipment room
- Common telecommunications room

References

The following documents should be referenced

- ANSI C95.2-1982, Reference 3
- ANSI/TIA/EIA-568-B.1
- FCC OET Bulletin 65

Definitions

Common equipment room (CER) **definition**

Common telecommunications room (CTR) **definition**

Entrance Facilities

- The construction of the entrance facility should take into consideration the facility and all telecommunications needs of the tenants.
- Services not directly related to the support of the entrance facility, such as water, electrical, ductwork etc, should not enter or pass through the entrance facility.
- Shall have controlled access

Telecommunications Service Entrance Pathway

- Shall be designed for initial and future requirements
- Should accommodate multiple service entrance points for multiple service providers

Wireless

- Wireless transmission/reception devices should be within line of sight of the target system.

Cable Pathways

- On towers should be consolidated from the transmission/reception devices to the service provider space.
- The route shall be the most direct route possible
- Cables should be isolated from pedestrian traffic, environmental damage etc, by placing them in conduit or cable tray.

Location

Transmission/reception devices may be located on:

- the building's rooftop
- outside walls
- lower roof setbacks or,
- inside the building

They should be mounted 2 mtrs (80") above foot traffic surfaces

Support Structures

- A structural engineer shall be employed in the design and placement of wireless support structures.

Towers

- May be installed on building rooftops
- Allow multiple access providers to share space on a single tower

Non Penetrating Wireless Device Mounts

- Light weight devices may be installed on mounts which are not directly attached to building structural members.

Examples:

- Sled mounts
- Ballast mounts
- Non penetrating wireless device mounts

The above mounts may be further secured by adding ballast weights based on wind and ice loading or by tethering.

Penetrating Wireless Device Mounts

- Consideration should be given to the effects of the environment on the structure and waterproofing of penetration points.

Design Considerations

Electrical Service

Shall:

- Be designed by an electrical engineer
- Be sized to support all functions such as, but not limited to:
    - Antenna lighting
    - De-cing
    - Motor operated functions
- Have standby power where required
- Have bonding and grounding systems meet applicable codes

Access Provider Spaces and Service Provider Spaces

- Shall be controlled by the primary or secondary organization

Location

The location of access provider and service provider spaces (including wireless):

- Shall be close to the CER
- Should be expandable
- Shall be accessible from common use corridors
- Shall not be close to electromagnetic interference, with special attention to power supply transformers, motors, generators, induction sealing devices etc.
- Adequate pathways should be provided:
    - From access provider spaces to CER
    - From service provider spaces to the CER
    - From access provider spaces to service provider spaces

Design

- Shared spaces should be partitioned
- A minimum of one wall should be covered with 20 mm (3/4") A-C plywood, void free, 2.4 m (8ft) high, fastened to the wall, and fire rated to applicable codes. The plywood shall be kiln dried to a maximum moisture content of 15%
- There shall be a minimum clearance of 3m (10ft) between the floor and the lowest point of the ceiling.
- Walls, floors and ceilings shall be treated to eliminate dust, and finishes shall be light in colour.
- Lighting shall be a minimum of 500 lx (50 ft candles), measured at 1 m (3ft) above the finished floor, and mounted 2.6 m (8.5 ft) above the finished floor.
- Suspended ceilings should not be installed
- Doors shall be a minimum of .9 m (36") wide, 2 m (8ft) high without a doorsill and hinged to open outward if it meets applicable codes, side to side or removable, and fitted with a lock.
- Minimum floor loading shall be 2.4kPA (50lbf/ft^2). A structural engineer shall verify floor loading conditions.
- Hazard warning signs shall be used where danger from exposure to radio frequency lectromagnetic fields may cause harm. These sign formats shall meet ANSI C95.2-1982
- Spaces shall be designed for seismic activity according to applicable codes.

Environmental

- Both access and service provider spaces shall be protected from contaminants and pollutants that could affect the operation of the equipment.
- Vapour barriers shall be provided if contaminants are present in greater concentrations than allowed in Table 2 of the original standards documents.

Heating Ventilation and Air Conditioning

- A guideline for air conditioning is to provide 9m^3 (300ft^3) of 12^{o}C (55^{o}F) conditioned air per 20 A dedicated circuit.

- HVAC requirements may exceed the above and should be calculated based on the heating and cooling of all equipment installed, or which may be installed in the access or service provider spaces.
- HVAC shall operate 24 hours per day, 365 days a year.
- A stand alone unit should be provided if the building cannot assure a continuous operation.

Access and service provider spaces should be kept at a continuous operating temperature of between 18°C (65°F) to 24°C (75°F) with a 30% to 55% relative humidity. Both temperature and humidity shall be measured at a distance of 1.5m (5ft) above the floor.

- A positive air pressure should be maintained.
- Proper ventilation shall be provided as per manufacturer's specification if back up batteries are installed.
- The structural engineer should design safeguards against building vibration.
- Mechanical fixtures such as ductwork, tubing, piping etc should not pass through or enter the space.

Electrical

- As a minimum at least one dedicated 20 A, 120Vac, non switched duplex outlet receptacle shall be located in each access provider and service provider space.
- Consideration should be given to connecting access and service provider equipment to a building standby power source if one is available.
- A UPS up to 100kVA shall be permitted in the access and service provider spaces. Larger UPS systems should be located outside the space.
- Access to the bonding and grounding system shall be provided.

Fire Protection

- Fire protection should be provided as per applicable code
- If sprinklers are used, wire cages shall be installed over the heads
- Drainage troughs shall be placed under sprinkler heads.
- Alternate fire suppression systems are allowed

Water Infiltration

- Access and service provider spaces should not be located below the water table unless proper measures are taken to prevent water infiltration.
- Only water and drain pipes associated with the support of the equipment are allowed in the space.
- A floor drain shall be provided.

Common Equipment Room CER

- Should only contain facilities that serve multiple tenants in a building
- More than one CER may be provided based on building size and facilities served
- Access shall be controlled by the primary or secondary organization

Location

- Should accommodate room expansion

- Should be as close as possible to the vertical backbone pathways
- Should be accessible through common use hallways and allow for the delivery of large cable reels.

Pathways

- Pathways should be provided for between:
- Access provider spaces and CER
- Service provider spaces and CER
- CER's and CTRs
- CERs to equipment rooms

Design

Shared spaces should be partitioned

If a building has less than 50,000 m^2 or less, the CER should have 12 m^2 of floor space. If the building has more than 50,000 m^2 the CER area should be increased by 10 m^2 increments for ever 10,000 m2. The minimum room width should not be less than 3m

A minimum of one wall should be covered with 20 mm (3/4") A-C plywood, void free, 2.4m (8ft) high, fastened to the wall, and fire rated to applicable codes. The plywood shall be kiln dried to a maximum moisture content of 15%.

There shall be a minimum clearance of 3m (10ft) between the floor and the lowest point of the ceiling.

Walls, floors and ceilings shall be treated to eliminate dust, and finishes shall be light in colour.

Lighting shall be a minimum of 500 lx (50 ft candles), measured at 1 m (3ft) above the finished floor, and mounted 2.6 m (8.5 ft) above the finished floor.

Suspended ceilings should not be installed

Doors shall be a minimum of .9 m (36") wide, 2 m (8ft) high without a doorsill and hinged to open outward if it meets applicable codes, side to side or removable, and fitted with a lock.

Minimum floor loading shall be 2.4kPA (50lbf/ft^2). A structural engineer shall verify floor loading conditions.

Hazard warning signs shall be used where danger from exposure to radio frequency electromagnetic fields may cause harm. These sign formats shall meet ANSI C95.2-1982

Spaces shall be designed for seismic activity according to applicable codes.

Environmental

Both access and service provider spaces shall be protected from contaminants and pollutants that could affect the operation of the equipment.

Vapour barriers shall be provided if contaminants are present in greater concentrations than allowed in Table 2 of the original standards documents.

Heating Ventilation and Air Conditioning

A guideline for air conditioning is to provide 9m^3 (300ft3) of 12°C (55°F) conditioned air per 20 A dedicated circuit.

HVAC requirements may exceed the above and should be calculated based on the heating and cooling of all equipment installed, or which may be installed in the access or service provider spaces.

HVAC shall operate 24 hours per day, 365 days a year.

A stand alone unit should be provided if the building cannot assure a continuous operation.

Access and service provider spaces should be kept at a continuous operating temperature of between 18°C (65°F) to 24°C (75°F) with a 30% to 55% relative humidity. Both temperature and humidity shall be measured at a distance of 1.5m (5ft) above the floor.

A positive air pressure should be maintained.

Proper ventilation shall be provided as per manufacturer's specification if back up batteries are installed.

The structural engineer should design safeguards against building vibration.

Mechanical fixtures such as ductwork, tubing, piping etc should not pass through or enter the space.

Electrical

As a minimum at least one dedicated 20 A, 120Vac, non switched duplex outlet receptacle shall be located in each access provider and service provider space.

Consideration should be given to connecting access and service provider equipment to a building standby power source if one is available.

A UPS up to 100kVA shall be permitted in the access and service provider spaces. Larger UPS systems should be located outside the space.

Access to the bonding and grounding system shall be provided.

Fire Protection

- Fire protection should be provided as per applicable code
- If sprinklers are used, wire cages shall be installed over the heads
- Drainage troughs shall be placed under sprinkler heads.
- Alternate fire suppression systems are allowed

Water Infiltration

- Access and service provider spaces should not be located below the water table unless proper measures are taken to prevent water infiltration.
- Only water and drain pipes associated with the support of the equipment are allowed in the space.
- A floor drain shall be provided.

Common Telecommunications Room

- Should contain only those facilities that serve multiple tenants
- Tenant customer premises equipment shall not be located in the CTR
- CTRs should be vertically aligned if possible
- CTR should be located central to the area served
- Access shall be controlled by the primary or secondary organization

Pathways

- Should take into consideration:
- Cable infrastructures shared by multiple tenants
- Intra-building connectivity
- Inter-building connectivity
- Wireline access/service provider bypass needs
- Wireless access/service provider bypass needs.

Design

- The design should be based on current and future needs
- A typical CTR should be $6m^2$ ($80ft^2$)
- More than one CTR should be provided if the serving area is greater than $2000m^2$ ($20,000ft^2$)
- A minimum of one wall should be covered with 20 mm (3/4") A-C plywood, void free, 2.4 m (8ft) high, fastened to the wall, and fire rated to applicable codes. The plywood shall be kiln dried to a maximum moisture content of 15%.
- There shall be a minimum clearance of 3m (10ft) between the floor and the lowest point of the ceiling.
- Walls, floors and ceilings shall be treated to eliminate dust, and finishes shall be light in colour.
- Lighting shall be a minimum of 500 lx (50 ft candles), measured at 1 m (3ft) above the finished floor, and mounted 2.6 m (8.5 ft) above the finished floor.
- Suspended ceilings should not be installed
- Doors shall be a minimum of .9 m (36") wide, 2 m (8ft) high without a doorsill and hinged to open outward if it meets applicable codes, side to side or removable, and fitted with a lock.
- Minimum floor loading shall be 2.4kPA ($50lbf/ft^2$). A structural engineer shall verify floor loading conditions.
- Hazard warning signs shall be used where danger from exposure to radio frequency electromagnetic fields may cause harm. These sign formats shall meet ANSI C95.2-1982
- Spaces shall be designed for seismic activity according to applicable codes

Heating Ventilation and Air Conditioning

A guideline for air conditioning is to provide $9m^3$ (300ft3) of 12^oC (55^oF) conditioned air per 20 A dedicated circuit.

Electrical

- As a minimum at least one dedicated 20 A, 120Vac, non switched duplex outlet receptacle shall be located in each access provider and service provider space.
- Consideration should be given to connecting access and service provider equipment to a building standby power source if one is available.
- A UPS up to 100kVA shall be permitted in the access and service provider spaces. Larger UPS systems should be located outside the space.
- Access to the bonding and grounding system shall be provided.

Fire Protection

- Fire protection should be provided as per applicable code
- If sprinklers are used, wire cages shall be installed over the heads
- Drainage troughs shall be placed under sprinkler heads.
- Alternate fire suppression systems are allowed

Water Infiltration

- Access and service provider spaces should not be located below the water table unless proper measures are taken to prevent water infiltration.
- Only water and drain pipes associated with the support of the equipment are allowed in the space.
- A floor drain shall be provided.

Intrabuilding and Interbuilding Pathway Requirements

Intrabuilding Pathways

Slot Quantity and Configuration

- The location of slots shall be determined by a structural engineer
- Depths shall be 150-600mm (6-24"), with a preference to the narrower slots

Size

- One slot of .04m^2 (60in^2) for up to 4,000m^2 (40,000ft^2) of usable floor space
- Increase by .04m^2 (60in^2) for each 4,000m^2 (40,000ft^2)

Sleeve Quantity and Configuration

- The location and configuration shall be approved by a structural engineer
- There should only be 2 rows of sleeves where possible
- There should be 4 sleeves with an additional sleeve for growth for every 4,000m^2 (40,000ft^2)

Common Pathways and Spaces Bypass definition

Interbuilding Pathways

- Should be sized taking into account wireline and wireless access and service provider bypass requirements, intra tenant connectivity needs and pathway requirements associated with cable infrastructures in multiple tenant environments.

ANSI/TIA/EIA 569-A-7

Commercial Building Standard for Telecommunications Pathways and Spaces

Addendum 7 Cable Trays and Wireways

The intent of this addendum is to update sub-clause 4.5 to reflect changes in cable fill issues.

Cable Trays and Runways **definition**

Types

Ladder Cable Tray

Ventilated Bottom Tray

Solid bottom tray

Cable Channel

Single Rail Cable Tray (see Spine Cable Tray)

Wire Cable Tray

Intermediate Mesh Tray (see Mesh Tray)

Cable Runway

Location

- May be located above or below ceiling, within an acess floor in either plenum or non plenum spaces.
- Applicable electrical and building codes shall be followed.

Design Information

Cable trays shall:

- Be designed for a maximum of 50% fill ratio for a maximum tray depth of 150mm (6”).
- A lower initial fill ratio is recommended to accommodate future expansion and changes

Calculation of Fill Ratio

1. Calculate cross sectional area of one cable
2. Calculate cross sectional area of all cables to be located in tray
3. Calculate usable cable tray area (maximum 50%) where either width or depth may be a known value.

Cable Runway

- Cables shall not be stacked higher than 150mm (6”) on a cable runway

Support

- The support span shall be installed as per manufacturer’s specifications
- Tray supports should be located so that the connections between trays fall between the support and ¼ the distance of the span.
- Supports should be located within 600 mm (24”) on each side of a bend, tee or cross.
- See also NEMA-VE2

Fittings

Installation

- Cable trays shall:
- be installed according to applicable electrical codes.
- have no burrs on the inside of the support system
- have protective coverings installed on threaded or rough support rods
- have penetrations through fire rated walls properly fire stopped
- not have a fill ratio exceeding clause 4.5.3 of the original standard
- not be used as walkways
- have power and telecommunications physically separated
- have 300m (12”) clearance above the raceway

Public Input No. 530-NFPA 70-2023 [Section No. 392.18(H)]

(H) Marking.

Cable trays containing conductors operating over ~~600 volts~~ 1000 volts shall have a permanent, legible warning notice carrying the wording “DANGER — HIGH VOLTAGE — KEEP AWAY” placed in a readily visible position on all cable trays, with the spacing of warning notices not to exceed 3 m (10 ft). The danger marking(s) or labels shall comply with 110.21(B).

Exception: Where not accessible (as applied to equipment), in industrial establishments where the conditions of maintenance and supervision ensure that only qualified persons service the installation, cable tray system warning notices shall be located where necessary for the installation to ensure safe maintenance and operation.

Statement of Problem and Substantiation for Public Input

392.20 differentiates conductor insulation of 1000 Volts or less (392.20(A)) from over 1000 Volts (392.20(B)). Reference to voltages above 600V as high voltage creates a third voltage level that causes confusion in differentiating high voltage from low voltage.

Submitter Information Verification

Submitter Full Name: David Bredhold
Organization: Vitok Engineers
Street Address:
City:
State:
Zip:
Submittal Date: Wed Apr 05 06:46:19 EDT 2023
Committee: NEC-P08

Committee Statement

Resolution: FR-7742-NFPA 70-2024

Statement: This revision correlates with the voltages identified in Sections 392.20(A)&(B). Requirements are revised to include the same voltage demarcation used in many places throughout the Code. This is in reference to Global PI-2424.

Public Input No. 1300-NFPA 70-2023 [Section No. 392.22(A)(5)]

(5) Ventilated Channel Cable Trays Containing Multiconductor Cables of Any Type.

Where ventilated channel cable trays contain multiconductor cables of any type, 392.22(A)(5)(a) and (A)(5)(b) shall apply.

(a) Where only one multiconductor cable is installed, the cross-sectional area shall not exceed the value specified in Column 1 of Table 392.22(A)(5).

(b) Where more than one multiconductor cable is installed, the sum of the cross-sectional area of all cables shall not exceed the value specified in Column 2 of Table 392.22(A)(5).

Table 392.22(A)(5) Allowable Cable Fill Area for Multiconductor Cables in Ventilated Channel Cable Trays for Cables Rated 2000 Volts or Less

Inside Width of Cable Tray		Maximum Allowable Fill Area for Multiconductor Cables			
		Column 1 One Cable		Column 2 More Than One Cable	
mm	in.	mm^2	$in.^2$	mm^2	$in.^2$
75	3	1500	2.3	850	1.3
100	4	2900	4.5	1600	2.5
150	6	4500	7.0	2450	3.8

Additional Proposed Changes

File Name	Description	Approved
Table_392.22_A_5_docx.docx	Table shows addition of 2" cable tray	

Statement of Problem and Substantiation for Public Input

This public input adds 2” cable tray to Table 392.22(A)(5) to be consistent with Table 392.22(A)(6).

Submitter Information Verification

Submitter Full Name: Megan Hayes
Organization: NEMA
Street Address:
City:
State:
Zip:
Submittal Date: Fri Jul 07 15:29:03 EDT 2023
Committee: NEC-P08

Committee Statement

Resolution: FR-7750-NFPA 70-2024

Statement: 2” vented channel cable tray was added to Table 392.22(A)(5) to be consistent with Table 392.22(A)(6).

Table 392.22(A)(5) Allowable Cable Fill Area for Multiconductor Cables in Ventilated Channel Cable Trays for Cables Rated 2000 Volts or Less

Inside Width of Cable Tray		Maximum Allowable Fill Area for Multiconductor Cables: Column 1 One Cable		Column 2 More Than One Cable	
mm	in.	mm^2	$in.^2$	mm^2	$in.^2$
50	2	850	1.3	500	0.8
75	3	1500	2.3	850	1.3
100	4	2900	4.5	1600	2.5
150	6	4500	7.0	2450	3.8

Public Input No. 1294-NFPA 70-2023 [Section No. 392.22(B)]

(B) Number of Single-Conductor Cables, Rated 2000 Volts or Less, in Cable Trays.

The number of single conductor cables, rated 2000 volts or less, permitted in a single cable tray section shall not exceed the requirements of this section. The ~~single conductors, or~~ conductor ~~assemblies, shall be evenly distributed across the cable tray. The conductor~~ sizes shall apply ~~to both aluminum and~~ to aluminum, copper conductors and Copper Clad Auluminum ..

(1) Ladder or Ventilated Trough Cable Trays.

Where ladder or ventilated trough cable trays contain single-conductor cables, the maximum number of single conductors shall conform to 392.22(B)(1)(a) through (B)(1)(d).

(a) Where all of the cables are 1000 kcmil or larger, the sum of the diameters of all single-conductor cables shall not exceed the cable tray width, and the cables shall be installed in a single layer. Conductors that are bound together to comprise each circuit group shall be permitted to be installed in other than a single layer.

(b) Where all of the cables are from 250 kcmil through 900 kcmil, the sum of the cross-sectional areas of all single-conductor cables shall not exceed the maximum allowable cable fill area in Column 1 of Table 392.22(B)(1) for the appropriate cable tray width.

(c) Where 1000 kcmil or larger single-conductor cables are installed in the same cable tray with single-conductor cables smaller than 1000 kcmil, the sum of the cross sectional areas of all cables smaller than 1000 kcmil shall not exceed the maximum allowable fill area resulting from the computation in Column 2 of Table 392.22(B)(1) for the appropriate cable tray width.

(d) Where any of the single conductor cables are 1/0 through 4/0 AWG, the sum of the diameters of all single conductor cables shall not exceed the cable tray width.

Table 392.22(B)(1) Allowable Cable Fill Area for Single-Conductor Cables in Ladder, Ventilated Trough, or Wire Mesh Cable Trays for Cables Rated 2000 Volts or Less

Inside Width of Cable Tray		-	Maximum Allowable Fill Area for Single-Conductor Cables in Ladder, Ventilated Trough, or Wire Mesh Cable Trays				
		-	Column 1 Applicable for 392.22(B)(1)(b) Only		-	Column 2[a] Applicable for 392.22(B)(1)(c) Only	
mm	in.	-	mm^2	$in.^2$	-	mm^2	$in.^2$
50	2	-	1,400	2.0	-	1,400 – (28 Sd)[b]	2.0 – (1.1 Sd)[b]
100	4	-	2,800	4.5	-	2,800 – (28 Sd)	4.5 – (1.1 Sd)
150	6	-	4,200	6.5	-	4,200 – (28 Sd)[b]	6.5 – (1.1 Sd)[b]
200	8	-	5,600	8.5	-	5,600 – (28 Sd)	8.5 – (1.1 Sd)
225	9	-	6,100	9.5	-	6,100 – (28 Sd)	9.5 – (1.1 Sd)
300	12	-	8,400	13.0	-	8,400 – (28 Sd)	13.0 – (1.1 Sd)
400	16	-	11,200	17.5	-	11,200 – (28 Sd)	17.5 – (1.1 Sd)
450	18	-	12,600	19.5	-	12,600 – (28 Sd)	19.5 – (1.1 Sd)
500	20	-	14,000	21.5	-	14,000 – (28 Sd)	21.5 – (1.1 Sd)
600	24	-	16,800	26.0	-	16,800 – (28 Sd)	26.0 – (1.1 Sd)

Inside Width of Cable Tray		-	Maximum Allowable Fill Area for Single-Conductor Cables in Ladder, Ventilated Trough, or Wire Mesh Cable Trays				
			Column 1 Applicable for 392.22(B)(1)(b) Only		-	Column 2[a] Applicable for 392.22(B)(1)(c) Only	
mm	in.	-	mm^2	in.^{2}	-	mm^2	in.^{2}
750	30	-	21,000	32.5	-	21,000 – (28 Sd)	32.5 – (1.1 Sd)
900	36	-	25,200	39.0	-	25,200 – (28 Sd)	39.0 – (1.1 Sd)

[a]The maximum allowable fill areas in Column 2 shall be calculated. For example, the maximum allowable fill, in mm^2, for a 150-mm wide cable tray in Column 2 shall be 4200 minus (28 multiplied by Sd) [the maximum allowable fill, in square inches, for a 6-in. wide cable tray in Column 2 shall be 6.5 minus (1.1 multiplied by Sd)].

[b]The term *Sd* in Column 2 is equal to the sum of the diameters, in mm, of all cables 507 mm^2 (in inches, of all 1000 kcmil) and larger single-conductor cables in the same cable tray with small cables.

(2) Ventilated Channel Cable Trays.

Where 50 mm (2 in.), 75 mm (3 in.), 100 mm (4 in.), or 150 mm (6 in.) wide ventilated channel cable trays contain single-conductor cables, the sum of the diameters of all single conductors shall not exceed the inside width of the channel.

Statement of Problem and Substantiation for Public Input

The requirement to be evenly distributed creates a safety item when adding cables into the existing tray. Being evenly spaced across the tray will require moving the conductors in some case while energized to create the space to add the new circuit conductors. We understand the need to de-energize conductors before working on or around them, but this is not possible in some cases.
Also adding copper clad aluminum conductors to the type of conductor materials that are allowed in a tray.

Submitter Information Verification

Submitter Full Name:	IEC National
Organization:	IEC
Affiliation:	Lowell Reith IEC
Street Address:	
City:	
State:	
Zip:	
Submittal Date:	Thu Jul 06 15:55:59 EDT 2023
Committee:	NEC-P08

Committee Statement

Resolution: FR-7752-NFPA 70-2024

Statement: Revised to allow flexibility in the placement of cables and to support the use of copper-clad aluminum. There are general requirements for future expansion in 90.8(A) and requirements to group conductors 300.20(A) which address distribution of cables across the cable tray.

Public Input No. 828-NFPA 70-2023 [Section No. 392.22(B) [Excluding any Sub-Sections]]

The number of single conductor cables, rated 2000 volts or less, permitted in a single cable tray section shall not exceed the requirements of this section. ~~The single conductors, or conductor assemblies, shall be evenly distributed across the cable tray. The conductor~~ The conductor sizes shall apply ~~to both~~ to aluminum, copper, and copper clad aluminum conductors.

-

Statement of Problem and Substantiation for Public Input

The requirement to be evenly distributed creates a safety item when adding cables into the existing tray. Being evenly spaced across the tray will require moving the conductors in some case while energized to create the space to add the new circuit conductors. We understand the need to de-energize conductors before working on or around them, but this is not possible in some cases. Also adding copper clad aluminum conductors to the type of conductor materials that are allowed in a tray.

Submitter Information Verification

Submitter Full Name: Lowell Reith
Organization: Interstates Construction Servi
Affiliation: Independent Electrical Contractors (IEC)
Street Address:
City:
State:
Zip:
Submittal Date: Mon May 15 14:21:56 EDT 2023
Committee: NEC-P08

Committee Statement

Resolution: FR-7752-NFPA 70-2024

Statement: Revised to allow flexibility in the placement of cables and to support the use of copper-clad aluminum. There are general requirements for future expansion in 90.8(A) and requirements to group conductors 300.20(A) which address distribution of cables across the cable tray.

Public Input No. 4349-NFPA 70-2023 [Section No. 392.30(B)]

(B) Cables and Conductors.

Cables and conductors shall be secured to and supported by the cable tray system in accordance with the following, as applicable:

(1) In other than horizontal runs, the cables shall be fastened securely to transverse members of the cable tray.

(2) Supports shall be provided to prevent stress on cables where they enter raceways from cable tray systems.

(3) The system shall provide for the support of cables and raceway wiring methods in accordance with their corresponding articles. Where cable trays support individual conductors or multiconductor cables and where the conductors or multiconductor cables pass from one cable tray to another, or from a cable tray to raceway(s) or from a cable tray to equipment where the conductors are terminated, the distance between the cable trays or between the cable tray and the raceway(s) or the equipment shall not exceed 1.8 m (6 ft). The conductors shall be secured to the cable tray(s) at the transition, and they shall be protected, by guarding or by location, from physical damage.

(4) Cable ties shall be listed and identified for the application and for securement and support.

(5) Medium Voltage cables shall be secured by listed cable cleats

Statement of Problem and Substantiation for Public Input

When you get into medium voltage cables standard tray fastening with cable ties or small clamps will not hold the cable in place if a fault occurs. Arcing or fault situations with these cables will jump and break ordinary fasteners. Cable cleats will hold the cable in pace during a fault and stop it from jumping out of the tray and potentially causing a hazard. There are many videos that show what happens in a fault situation with cable ties compared to using cleats. Please look at the following video. https://youtu.be/_i2L-CCJoDI

Related Public Inputs for This Document

Related Input	Relationship
Public Input No. 4343-NFPA 70-2023 [Sections 315.32(A), 315.32(B)]	

Submitter Information Verification

Submitter Full Name: Raymond Horner
Organization: Atkore
Affiliation: Atkore
Street Address:
City:
State:
Zip:
Submittal Date: Thu Sep 07 12:25:32 EDT 2023
Committee: NEC-P08

Committee Statement

Resolution: Cable Cleats are not required for multiconductor cables of any voltage and are not required for tri-plexed cables where fault energies are less than the strength of cable ties, whether stainless steel, or duplexed plastic ties. Cable cleats are not prohibited by the NEC and may be used where higher fault currents exist.

Public Input No. 2669-NFPA 70-2023 [Section No. 392.60(A)]

(A) Metal Cable Trays.

Metal cable trays shall be permitted to be used as equipment grounding conductors where continuous maintenance and supervision ensure that qualified persons service the installed cable tray system and the cable tray complies with this section. Metal cable trays that support electrical conductors shall be grounded as required for conductor enclosures in accordance with 250.96 and ~~Part IV of~~ Article 250 , Part IV . Metal cable trays containing only non-power conductors shall be electrically continuous through approved connections or the use of a bonding jumper.

Informational Note: Examples of non-power conductors include nonconductive optical fiber cables and Class 2 and Class 3 remote-control, signaling, and power-limited circuits.

Statement of Problem and Substantiation for Public Input

This Public Input is being submitted on behalf of the NEC Correlating Committee Usability Task Group in order to provide correlation throughout the document. The text is revised to to comply with the NEC Style Manual Section 4.1.4, regarding the use of Parts.
4.1.4 References to an Entire Article. References shall not be made to an entire article, except for the Article 100 or where referenced to provide the necessary context. References to specific parts within articles shall be permitted. References to all parts of an article shall not be permitted. The article number shall precede the part number.
The Usability Task Group members are: Derrick Atkins, David Hittinger, Richard Holub, Dean Hunter, Chad Kennedy and David Williams.

Submitter Information Verification

Submitter Full Name:	David Williams
Organization:	Delta Charter Township
Street Address:	
City:	
State:	
Zip:	
Submittal Date:	Thu Aug 24 08:26:36 EDT 2023
Committee:	NEC-P08

Committee Statement

Resolution: FR-7759-NFPA 70-2024

Statement: The revised text has been modified to comply with the 2023 style manual. The text was revised to address changes in low power class circuits.

Public Input No. 4336-NFPA 70-2023 [Section No. 392.60(A)]

(A) Metal Cable Trays.

Metal cable trays shall be permitted to be used as equipment grounding conductors where continuous maintenance and supervision ensure that qualified persons service the installed cable tray system and the cable tray complies with this section. Metal cable trays that support electrical conductors shall be grounded as required for conductor enclosures in accordance with 250.96 and Part IV of Article 250. Metal cable trays containing only non-power~~-~~ ~~conductors~~ , power-limited, or fault managed power conductors shall be electrically continuous through approved connections or the use of a bonding jumper.

Informational Note: Examples of non-power conductors include nonconductive optical fiber cables~~-~~ ~~and~~ , Class 2 and ~~Class 3 remote~~ Class 3 power ~~-control~~ limited circuits , ~~signaling, and power-limited circuits~~ and Class 4 Fault Managed Power Systems .

Statement of Problem and Substantiation for Public Input

NEC 2023 changed the title on Article 725 to remove "remote-control, signaling" and define them simply as power-limited circuits as Class 2 circuits may carry some power, but at safe levels on isolated circuits. Therefore the new name of the section is in conflict with the requirement here referring to non-power Class 2/3 circuits. As these isolated circuits do not require grounding to maintain safety, there is no apparent benefit to requiring grounded tray nor a hazard in allowing only electrically continuous cable tray. Class 4 circuits were added in the 2023 NEC and as they are required to be isolated, and have fault-response requirements that exceed those of Class 2, they should be considered for inclusion in this modified requirement.

Submitter Information Verification

Submitter Full Name: Chad Jones

Organization: Cisco Systems

Street Address:

City:

State:

Zip:

Submittal Date: Thu Sep 07 12:03:20 EDT 2023

Committee: NEC-P08

Committee Statement

Resolution: FR-7759-NFPA 70-2024

Statement: The revised text has been modified to comply with the 2023 style manual. The text was revised to address changes in low power class circuits.

Public Input No. 1522-NFPA 70-2023 [Section No. 392.80(A)(1)]

(1) Multiconductor Cables.

The ampacity of multiconductor cables, nominally rated 2000 volts or less, installed according to the requirements of 392.22(A) shall be as given in Table 310.16 and Table 310.18, subject to 392.80(A)(1)(a), (A)(1)(b), (A)(1)(c), and 310.14(A)(2).

(a) The adjustment factors of 310.15(C)(1) shall apply only to multiconductor cables with more than three current-carrying conductors. Adjustment factors shall be limited to the number of current-carrying conductors in the cable and not to the number of conductors in the cable tray.

(b) Where cable trays are continuously covered for more than 1.8 m (6 ft) with solid unventilated covers, not over 95 percent of the ampacities as calculated in 392.80(A)(1)(a) or 392.80(A)(1) (c) shall be permitted for multiconductor cables of Table 310.16 and Table 310.18 shall be permitted for multiconductor cables.

(c) Where multiconductor cables are installed in a single layer in uncovered trays, with a maintained spacing of not less than one cable diameter between cables, the ampacity shall not exceed the ambient temperature-corrected ampacities of multiconductor cables, with not more than three insulated conductors rated 0 through 2000 volts in free air, in accordance with 310.14(B).

Informational Note: See Informative Annex B, Table B.2(3).

Statement of Problem and Substantiation for Public Input

Add clarity as the existing language isn't clear regarding if (a) and (b) are performed. Currently if an 80% adjustment is done according to 310.15(C)(1), this value is less than the 95% of the ampacities of Table 310.16 and Table 310.18, and therefore the calculation in 392.80(A)(1)(b) would not need to be done since the 80% is less than 95%. If the intent is to apply the 95% for the covered tray application in 392.80(A)(1)(b) in addition to any calculation in 392.80(A), then this public input does that.

Submitter Information Verification

Submitter Full Name: John McCamish
Organization: NECA IBEW Electrical Training
Affiliation: Self
Street Address:
City:
State:
Zip:
Submittal Date: Sun Jul 23 19:15:53 EDT 2023
Committee: NEC-P08

Committee Statement

Resolution: (A)(1)(a) and (A)(1)(c) already cover the ampacity adjustment requirements. NEC Style Manual 4.1.1 identifies that the use of redundant references shall be avoided.

Public Input No. 3907-NFPA 70-2023 [Section No. 394.10]

394.10 Uses Permitted.

Concealed knob-and-tube wiring shall be permitted to be installed in the hollow spaces of walls and ceilings, or in unfinished attics and roof spaces as provided by 394.23, only as follows:

(1) For extensions of existing installations

(2) Elsewhere by special permission

<u>I.N. See 210.12(E) for AFCI requirements.</u>

Statement of Problem and Substantiation for Public Input

I have had multiple reports that the 210.12(E) requirement is overlooked. Adding an I.N. is not going to convince flippers to hire electrical contractors with extensive code knowledge. However, it might just serve as a tickler for people who are unfamiliar with K&T and flip to this article. There is considerable justification for requiring AFCI protection whenever K&T buried in outside walls is extended, because how many people pouring or foaming insulation into a wall consider the wiring? This is a much more modest proposal.

Submitter Information Verification

Submitter Full Name: David Shapiro
Organization: Safety First Electrical
Street Address:
City:
State:
Zip:
Submittal Date: Wed Sep 06 09:52:39 EDT 2023
Committee: NEC-P08

Committee Statement

Resolution: FR-7861-NFPA 70-2024

Statement: A new informational note is added for clarity and completeness of the Code requirements when extending concealed knob-and-tube wiring.

Public Input No. 3864-NFPA 70-2023 [Section No. 394.23(A)]

(A) Accessible by Stairway or Permanent Ladder.

Conductors shall be installed along the side of or through bored holes in floor joists, studs, or rafters. Where run through bored holes, conductors in the joists and in studs or rafters to a height of not less than 2.1 m (7 ft) above the floor or floor joists shall be protected by substantial running boards across the edges of the joists, studs, or rafters, extending not less than 25 mm (1 in.) on each side of the conductors. Running boards shall be securely fastened in place. Running boards and guard strips shall not be required where conductors are installed along the sides of joists, studs, or rafters.

Statement of Problem and Substantiation for Public Input

With the exception of protection from cinder fill, other requirements for running boards require wiring methods to be secured to them for support as well as protection. Without this clarification, the rule could be taken as absurdly requiring running boards to be pieced between structural members. I talked a few days ago with a senior electrician who deals with K&T every month, but never understood this requirement.

Related Public Inputs for This Document

Related Input	Relationship
Public Input No. 3463-NFPA 70-2023 [New Definition after Definition: Riser Cable, Cable Routing...]	Running boards have not been defined. the dictionary thinks they belong on a Chevy.
Public Input No. 3463-NFPA 70-2023 [New Definition after Definition: Riser Cable, Cable Routing...]	

Submitter Information Verification

Submitter Full Name: David Shapiro

Organization: Safety First Electrical

Street Address:

City:

State:

Zip:

Submittal Date: Tue Sep 05 20:09:07 EDT 2023

Committee: NEC-P08

Committee Statement

Resolution: The existing requirements are clear, and the proposed additional language is not necessary.

Public Input No. 1713-NFPA 70-2023 [Section No. 394.56]

394.56 Splices and Taps.

Splices shall be soldered unless approved splicing devices are used. Splices shall be accessible, unless made with splicing devices listed for concealment.

I.N. In-line ~~or strain~~ splices ~~shall not be used.~~ are not exempt from the 394.30 requirement for strain relief to each side.

Statement of Problem and Substantiation for Public Input

People still extend these existing circuits using knob-and-tube wiring, sometimes in hollow walls and ceilings. It is legal to extend this method not only from enclosures but also by adding knobs within a wall, concealing them by repairing the building finish.

When this wiring method first was used, the common splicing method was to twist, solder, and then tape. This was highly reliable. Section 324.11 in the 1968 NEC first forbade in-line or strain splices. My guess is that members of the CMP realized that the days when an electrician twisted, twisted, twisted, the wires, folded over all those twists doubling the splice, called for the boy with the solder pot so he could dip the mass, then taped it with rubber and re-taped it with friction tape, were long gone and splices were no longer nearly as bulletproof. The permission to use approved splicing devices allows installers to stick a few wires into such a device and perhaps, depending on its design, give it a couple of twists. How many inspectors will refuse to approve use of a listed product, when the listing does not explicitly restrict its use to enclosures? This procedure is much more variable and thus makes it more important that the splice remain accessible for troubleshooting and repair. This can be provided by adding, for example, a blank cover without a box.

The change from "in-line or strain splices" is offered for two reasons. First, "strain splices" is not a commonly understood term. Second the danger with in-line splices comes from the risk that they will pull apart, or at least loosen. 394.30 addresses this risk., and the I.N. clarifies that no exemption magically appeared here.

Submitter Information Verification

Submitter Full Name:	David Shapiro
Organization:	Safety First Electrical
Street Address:	
City:	
State:	
Zip:	
Submittal Date:	Sat Jul 29 16:11:46 EDT 2023
Committee:	NEC-P08

Committee Statement

Resolution: The existing requirements are clear, and the proposed additional language is not necessary. No substantiation was provided to support the acceptance of in line splices.

Public Input No. 4397-NFPA 70-2023 [New Definition after Definition:]

Insert into Table A.1(a)

Article 371

Standard Number = UL 1386, Flexible Bus Systems

UL 1387, Flexible Insulated Bus

Statement of Problem and Substantiation for Public Input

This adds the standards required for listing to comply with Article 371.6 requirement.

Submitter Information Verification

Submitter Full Name: Ward Judson

Organization: nVent Electric

Street Address:

City:

State:

Zip:

Submittal Date: Thu Sep 07 14:13:17 EDT 2023

Committee: NEC-P08

Committee Statement

Resolution: FR-7853-NFPA 70-2024

Statement: This first revision adds the two product safety standards associated with Article 371 to Table A.1(a) for clarity and completeness.

Public Input No. 1588-NFPA 70-2023 [Annex C]

Informative Annex C Conduit, Tubing, and Cable Tray Fill Tables for Conductors and Fixture Wires of the Same Size

This informative annex is not a part of the requirements of this NFPA document but is included for informational purposes only.

Table	Page

*Where this table is used in conjunction with Tables C.1 through C.13, the conductors installed must be of the compact type.

Table C.1 Maximum Number of Conductors or Fixture Wires in Electrical Metallic Tubing (EMT) (Based on Chapter 9: Table 1, Table 4, and Table 5)

Type	Conductor Size (AWG/kcmil)	Trade Size (Metric Designator)												
		3/8 (12)	1/2 (16)	3/4 (21)	1 (27)	1¼ (35)	1½ (41)	2 (53)	2½ (63)	3 (78)	3½ (91)	4 (103)	5 (129)	6 (155)
CONDUCTORS														
RHH, RHW, RHW-2	14	—	4	7	11	20	27	46	80	120	157	201	302	427
	12	—	3	6	9	17	23	38	66	100	131	167	251	354
	10	—	2	5	8	13	18	30	53	81	105	135	203	286

Type	Conductor Size (AWG/kcmil)	Trade Size (Metric Designator) ⅜ (12)	½ (16)	¾ (21)	1 (27)	1¼ (35)	1½ (41)	2 (53)	2½ (63)	3 (78)	3½ (91)	4 (103)	5 (129)	6 (155)
	8	—	1	2	4	7	9	16	28	42	55	70	106	150
	6	—	1	1	3	5	8	13	22	34	44	56	85	120
	4	—	1	1	2	4	6	10	17	26	34	44	66	94
	3	—	1	1	1	4	5	9	15	23	30	38	58	82
	2	—	1	1	1	3	4	7	13	20	26	33	50	71
	1	—	0	1	1	1	3	5	9	13	17	22	33	47
	1/0	—	0	1	1	1	2	4	7	11	15	19	29	41
	2/0	—	0	1	1	1	2	4	6	10	13	17	25	35
	3/0	—	0	0	1	1	1	3	5	8	11	14	21	30
	4/0	—	0	0	1	1	1	3	5	7	9	12	18	26
	250	—	0	0	0	1	1	1	3	5	7	9	14	20
	300	—	0	0	0	1	1	1	3	5	6	8	12	17
	350	—	0	0	0	1	1	1	3	4	6	7	11	16
	400	—	0	0	0	1	1	1	2	4	5	7	10	14
	500	—	0	0	0	0	1	1	2	3	4	6	8	12
	600	—	0	0	0	0	1	1	1	3	4	5	7	10
	700	—	0	0	0	0	0	1	1	2	3	4	6	9
	750	—	0	0	0	0	0	1	1	2	3	4	6	8
	800	—	0	0	0	0	0	1	1	2	3	4	6	8
	900	—	0	0	0	0	0	1	1	1	3	3	5	7
	1000	—	0	0	0	0	0	1	1	1	2	3	5	7
	1250	—	0	0	0	0	0	0	1	1	1	2	3	5
	1500	—	0	0	0	0	0	0	1	1	1	1	3	4
	1750	—	0	0	0	0	0	0	1	1	1	1	3	4
	2000	—	0	0	0	0	0	0	1	1	1	1	2	3
TW, THHW, THW, THW-2	14	—	8	15	25	43	58	96	168	254	332	424	638	900
	12	—	6	11	19	33	45	74	129	195	255	326	490	691
	10	—	5	8	14	24	33	55	96	145	190	243	365	515
	8	—	2	5	8	13	18	30	53	81	105	135	203	286
RHH*, RHW*, RHW-2*	14	—	6	10	16	28	39	64	112	169	221	282	424	599
	12	—	4	8	13	23	31	51	90	136	177	227	341	481
	10	—	3	6	10	18	24	40	70	106	138	177	266	376
	8	—	1	4	6	10	14	24	42	63	83	106	159	225
TW, THW, THHW, THW-2, RHH*, RHW*, RHW-2*	6	—	1	3	4	8	11	18	32	48	63	81	122	172
	4	—	1	1	3	6	8	13	24	36	47	60	91	128
	3	—	1	1	3	5	7	12	20	31	40	52	78	110
	2	—	1	1	2	4	6	10	17	26	34	44	66	94
	1	—	1	1	1	3	4	7	12	18	24	31	46	66
	1/0	—	0	1	1	2	3	6	10	16	20	26	40	56
	2/0	—	0	1	1	1	3	5	9	13	17	22	33	47

Type	Conductor Size (AWG/kcmil)	Trade Size (Metric Designator)												
		⅜ (12)	½ (16)	¾ (21)	1 (27)	1¼ (35)	1½ (41)	2 (53)	2½ (63)	3 (78)	3½ (91)	4 (103)	5 (129)	6 (155)
	3/0	—	0	1	1	1	2	4	7	11	15	19	28	40
	4/0	—	0	0	1	1	1	3	6	9	12	16	24	33
	250	—	0	0	1	1	1	3	5	7	10	13	19	27
	300	—	0	0	1	1	1	2	4	6	8	11	16	23
	350	—	0	0	0	1	1	1	4	6	7	10	15	21
	400	—	0	0	0	1	1	1	3	5	7	9	13	19
	500	—	0	0	0	1	1	1	3	4	6	7	11	16
	600	—	0	0	0	1	1	1	2	3	4	6	9	13
	700	—	0	0	0	0	1	1	1	3	4	5	8	11
	750	—	0	0	0	0	1	1	1	3	4	5	7	10
	800	—	0	0	0	0	1	1	1	3	3	5	7	10
	900	—	0	0	0	0	0	1	1	2	3	4	6	9
	1000	—	0	0	0	0	0	1	1	2	3	4	6	8
	1250	—	0	0	0	0	0	1	1	1	2	3	4	6
	1500	—	0	0	0	0	0	1	1	1	1	2	4	5
	1750	—	0	0	0	0	0	0	1	1	1	2	3	5
	2000	—	0	0	0	0	0	0	1	1	1	1	3	4
THHN, THWN, THWN-2	14	—	12	22	35	61	84	138	241	364	476	608	914	1290
	12	—	9	16	26	45	61	101	176	266	347	443	666	941
	10	—	5	10	16	28	38	63	111	167	219	279	420	593
	8	—	3	6	9	16	22	36	64	96	126	161	242	342
	6	—	2	4	7	12	16	26	46	69	91	116	175	247
	4	—	1	2	4	7	10	16	28	43	56	71	107	152
	3	—	1	1	3	6	8	13	24	36	47	60	91	128
	2	—	1	1	3	5	7	11	20	30	40	51	76	108
	1	—	1	1	1	4	5	8	15	22	29	37	56	80
	1/0	—	1	1	1	3	4	7	12	19	25	32	47	67
	2/0	—	0	1	1	2	3	6	10	16	20	26	40	56
	3/0	—	0	1	1	1	3	5	8	13	17	22	33	46
	4/0	—	0	1	1	1	2	4	7	11	14	18	27	38
	250	—	0	0	1	1	1	3	6	9	11	15	22	31
	300	—	0	0	1	1	1	3	5	7	10	13	19	27
	350	—	0	0	1	1	1	2	4	6	9	11	17	24
	400	—	0	0	0	1	1	1	4	6	8	10	15	21
	500	—	0	0	0	1	1	1	3	5	6	8	12	17
	600	—	0	0	0	1	1	1	2	4	5	7	10	14
	700	—	0	0	0	1	1	1	2	3	4	6	9	12
	750	—	0	0	0	0	1	1	1	3	4	5	8	12
	800	—	0	0	0	0	1	1	1	3	4	5	8	11
	900	—	0	0	0	0	1	1	1	3	3	4	7	10
	1000	—	0	0	0	0	1	1	1	2	3	4	6	9

Type	Conductor Size (AWG/kcmil)	Trade Size (Metric Designator) ⅜ (12)	½ (16)	¾ (21)	1 (27)	1¼ (35)	1½ (41)	2 (53)	2½ (63)	3 (78)	3½ (91)	4 (103)	5 (129)	6 (155)
FEP, FEPB, PFA, PFAH, TFE	14	—	12	21	34	60	81	134	234	354	462	590	886	1252
	12	—	9	15	25	43	59	98	171	258	337	430	647	913
	10	—	6	11	18	31	42	70	122	185	241	309	464	655
	8	—	3	6	10	18	24	40	70	106	138	177	266	376
	6	—	2	4	7	12	17	28	50	75	98	126	189	267
	4	—	1	3	5	9	12	20	35	53	69	88	132	187
	3	—	1	2	4	7	10	16	29	44	57	73	110	155
	2	—	1	1	3	6	8	13	24	36	47	60	91	128
PFA, PFAH, TFE	1	—	1	1	2	4	6	9	16	25	33	42	63	89
PFA, PFAH, TFE, Z	1/0	—	1	1	1	3	5	8	14	21	27	35	53	74
	2/0	—	0	1	1	3	4	6	11	17	22	29	43	61
	3/0	—	0	1	1	2	3	5	9	14	18	24	36	51
	4/0	—	0	1	1	1	2	4	8	11	15	19	29	41
Z	14	—	14	25	41	72	98	161	282	426	556	711	1068	1508
	12	—	10	18	29	51	69	114	200	302	394	504	758	1070
	10	—	6	11	18	31	42	70	122	185	241	309	464	655
	8	—	4	7	11	20	27	44	77	117	153	195	293	414
	6	—	3	5	8	14	19	31	54	82	107	137	206	291
	4	—	1	3	5	9	13	21	37	56	74	94	142	200
	3	—	1	2	4	7	9	15	27	41	54	69	103	146
	2	—	1	1	3	6	8	13	22	34	45	57	86	121
	1	—	1	1	2	4	6	10	18	28	36	46	70	98
XHHW, ZW, XHHW-2, XHH	14	—	8	15	25	43	58	96	168	254	332	424	638	900
	12	—	6	11	19	33	45	74	129	195	255	326	490	691
	10	—	5	8	14	24	33	55	96	145	190	243	365	515
	8	—	2	5	8	13	18	30	53	81	105	135	203	286
	6	—	1	3	6	10	14	22	39	60	78	100	150	212
	4	—	1	2	4	7	10	16	28	43	56	72	109	153
	3	—	1	1	3	6	8	14	24	36	48	61	92	130
	2	—	1	1	3	5	7	11	20	31	40	51	77	109
XHHW, XHHW-2, XHH	1	—	1	1	1	4	5	8	15	23	30	38	57	81
	1/0	—	1	1	1	3	4	7	13	19	25	32	48	68
	2/0	—	0	1	1	2	3	6	10	16	21	27	40	57
	3/0	—	0	1	1	1	3	5	9	13	17	22	33	47
	4/0	—	0	1	1	1	2	4	7	11	14	18	27	39
	250	—	0	0	1	1	1	3	6	9	12	15	22	32
	300	—	0	0	1	1	1	3	5	8	10	13	19	27
	350	—	0	0	1	1	1	2	4	7	9	11	17	24
	400	—	0	0	0	1	1	1	4	6	8	10	15	21
	500	—	0	0	0	1	1	1	3	5	6	8	12	18

Type	Conductor Size (AWG/kcmil)	Trade Size (Metric Designator)												
		⅜ (12)	½ (16)	¾ (21)	1 (27)	1¼ (35)	1½ (41)	2 (53)	2½ (63)	3 (78)	3½ (91)	4 (103)	5 (129)	6 (155)
	600	—	0	0	0	1	1	1	2	4	5	6	10	14
	700	—	0	0	0	0	1	1	2	3	4	6	9	12
	750	—	0	0	0	0	1	1	1	3	4	5	8	12
	800	—	0	0	0	0	1	1	1	3	4	5	8	11
	900	—	0	0	0	0	1	1	1	3	3	4	7	10
	1000	—	0	0	0	0	0	1	1	2	3	4	6	9
	1250	—	0	0	0	0	0	1	1	1	2	3	5	7
	1500	—	0	0	0	0	0	1	1	1	1	3	4	6
	1750	—	0	0	0	0	0	0	1	1	1	2	4	5
	2000	—	0	0	0	0	0	0	1	1	1	1	3	5
FIXTURE WIRES														
RFH-2, FFH-2, RFHH-2	18	—	8	14	24	41	56	92	161	244	318	407	611	863
	16	—	7	12	20	34	47	78	136	205	268	343	515	728
SF-2, SFF-2	18	—	10	18	30	52	71	116	203	307	401	513	771	1088
	16	—	8	15	25	43	58	96	168	254	332	424	638	900
	14	—	7	12	20	34	47	78	136	205	268	343	515	728
SF-1, SFF-1	18	—	18	33	53	92	125	206	360	544	710	908	1364	1926
RFH-1, TF, TFF, XF, XFF	18	—	14	24	39	68	92	152	266	402	524	670	1007	1422
	16	—	11	19	31	55	74	123	215	324	423	541	813	1148
XF, XFF	14	—	8	15	25	43	58	96	168	254	332	424	638	900
TFN, TFFN	18	—	22	38	63	109	148	244	426	643	839	1073	1612	2276
	16	—	17	29	48	83	113	186	325	491	641	819	1231	1738
PF, PFF, PGF, PGFF, PAF, PTF, PTFF, PAFF	18	—	21	36	59	103	140	231	404	610	796	1017	1528	2158
	16	—	16	28	46	79	108	179	312	471	615	787	1182	1669
	14	—	12	21	34	60	81	134	234	354	462	590	886	1252
ZF, ZFF, ZHF	18	—	27	47	77	133	181	298	520	786	1026	1311	1970	2782
	16	—	20	35	56	98	133	220	384	580	757	967	1453	2052
	14	—	14	25	41	72	98	161	282	426	556	711	1068	1508
KF-2, KFF-2	18	—	40	71	115	199	271	447	781	1179	1539	1967	2955	4173
	16	—	28	49	80	139	189	312	545	823	1074	1372	2062	2911
	14	—	19	33	54	93	127	209	366	553	721	922	1385	1956
	12	—	13	23	37	65	88	146	254	384	502	641	963	1360
	10	—	8	15	25	43	58	96	168	254	332	424	638	900

Type	**Conductor Size (AWG/kcmil)**	**Trade Size (Metric Designator)**												
		⅜ (12)	**½ (16)**	**¾ (21)**	**1 (27)**	**1¼ (35)**	**1½ (41)**	**2 (53)**	**2½ (63)**	**3 (78)**	**3½ (91)**	**4 (103)**	**5 (129)**	**6 (155)**
KF-1, KFF-1	18	—	46	82	133	230	313	516	901	1361	1776	2269	3410	4815
	16	—	33	57	93	161	220	363	633	956	1248	1595	2396	3383
	14	—	22	38	63	109	148	244	426	643	839	1073	1612	2276
	12	—	14	25	41	72	98	161	282	426	556	711	1068	1508
	10	—	9	16	27	47	64	105	184	278	363	464	698	985
XF, XFF	12	—	4	8	13	23	31	51	90	136	177	227	341	481
	10	—	3	6	10	18	24	40	70	106	138	177	266	376

Notes:

1. This table is for concentric stranded conductors only. For compact stranded conductors, Table C.1(A) should be used.

2. Two-hour fire-rated RHH cable has ceramifiable insulation, which has much larger diameters than other RHH wires.

Consult manufacturer's conduit fill tables.

*Types RHH, RHW, and RHW-2 without outer covering.

Table C.1(A) Maximum Number of Conductors or Fixture Wires in Electrical Metallic Tubing (EMT)

(Based on Chapter 9: Table 1, Table 4, and Table 5A)

Type	**Conductor Size (AWG/ kcmil)**	**Trade Size (Metric Designator)**												
		⅜ (12)	**½ (16)**	**¾ (21)**	**1 (27)**	**1¼ (35)**	**1½ (41)**	**2 (53)**	**2½ (63)**	**3 (78)**	**3½ (91)**	**4 (103)**	**5 (129)**	**6 (155)**
COMPACT CONDUCTORS														
THW, THW-2, THHW	8	—	2	4	6	11	16	26	46	69	90	115	174	245
	6	—	1	3	5	9	12	20	35	53	70	89	134	189
	4	—	1	2	4	6	9	15	26	40	52	67	100	142
	2	—	1	1	3	5	7	11	19	29	38	49	74	105
	1	—	1	1	1	3	4	8	13	21	27	34	52	73
	1/0	—	1	1	1	3	4	7	12	18	23	30	45	63
	2/0	—	0	1	1	2	3	5	10	15	20	25	38	53
	3/0	—	0	1	1	1	3	5	8	13	17	21	32	46
	4/0	—	0	1	1	1	2	4	7	11	14	18	27	38
	250	—	0	0	1	1	1	3	5	8	11	14	21	30
	300	—	0	0	1	1	1	3	5	7	9	12	18	26
	350	—	0	0	1	1	1	2	4	6	8	11	16	23
	400	—	0	0	0	1	1	1	4	6	8	10	15	21
	500	—	0	0	0	1	1	1	3	5	6	8	12	18
	600	—	0	0	0	1	1	1	2	4	5	7	10	14
	700	—	0	0	0	1	1	1	2	3	4	6	9	13
	750	—	0	0	0	0	1	1	1	3	4	5	8	12
	900	—	0	0	0	0	1	1	1	3	4	5	7	10
	1000	—	0	0	0	0	1	1	1	2	3	4	7	9

Type	Conductor Size (AWG/ kcmil)	Trade Size (Metric Designator)												
		⅜ (12)	½ (16)	¾ (21)	1 (27)	1¼ (35)	1½ (41)	2 (53)	2½ (63)	3 (78)	3½ (91)	4 (103)	5 (129)	6 (155)
THHN, THWN, THWN-2	8	—	—	—	—	—	—	—	—	—	—	—	—	—
	6	—	2	4	7	13	18	29	52	78	102	130	196	277
	4	—	1	3	4	8	11	18	32	48	63	81	121	171
	2	—	1	1	3	6	8	13	23	34	45	58	87	123
	1	—	1	1	2	4	6	10	17	26	34	43	65	92
	1/0	—	1	1	1	3	5	8	14	22	29	37	55	78
	2/0	—	1	1	1	3	4	7	12	18	24	30	46	65
	3/0	—	0	1	1	2	3	6	10	15	20	25	38	54
	4/0	—	0	1	1	1	3	5	8	12	16	21	32	45
	250	—	0	1	1	1	1	4	6	10	13	16	25	35
	300	—	0	0	1	1	1	3	5	8	11	14	21	30
	350	—	0	0	1	1	1	3	5	7	10	12	19	27
	400	—	0	0	1	1	1	2	4	6	9	11	17	24
	500	—	0	0	0	1	1	1	4	5	7	9	14	20
	600	—	0	0	0	1	1	1	3	4	6	7	11	16
	700	—	0	0	0	1	1	1	2	4	5	7	10	14
	750	—	0	0	0	1	1	1	2	4	5	6	9	13
	900	—	0	0	0	0	1	1	1	3	4	5	8	11
	1000	—	0	0	0	0	1	1	1	3	3	4	7	10
XHHW, XHHW-2	8	—	3	5	8	15	20	34	59	90	117	149	225	317
	6	—	1	4	6	11	15	25	44	66	87	111	167	236
	4	—	1	3	4	8	11	18	32	48	63	81	121	171
	2	—	1	1	3	6	8	13	23	34	45	58	87	123
	1	—	1	1	2	4	6	10	17	26	34	43	65	92
	1/0	—	1	1	1	3	5	8	14	22	29	37	55	78
	2/0	—	1	1	1	3	4	7	12	18	24	31	47	66
	3/0	—	0	1	1	2	3	6	10	15	20	25	38	54
	4/0	—	0	1	1	1	3	5	8	13	17	21	32	46
	250	—	0	1	1	1	2	4	7	10	13	17	26	36
	300	—	0	0	1	1	1	3	6	9	11	14	22	31
	350	—	0	0	1	1	1	3	5	8	10	13	19	27
	400	—	0	0	1	1	1	2	4	7	9	11	17	25
	500	—	0	0	0	1	1	1	4	6	7	9	14	20
	600	—	0	0	0	1	1	1	3	4	6	8	11	16
	700	—	0	0	0	1	1	1	2	4	5	7	10	14
	750	—	0	0	0	1	1	1	2	3	5	6	9	13
	900	—	0	0	0	0	1	1	1	3	4	5	8	11
	1000	—	0	0	0	0	1	1	1	3	4	5	7	10

Definition: *Compact stranding* is the result of a manufacturing process where the stranded conductor is

compressed to the extent that the interstices (voids between strand wires) are virtually eliminated.

Table C.2 Maximum Number of Conductors or Fixture Wires in Electrical Nonmetallic Tubing (ENT)

(Based on Chapter 9: Table 1, Table 4, and Table 5)

Type	Conductor Size (AWG/ kcmil)	Trade Size (Metric Designator)												
		⅜ (12)	½ (16)	¾ (21)	1 (27)	1¼ (35)	1½ (41)	2 (53)	2½ (63)	3 (78)	3½ (91)	4 (103)	5 (129)	6 (155)
CONDUCTORS														
RHH, RHW, RHW-2	14	—	4	7	11	20	27	45	—	—	—	—	—	—
	12	—	3	5	9	16	22	37	—	—	—	—	—	—
	10	—	2	4	7	13	18	30	—	—	—	—	—	—
	8	—	1	2	4	7	9	15	—	—	—	—	—	—
	6	—	1	1	3	5	7	12	—	—	—	—	—	—
	4	—	1	1	2	4	6	10	—	—	—	—	—	—
	3	—	1	1	1	4	5	8	—	—	—	—	—	—
	2	—	1	1	1	3	4	7	—	—	—	—	—	—
	1	—	0	1	1	1	3	5	—	—	—	—	—	—
	1/0	—	0	1	1	1	2	4	—	—	—	—	—	—
	2/0	—	0	0	1	1	1	3	—	—	—	—	—	—
	3/0	—	0	0	1	1	1	3	—	—	—	—	—	—
	4/0	—	0	0	1	1	1	2	—	—	—	—	—	—
	250	—	0	0	0	1	1	1	—	—	—	—	—	—
	300	—	0	0	0	1	1	1	—	—	—	—	—	—
	350	—	0	0	0	1	1	1	—	—	—	—	—	—
	400	—	0	0	0	1	1	1	—	—	—	—	—	—
	500	—	0	0	0	0	1	1	—	—	—	—	—	—
	600	—	0	0	0	0	1	1	—	—	—	—	—	—
	700	—	0	0	0	0	0	1	—	—	—	—	—	—
	750	—	0	0	0	0	0	1	—	—	—	—	—	—
	800	—	0	0	0	0	0	1	—	—	—	—	—	—
	900	—	0	0	0	0	0	1	—	—	—	—	—	—
	1000	—	0	0	0	0	0	1	—	—	—	—	—	—
	1250	—	0	0	0	0	0	0	—	—	—	—	—	—
	1500	—	0	0	0	0	0	0	—	—	—	—	—	—
	1750	—	0	0	0	0	0	0	—	—	—	—	—	—
	2000	—	0	0	0	0	0	0	—	—	—	—	—	—
TW, THHW, THW, THW-2	14	—	8	14	24	42	57	94	—	—	—	—	—	—
	12	—	6	11	18	32	44	72	—	—	—	—	—	—
	10	—	4	8	13	24	32	54	—	—	—	—	—	—
	8	—	2	4	7	13	18	30	—	—	—	—	—	—
RHH*, RHW*, RHW-2*	14	—	5	9	16	28	38	63	—	—	—	—	—	—
	12	—	4	8	13	22	30	50	—	—	—	—	—	—
	10	—	3	6	10	17	24	39	—	—	—	—	—	—
	8	—	1	3	6	10	14	23	—	—	—	—	—	—

Type	Conductor Size (AWG/ kcmil)	Trade Size (Metric Designator)												
		⅜ (12)	½ (16)	¾ (21)	1 (27)	1¼ (35)	1½ (41)	2 (53)	2½ (63)	3 (78)	3½ (91)	4 (103)	5 (129)	6 (155)
TW, THW, THHW, THW-2, RHH*, RHW*, RHW-2*	6	—	1	2	4	8	11	18	—	—	—	—	—	—
	4	—	1	1	3	6	8	13	—	—	—	—	—	—
	3	—	1	1	3	5	7	11	—	—	—	—	—	—
	2	—	1	1	2	4	6	10	—	—	—	—	—	—
	1	—	0	1	1	3	4	7	—	—	—	—	—	—
	1/0	—	0	1	1	2	3	6	—	—	—	—	—	—
	2/0	—	0	1	1	1	3	5	—	—	—	—	—	—
	3/0	—	0	1	1	1	2	4	—	—	—	—	—	—
	4/0	—	0	0	1	1	1	3	—	—	—	—	—	—
	250	—	0	0	1	1	1	3	—	—	—	—	—	—
	300	—	0	0	1	1	1	2	—	—	—	—	—	—
	350	—	0	0	0	1	1	1	—	—	—	—	—	—
	400	—	0	0	0	1	1	1	—	—	—	—	—	—
	500	—	0	0	0	1	1	1	—	—	—	—	—	—
	600	—	0	0	0	0	1	1	—	—	—	—	—	—
	700	—	0	0	0	0	1	1	—	—	—	—	—	—
	750	—	0	0	0	0	1	1	—	—	—	—	—	—
	800	—	0	0	0	0	1	1	—	—	—	—	—	—
	900	—	0	0	0	0	0	1	—	—	—	—	—	—
	1000	—	0	0	0	0	0	1	—	—	—	—	—	—
	1250	—	0	0	0	0	0	1	—	—	—	—	—	—
	1500	—	0	0	0	0	0	1	—	—	—	—	—	—
	1750	—	0	0	0	0	0	0	—	—	—	—	—	—
	2000	—	0	0	0	0	0	0	—	—	—	—	—	—
THHN, THWN, THWN-2	14	—	11	21	34	60	82	135	—	—	—	—	—	—
	12	—	8	15	25	43	59	99	—	—	—	—	—	—
	10	—	5	9	15	27	37	62	—	—	—	—	—	—
	8	—	3	5	9	16	21	36	—	—	—	—	—	—
	6	—	1	4	6	11	15	26	—	—	—	—	—	—
	4	—	1	2	4	7	9	16	—	—	—	—	—	—
	3	—	1	1	3	6	8	13	—	—	—	—	—	—
	2	—	1	1	3	5	7	11	—	—	—	—	—	—
	1	—	1	1	1	3	5	8	—	—	—	—	—	—
	1/0	—	1	1	1	3	4	7	—	—	—	—	—	—
	2/0	—	0	1	1	2	3	6	—	—	—	—	—	—
	3/0	—	0	1	1	1	3	5	—	—	—	—	—	—
	4/0	—	0	1	1	1	2	4	—	—	—	—	—	—
	250	—	0	0	1	1	1	3	—	—	—	—	—	—
	300	—	0	0	1	1	1	3	—	—	—	—	—	—
	350	—	0	0	1	1	1	2	—	—	—	—	—	—
	400	—	0	0	0	1	1	1	—	—	—	—	—	—

Type	Conductor Size (AWG/ kcmil)	Trade Size (Metric Designator)												
		⅜ (12)	½ (16)	¾ (21)	1 (27)	1¼ (35)	1½ (41)	2 (53)	2½ (63)	3 (78)	3½ (91)	4 (103)	5 (129)	6 (155)
	500	—	0	0	0	1	1	1	—	—	—	—	—	—
	600	—	0	0	0	1	1	1	—	—	—	—	—	—
	700	—	0	0	0	0	1	1	—	—	—	—	—	—
	750	—	0	0	0	0	1	1	—	—	—	—	—	—
	800	—	0	0	0	0	1	1	—	—	—	—	—	—
	900	—	0	0	0	0	1	1	—	—	—	—	—	—
	1000	—	0	0	0	0	0	1	—	—	—	—	—	—
FEP, FEPB, PFA, PFAH, TFE	14	—	11	20	33	58	79	131	—	—	—	—	—	—
	12	—	8	15	24	42	58	96	—	—	—	—	—	—
	10	—	6	10	17	30	41	69	—	—	—	—	—	—
	8	—	3	6	10	17	24	39	—	—	—	—	—	—
	6	—	2	4	7	12	17	28	—	—	—	—	—	—
	4	—	1	3	5	8	12	19	—	—	—	—	—	—
	3	—	1	2	4	7	10	16	—	—	—	—	—	—
	2	—	1	1	3	6	8	13	—	—	—	—	—	—
PFA, PFAH, TFE	1	—	1	1	2	4	5	9	—	—	—	—	—	—
PFA, PFAH, TFE, Z	1/0	—	1	1	1	3	4	8	—	—	—	—	—	—
	2/0	—	0	1	1	3	4	6	—	—	—	—	—	—
	3/0	—	0	1	1	2	3	5	—	—	—	—	—	—
	4/0	—	0	1	1	1	2	4	—	—	—	—	—	—
Z	14	—	13	24	40	70	95	158	—	—	—	—	—	—
	12	—	9	17	28	49	68	112	—	—	—	—	—	—
	10	—	6	10	17	30	41	69	—	—	—	—	—	—
	8	—	3	6	11	19	26	43	—	—	—	—	—	—
	6	—	2	4	7	13	18	30	—	—	—	—	—	—
	4	—	1	3	5	9	12	21	—	—	—	—	—	—
	3	—	1	2	4	6	9	15	—	—	—	—	—	—
	2	—	1	1	3	5	7	12	—	—	—	—	—	—
	1	—	1	1	2	4	6	10	—	—	—	—	—	—
XHHW, ZW, XHHW-2, XHH	14	—	8	14	24	42	57	94	—	—	—	—	—	—
	12	—	6	11	18	32	44	72	—	—	—	—	—	—
	10	—	4	8	13	24	32	54	—	—	—	—	—	—
	8	—	2	4	7	13	18	30	—	—	—	—	—	—
	6	—	1	3	5	10	13	22	—	—	—	—	—	—
	4	—	1	2	4	7	9	16	—	—	—	—	—	—
	3	—	1	1	3	6	8	13	—	—	—	—	—	—
	2	—	1	1	3	5	7	11	—	—	—	—	—	—
XHHW, XHHW-2, XHH	1	—	1	1	1	3	5	8	—	—	—	—	—	—
	1/0	—	0	1	1	3	4	7	—	—	—	—	—	—
	2/0	—	0	1	1	2	3	6	—	—	—	—	—	—

Type	Conductor Size (AWG/ kcmil)	Trade Size (Metric Designator)												
		⅜ (12)	½ (16)	¾ (21)	1 (27)	1¼ (35)	1½ (41)	2 (53)	2½ (63)	3 (78)	3½ (91)	4 (103)	5 (129)	6 (155)
	3/0	—	0	1	1	1	3	5	—	—	—	—	—	—
	4/0	—	0	1	1	1	2	4	—	—	—	—	—	—
	250	—	0	0	1	1	1	3	—	—	—	—	—	—
	300	—	0	0	1	1	1	3	—	—	—	—	—	—
	350	—	0	0	1	1	1	2	—	—	—	—	—	—
	400	—	0	0	0	1	1	1	—	—	—	—	—	—
	500	—	0	0	0	1	1	1	—	—	—	—	—	—
	600	—	0	0	0	1	1	1	—	—	—	—	—	—
	700	—	0	0	0	0	1	1	—	—	—	—	—	—
	750	—	0	0	0	0	1	1	—	—	—	—	—	—
	800	—	0	0	0	0	1	1	—	—	—	—	—	—
	900	—	0	0	0	0	1	1	—	—	—	—	—	—
	1000	—	0	0	0	0	0	1	—	—	—	—	—	—
	1250	—	0	0	0	0	0	1	—	—	—	—	—	—
	1500	—	0	0	0	0	0	1	—	—	—	—	—	—
	1750	—	0	0	0	0	0	0	—	—	—	—	—	—
	2000	—	0	0	0	0	0	0	—	—	—	—	—	—
FIXTURE WIRES														
RFH-2, FFH-2, RFHH-2	18	—	8	14	23	40	54	90	—	—	—	—	—	—
	16	—	6	12	19	33	46	76	—	—	—	—	—	—
SF-2, SFF-2	18	—	10	17	29	50	69	114	—	—	—	—	—	—
	16	—	8	14	24	42	57	94	—	—	—	—	—	—
	14	—	6	12	19	33	46	76	—	—	—	—	—	—
SF-1, SFF-1	18	—	17	31	51	89	122	202	—	—	—	—	—	—
RFH-1, TF, TFF, XF, XFF	18	—	13	23	38	66	90	149	—	—	—	—	—	—
	16	—	10	18	30	53	73	120	—	—	—	—	—	—
XF, XFF	14	—	8	14	24	42	57	94	—	—	—	—	—	—
TFN, TFFN	18	—	20	37	60	105	144	239	—	—	—	—	—	—
	16	—	16	28	46	80	110	183	—	—	—	—	—	—
PF, PFF, PGF, PGFF, PAF, PTF, PTFF, PAFF	18	—	19	35	57	100	137	227	—	—	—	—	—	—
	16	—	15	27	44	77	106	175	—	—	—	—	—	—
	14	—	11	20	33	58	79	131	—	—	—	—	—	—
ZF, ZFF, ZHF	18	—	25	45	74	129	176	292	—	—	—	—	—	—
	16	—	18	33	54	95	130	216	—	—	—	—	—	—
	14	—	13	24	40	70	95	158	—	—	—	—	—	—

Type	Conductor Size (AWG/ kcmil)	Trade Size (Metric Designator)												
		⅜ (12)	½ (16)	¾ (21)	1 (27)	1¼ (35)	1½ (41)	2 (53)	2½ (63)	3 (78)	3½ (91)	4 (103)	5 (129)	6 (155)
KF-2, KFF-2	18	—	38	67	111	193	265	439	—	—	—	—	—	—
	16	—	26	47	77	135	184	306	—	—	—	—	—	—
	14	—	18	31	52	91	124	205	—	—	—	—	—	—
	12	—	12	22	36	63	86	143	—	—	—	—	—	—
	10	—	8	14	24	42	57	94	—	—	—	—	—	—
KF-1, KFF-1	18	—	44	78	128	223	305	506	—	—	—	—	—	—
	16	—	31	55	90	157	214	355	—	—	—	—	—	—
	14	—	20	37	60	105	144	239	—	—	—	—	—	—
	12	—	13	24	40	70	95	158	—	—	—	—	—	—
	10	—	9	16	26	45	62	103	—	—	—	—	—	—
XF, XFF	12	—	4	8	13	22	30	50	—	—	—	—	—	—
	10	—	3	6	10	17	24	39	—	—	—	—	—	—

Notes:

1. This table is for concentric stranded conductors only. For compact stranded conductors, Table C.2(A) should be used.

2. Two-hour fire-rated RHH cable has ceramifiable insulation, which has much larger diameters than other RHH wires.

Consult manufacturer's conduit fill tables.

*Types RHH, RHW, and RHW-2 without outer covering.

Table C.2(A) Maximum Number of Conductors or Fixture Wires in Electrical Nonmetallic Tubing (ENT)
(Based on Chapter 9: Table 1, Table 4, and Table 5A)

Type	Conductor Size (AWG/ kcmil)	Trade Size (Metric Designator)												
		⅜ (12)	½ (16)	¾ (21)	1 (27)	1¼ (35)	1½ (41)	2 (53)	2½ (63)	3 (78)	3½ (91)	4 (103)	5 (129)	6 (155)
COMPACT CONDUCTORS														
THW, THW-2, THHW	8	—	1	4	6	11	15	26	—	—	—	—	—	—
	6	—	1	3	5	9	12	20	—	—	—	—	—	—
	4	—	1	1	3	6	9	15	—	—	—	—	—	—
	2	—	1	1	2	5	6	11	—	—	—	—	—	—
	1	—	1	1	1	3	4	7	—	—	—	—	—	—
	1/0	—	0	1	1	3	4	6	—	—	—	—	—	—
	2/0	—	0	1	1	2	3	5	—	—	—	—	—	—
	3/0	—	0	1	1	1	3	5	—	—	—	—	—	—
	4/0	—	0	1	1	1	2	4	—	—	—	—	—	—
	250	—	0	0	1	1	1	3	—	—	—	—	—	—
	300	—	0	0	1	1	1	2	—	—	—	—	—	—
	350	—	0	0	1	1	1	2	—	—	—	—	—	—
	400	—	0	0	0	1	1	1	—	—	—	—	—	—

Type	Conductor Size (AWG/ kcmil)	Trade Size (Metric Designator)												
		⅜ (12)	½ (16)	¾ (21)	1 (27)	1¼ (35)	1½ (41)	2 (53)	2½ (63)	3 (78)	3½ (91)	4 (103)	5 (129)	6 (155)
	500	—	0	0	0	1	1	1	—	—	—	—	—	—
	600	—	0	0	0	1	1	1	—	—	—	—	—	—
	700	—	0	0	0	0	1	1	—	—	—	—	—	—
	750	—	0	0	0	0	1	1	—	—	—	—	—	—
	900	—	0	0	0	0	1	1	—	—	—	—	—	—
	1000	—	0	0	0	0	1	1	—	—	—	—	—	—
THHN, THWN, THWN-2	8	—	—	—	—	—	—	—	—	—	—	—	—	—
	6	—	2	4	7	13	17	29	—	—	—	—	—	—
	4	—	1	2	4	8	11	18	—	—	—	—	—	—
	2	—	1	1	3	5	8	13	—	—	—	—	—	—
	1	—	1	1	2	4	6	9	—	—	—	—	—	—
	1/0	—	1	1	1	3	5	8	—	—	—	—	—	—
	2/0	—	0	1	1	3	4	7	—	—	—	—	—	—
	3/0	—	0	1	1	2	3	5	—	—	—	—	—	—
	4/0	—	0	1	1	1	3	4	—	—	—	—	—	—
	250	—	0	0	1	1	1	3	—	—	—	—	—	—
	300	—	0	0	1	1	1	3	—	—	—	—	—	—
	350	—	0	0	1	1	1	3	—	—	—	—	—	—
	400	—	0	0	1	1	1	2	—	—	—	—	—	—
	500	—	0	0	0	1	1	1	—	—	—	—	—	—
	600	—	0	0	0	1	1	1	—	—	—	—	—	—
	700	—	0	0	0	1	1	1	—	—	—	—	—	—
	750	—	0	0	0	1	1	1	—	—	—	—	—	—
	900	—	0	0	0	0	1	1	—	—	—	—	—	—
	1000	—	0	0	0	0	1	1	—	—	—	—	—	—
XHHW, XHHW-2	8	—	3	5	8	14	20	33	—	—	—	—	—	—
	6	—	1	4	6	11	15	25	—	—	—	—	—	—
	4	—	1	2	4	8	11	18	—	—	—	—	—	—
	2	—	1	1	3	5	8	13	—	—	—	—	—	—
	1	—	1	1	2	4	6	9	—	—	—	—	—	—
	1/0	—	1	1	1	3	5	8	—	—	—	—	—	—
	2/0	—	1	1	1	3	4	7	—	—	—	—	—	—
	3/0	—	0	1	1	2	3	5	—	—	—	—	—	—
	4/0	—	0	1	1	1	3	5	—	—	—	—	—	—
	250	—	0	0	1	1	1	4	—	—	—	—	—	—
	300	—	0	0	1	1	1	3	—	—	—	—	—	—
	350	—	0	0	1	1	1	3	—	—	—	—	—	—
	400	—	0	0	1	1	1	2	—	—	—	—	—	—
	500	—	0	0	0	1	1	1	—	—	—	—	—	—
	600	—	0	0	0	1	1	1	—	—	—	—	—	—
	700	—	0	0	0	1	1	1	—	—	—	—	—	—

Type	Conductor Size (AWG/ kcmil)	Trade Size (Metric Designator)												
		⅜ (12)	½ (16)	¾ (21)	1 (27)	1¼ (35)	1½ (41)	2 (53)	2½ (63)	3 (78)	3½ (91)	4 (103)	5 (129)	6 (155)
	750	—	0	0	0	1	1	1	—	—	—	—	—	—
	900	—	0	0	0	0	1	1	—	—	—	—	—	—
	1000	—	0	0	0	0	1	1	—	—	—	—	—	—

Definition: *Compact stranding* is the result of a manufacturing process where the stranded conductor is
compressed to the extent that the interstices (voids between strand wires) are virtually eliminated.

Table C.3 Maximum Number of Conductors or Fixture Wires in Flexible Metal Conduit (FMC) (Based on Chapter 9: Table 1, Table 4, and Table 5)

Type	Conductor Size (AWG/ kcmil)	Trade Size (Metric Designator)												
		⅜ (12)	½ (16)	¾ (21)	1 (27)	1¼ (35)	1½ (41)	2 (53)	2½ (63)	3 (78)	3½ (91)	4 (103)	5 (129)	6 (155)
CONDUCTORS														
RHH, RHW, RHW-2	14	1	4	7	11	17	25	44	67	96	131	171	—	—
	12	1	3	6	9	14	21	37	55	80	109	142	—	—
	10	1	3	5	7	11	17	30	45	64	88	115	—	—
	8	0	1	2	4	6	9	15	23	34	46	60	—	—
	6	0	1	1	3	5	7	12	19	27	37	48	—	—
	4	0	1	1	2	4	5	10	14	21	29	37	—	—
	3	0	1	1	1	3	5	8	13	18	25	33	—	—
	2	0	1	1	1	3	4	7	11	16	22	28	—	—
	1	0	0	1	1	1	2	5	7	10	14	19	—	—
	1/0	0	0	1	1	1	2	4	6	9	12	16	—	—
	2/0	0	0	1	1	1	1	3	5	8	11	14	—	—
	3/0	0	0	0	1	1	1	3	5	7	9	12	—	—
	4/0	0	0	0	1	1	1	2	4	6	8	10	—	—
	250	0	0	0	0	1	1	1	3	4	6	8	—	—
	300	0	0	0	0	1	1	1	2	4	5	7	—	—
	350	0	0	0	0	1	1	1	2	3	5	6	—	—
	400	0	0	0	0	0	1	1	1	3	4	6	—	—
	500	0	0	0	0	0	1	1	1	3	4	5	—	—
	600	0	0	0	0	0	1	1	1	2	3	4	—	—
	700	0	0	0	0	0	0	1	1	1	3	3	—	—
	750	0	0	0	0	0	0	1	1	1	2	3	—	—
	800	0	0	0	0	0	0	1	1	1	2	3	—	—
	900	0	0	0	0	0	0	1	1	1	2	3	—	—
	1000	0	0	0	0	0	0	1	1	1	1	3	—	—
	1250	0	0	0	0	0	0	0	1	1	1	1	—	—
	1500	0	0	0	0	0	0	0	1	1	1	1	—	—
	1750	0	0	0	0	0	0	0	1	1	1	1	—	—

Type	Conductor Size (AWG/ kcmil)	Trade Size (Metric Designator)												
		⅜ (12)	½ (16)	¾ (21)	1 (27)	1¼ (35)	1½ (41)	2 (53)	2½ (63)	3 (78)	3½ (91)	4 (103)	5 (129)	6 (155)
	2000	0	0	0	0	0	0	0	0	1	1	1	—	—
TW, THHW, THW, THW-2	14	3	9	15	23	36	53	94	141	203	277	361	—	—
	12	2	7	11	18	28	41	72	108	156	212	277	—	—
	10	1	5	8	13	21	30	54	81	116	158	207	—	—
	8	1	3	5	7	11	17	30	45	64	88	115	—	—
RHH*, RHW*, RHW-2*	14	1	6	10	15	24	35	62	94	135	184	240	—	—
	12	1	5	8	12	19	28	50	75	108	148	193	—	—
	10	1	4	6	10	15	22	39	59	85	115	151	—	—
	8	1	1	4	6	9	13	23	35	51	69	90	—	—
TW, THW, THHW, THW-2, RHH*, RHW*, RHW-2*	6	1	1	3	4	7	10	18	27	39	53	69	—	—
	4	0	1	1	3	5	7	13	20	29	39	51	—	—
	3	0	1	1	3	4	6	11	17	25	34	44	—	—
	2	0	1	1	2	4	5	10	14	21	29	37	—	—
	1	0	1	1	1	2	4	7	10	15	20	26	—	—
	1/0	0	0	1	1	1	3	6	9	12	17	22	—	—
	2/0	0	0	1	1	1	3	5	7	10	14	19	—	—
	3/0	0	0	1	1	1	2	4	6	9	12	16	—	—
	4/0	0	0	0	1	1	1	3	5	7	10	13	—	—
	250	0	0	0	1	1	1	3	4	6	8	11	—	—
	300	0	0	0	1	1	1	2	3	5	7	9	—	—
	350	0	0	0	0	1	1	1	3	4	6	8	—	—
	400	0	0	0	0	1	1	1	3	4	6	7	—	—
	500	0	0	0	0	1	1	1	2	3	5	6	—	—
	600	0	0	0	0	0	1	1	1	3	4	5	—	—
	700	0	0	0	0	0	1	1	1	2	3	4	—	—
	750	0	0	0	0	0	1	1	1	2	3	4	—	—
	800	0	0	0	0	0	1	1	1	1	3	4	—	—
	900	0	0	0	0	0	0	1	1	1	3	3	—	—
	1000	0	0	0	0	0	0	1	1	1	2	3	—	—
	1250	0	0	0	0	0	0	1	1	1	1	2	—	—
	1500	0	0	0	0	0	0	0	1	1	1	1	—	—
	1750	0	0	0	0	0	0	0	1	1	1	1	—	—
	2000	0	0	0	0	0	0	0	1	1	1	1	—	—
THHN, THWN, THWN-2	14	4	13	22	33	52	76	135	202	291	396	518	—	—
	12	3	9	16	24	38	56	98	147	212	289	378	—	—
	10	1	6	10	15	24	35	62	93	134	182	238	—	—
	8	1	3	6	9	14	20	35	53	77	105	137	—	—
	6	1	2	4	6	10	14	25	38	55	76	99	—	—
	4	0	1	2	4	6	9	16	24	34	46	61	—	—
	3	0	1	1	3	5	7	13	20	29	39	51	—	—
	2	0	1	1	3	4	6	11	17	24	33	43	—	—

Type	Conductor Size (AWG/ kcmil)	Trade Size (Metric Designator)												
		⅜ (12)	½ (16)	¾ (21)	1 (27)	1¼ (35)	1½ (41)	2 (53)	2½ (63)	3 (78)	3½ (91)	4 (103)	5 (129)	6 (155)
	1	0	1	1	1	3	4	8	12	18	24	32	—	—
	1/0	0	1	1	1	2	4	7	10	15	20	27	—	—
	2/0	0	0	1	1	1	3	6	9	12	17	22	—	—
	3/0	0	0	1	1	1	2	5	7	10	14	18	—	—
	4/0	0	0	1	1	1	1	4	6	8	12	15	—	—
	250	0	0	0	1	1	1	3	5	7	9	12	—	—
	300	0	0	0	1	1	1	3	4	6	8	11	—	—
	350	0	0	0	1	1	1	2	3	5	7	9	—	—
	400	0	0	0	0	1	1	1	3	5	6	8	—	—
	500	0	0	0	0	1	1	1	2	4	5	7	—	—
	600	0	0	0	0	0	1	1	1	3	4	5	—	—
	700	0	0	0	0	0	1	1	1	3	4	5	—	—
	750	0	0	0	0	0	1	1	1	2	3	4	—	—
	800	0	0	0	0	0	1	1	1	2	3	4	—	—
	900	0	0	0	0	0	0	1	1	1	3	4	—	—
	1000	0	0	0	0	0	0	1	1	1	3	3	—	—
FEP, FEPB, PFA, PFAH, TFE	14	4	12	21	32	51	74	130	196	282	385	502	—	—
	12	3	9	15	24	37	54	95	143	206	281	367	—	—
	10	2	6	11	17	26	39	68	103	148	201	263	—	—
	8	1	4	6	10	15	22	39	59	85	115	151	—	—
	6	1	2	4	7	11	16	28	42	60	82	107	—	—
	4	1	1	3	5	7	11	19	29	42	57	75	—	—
	3	0	1	2	4	6	9	16	24	35	48	62	—	—
	2	0	1	1	3	5	7	13	20	29	39	51	—	—
PFA, PFAH, TFE	1	0	1	1	2	3	5	9	14	20	27	36	—	—
PFA, PFAH, TFE, Z	1/0	0	1	1	1	3	4	8	11	17	23	30	—	—
	2/0	0	1	1	1	2	3	6	9	14	19	24	—	—
	3/0	0	0	1	1	1	3	5	8	11	15	20	—	—
	4/0	0	0	1	1	1	2	4	6	9	13	16	—	—
Z	14	5	15	25	39	61	89	157	236	340	463	605	—	—
	12	4	11	18	28	43	63	111	168	241	329	429	—	—
	10	2	6	11	17	26	39	68	103	148	201	263	—	—
	8	1	4	7	11	17	24	43	65	93	127	166	—	—
	6	1	3	5	7	12	17	30	45	65	89	117	—	—
	4	1	1	3	5	8	12	21	31	45	61	80	—	—
	3	0	1	2	4	6	8	15	23	33	45	58	—	—
	2	0	1	1	3	5	7	12	19	27	37	49	—	—
	1	0	1	1	2	4	6	10	15	22	30	39	—	—
XHHW, ZW,	14	3	9	15	23	36	53	94	141	203	277	361	—	—
	12	2	7	11	18	28	41	72	108	156	212	277	—	—

Type	Conductor Size (AWG/ kcmil)	Trade Size (Metric Designator)												
		3⁄8 (12)	½ (16)	¾ (21)	1 (27)	1¼ (35)	1½ (41)	2 (53)	2½ (63)	3 (78)	3½ (91)	4 (103)	5 (129)	6 (155)
XHHW-2, XHH	10	1	5	8	13	21	30	54	81	116	158	207	—	—
	8	1	3	5	7	11	17	30	45	64	88	115	—	—
	6	1	1	3	5	8	12	22	33	48	65	85	—	—
	4	0	1	2	4	6	9	16	24	34	47	61	—	—
	3	0	1	1	3	5	7	13	20	29	40	52	—	—
	2	0	1	1	3	4	6	11	17	24	33	44	—	—
XHH, XHHW, XHHW-2	1	0	1	1	1	3	5	8	13	18	25	32	—	—
	1/0	0	1	1	1	2	4	7	10	15	21	27	—	—
	2/0	0	0	1	1	2	3	6	9	13	17	23	—	—
	3/0	0	0	1	1	1	3	5	7	10	14	19	—	—
	4/0	0	0	1	1	1	2	4	6	9	12	15	—	—
	250	0	0	0	1	1	1	3	5	7	10	13	—	—
	300	0	0	0	1	1	1	3	4	6	8	11	—	—
	350	0	0	0	1	1	1	2	4	5	7	9	—	—
	400	0	0	0	0	1	1	1	3	5	6	8	—	—
	500	0	0	0	0	1	1	1	3	4	5	7	—	—
	600	0	0	0	0	0	1	1	1	3	4	5	—	—
	700	0	0	0	0	0	1	1	1	3	4	5	—	—
	750	0	0	0	0	0	1	1	1	2	3	4	—	—
	800	0	0	0	0	0	1	1	1	2	3	4	—	—
	900	0	0	0	0	0	0	1	1	1	3	4	—	—
	1000	0	0	0	0	0	0	1	1	1	3	3	—	—
	1250	0	0	0	0	0	0	1	1	1	1	3	—	—
	1500	0	0	0	0	0	0	1	1	1	1	2	—	—
	1750	0	0	0	0	0	0	0	1	1	1	1	—	—
	2000	0	0	0	0	0	0	0	1	1	1	1	—	—
FIXTURE WIRES														
RFH-2, FFH-2, RFHH-2	18	3	8	14	22	35	51	90	135	195	265	346	—	—
	16	2	7	12	19	29	43	76	114	164	223	292	—	—
SF-2, SFF-2	18	4	11	18	28	44	64	113	170	246	334	437	—	—
	16	3	9	15	23	36	53	94	141	203	277	361	—	—
	14	2	7	12	19	29	43	76	114	164	223	292	—	—
SF-1, SFF-1	18	7	19	33	50	78	114	201	302	435	592	773	—	—
RFH-1, TF, TFF, XF, XFF	18	5	14	24	37	58	84	148	223	321	437	571	—	—
	16	4	11	19	30	47	68	120	180	259	353	461	—	—
XF, XFF	14	3	9	15	23	36	53	94	141	203	277	361	—	—
TFN, TFFN	18	8	23	38	59	93	135	237	357	514	699	914	—	—
	16	6	17	29	45	71	103	181	272	392	534	698	—	—

Type	Conductor Size (AWG/ kcmil)	Trade Size (Metric Designator)												
		⅜ (12)	½ (16)	¾ (21)	1 (27)	1¼ (35)	1½ (41)	2 (53)	2½ (63)	3 (78)	3½ (91)	4 (103)	5 (129)	6 (155)
PF, PFF, PGF, PGFF, PAF, PTF, PTFF, PAFF	18	8	22	36	56	88	128	225	338	487	663	866	—	—
	16	6	17	28	43	68	99	174	262	377	513	670	—	—
	14	4	12	21	32	51	74	130	196	282	385	502	—	—
ZF, ZFF, ZHF	18	10	28	47	72	113	165	290	436	628	855	1117	—	—
	16	7	20	35	53	83	122	214	322	463	631	824	—	—
	14	5	15	25	39	61	89	157	236	340	463	605	—	—
KF-2, KFF-2	18	15	42	71	109	170	247	436	654	942	1282	1675	—	—
	16	10	29	49	76	118	173	304	456	657	895	1169	—	—
	14	7	20	33	51	80	116	204	307	442	601	785	—	—
	12	5	13	23	35	55	80	142	213	307	418	546	—	—
	10	3	9	15	23	36	53	94	141	203	277	361	—	—
KF-1, KFF-1	18	18	48	82	125	196	286	503	755	1087	1480	1933	—	—
	16	12	34	57	88	138	201	353	530	764	1040	1358	—	—
	14	8	23	38	59	93	135	237	357	514	699	914	—	—
	12	5	15	25	39	61	89	157	236	340	463	605	—	—
	10	3	10	16	25	40	58	103	154	222	303	395	—	—
XF, XFF	12	1	5	8	12	19	28	50	75	108	148	193	—	—
	10	1	4	6	10	15	22	39	59	85	115	151	—	—

Notes:

1. This table is for concentric stranded conductors only. For compact stranded conductors, Table C.3(A) should be used.

2. Two-hour fire-rated RHH cable has ceramifiable insulation, which has much larger diameters than other RHH wires. Consult manufacturer's conduit fill tables.

*Types RHH, RHW, and RHW-2 without outer covering.

Table C.3(A) Maximum Number of Conductors or Fixture Wires in Flexible Metal Conduit (FMC)

(Based on Chapter 9: Table 1, Table 4, and Table 5A)

Type	Conductor Size (AWG/ kcmil)	Trade Size (Metric Designator)												
		⅜ (12)	½ (16)	¾ (21)	1 (27)	1¼ (35)	1½ (41)	2 (53)	2½ (63)	3 (78)	3½ (91)	4 (103)	5 (129)	6 (155)
COMPACT CONDUCTORS														
THW, THW-2, THHW	8	1	2	4	6	10	14	25	38	55	75	98	—	—
	6	1	1	3	5	7	11	20	29	43	58	76	—	—
	4	0	1	2	3	5	8	15	22	32	43	57	—	—
	2	0	1	1	2	4	6	11	16	23	32	42	—	—

Type	Conductor Size (AWG/ kcmil)	Trade Size (Metric Designator)												
		3⁄8 (12)	½ (16)	¾ (21)	1 (27)	1¼ (35)	1½ (41)	2 (53)	2½ (63)	3 (78)	3½ (91)	4 (103)	5 (129)	6 (155)
	1	0	1	1	1	3	4	7	11	16	22	29	—	—
	1/0	0	1	1	1	2	3	6	10	14	19	25	—	—
	2/0	0	0	1	1	1	3	5	8	12	16	21	—	—
	3/0	0	0	1	1	1	2	4	7	10	14	18	—	—
	4/0	0	0	1	1	1	1	4	6	8	11	15	—	—
	250	0	0	0	1	1	1	3	4	7	9	12	—	—
	300	0	0	0	1	1	1	2	4	6	8	10	—	—
	350	0	0	0	1	1	1	2	3	5	7	9	—	—
	400	0	0	0	0	1	1	1	3	5	6	8	—	—
	500	0	0	0	0	1	1	1	3	4	5	7	—	—
	600	0	0	0	0	0	1	1	1	3	4	6	—	—
	700	0	0	0	0	0	1	1	1	3	4	5	—	—
	750	0	0	0	0	0	1	1	1	2	3	5	—	—
	900	0	0	0	0	0	1	1	1	2	3	4	—	—
	1000	0	0	0	0	0	0	1	1	1	3	4	—	—
THHN, THWN, THWN-2	8	—	—	—	—	—	—	—	—	—	—	—	—	—
	6	1	3	4	7	11	16	29	43	62	85	111	—	—
	4	1	1	3	4	7	10	18	27	38	52	69	—	—
	2	0	1	1	3	5	7	13	19	28	38	49	—	—
	1	0	1	1	2	3	5	9	14	21	28	37	—	—
	1/0	0	1	1	1	3	4	8	12	17	24	31	—	—
	2/0	0	1	1	1	2	4	6	10	14	20	26	—	—
	3/0	0	0	1	1	1	3	5	8	12	17	22	—	—
	4/0	0	0	1	1	1	2	4	7	10	14	18	—	—
	250	0	0	1	1	1	1	3	5	8	11	14	—	—
	300	0	0	0	1	1	1	3	5	7	9	12	—	—
	350	0	0	0	1	1	1	3	4	6	8	10	—	—
	400	0	0	0	1	1	1	2	3	5	7	9	—	—
	500	0	0	0	0	1	1	1	3	4	6	8	—	—
	600	0	0	0	0	1	1	1	2	3	5	6	—	—
	700	0	0	0	0	0	1	1	1	3	4	6	—	—
	750	0	0	0	0	0	1	1	1	3	4	5	—	—
	900	0	0	0	0	0	1	1	1	2	3	4	—	—
	1000	0	0	0	0	0	0	1	1	1	3	4	—	—
XHHW, XHHW-2	8	1	3	5	8	13	19	33	50	71	97	127	—	—
	6	1	2	4	6	9	14	24	37	53	72	95	—	—
	4	1	1	3	4	7	10	18	27	38	52	69	—	—
	2	0	1	1	3	5	7	13	19	28	38	49	—	—
	1	0	1	1	2	3	5	9	14	21	28	37	—	—
	1/0	0	1	1	1	3	4	8	12	17	24	31	—	—
	2/0	0	1	1	1	2	4	7	10	15	20	26	—	—

Type	Conductor Size (AWG/ kcmil)	⅜ (12)	½ (16)	¾ (21)	1 (27)	1¼ (35)	1½ (41)	2 (53)	2½ (63)	3 (78)	3½ (91)	4 (103)	5 (129)	6 (155)
	3/0	0	0	1	1	1	3	5	8	12	17	22	—	—
	4/0	0	0	1	1	1	2	4	7	10	14	18	—	—
	250	0	0	1	1	1	1	4	5	8	11	14	—	—
	300	0	0	0	1	1	1	3	5	7	9	12	—	—
	350	0	0	0	1	1	1	3	4	6	8	11	—	—
	400	0	0	0	1	1	1	2	4	5	7	10	—	—
	500	0	0	0	0	1	1	1	3	4	6	8	—	—
	600	0	0	0	0	1	1	1	2	3	5	6	—	—
	700	0	0	0	0	0	1	1	1	3	4	6	—	—
	750	0	0	0	0	0	1	1	1	3	4	5	—	—
	900	0	0	0	0	0	1	1	1	2	3	4	—	—
	1000	0	0	0	0	0	1	1	1	2	3	4	—	—

Definition: *Compact stranding* is the result of a manufacturing process where the stranded conductor is
compressed to the extent that the interstices (voids between strand wires) are virtually eliminated.

Table C.4 Maximum Number of Conductors or Fixture Wires in Intermediate Metal Conduit (IMC)
(Based on Chapter 9: Table 1, Table 4, and Table 5)

Type	Conductor Size (AWG/ kcmil)	⅜ (12)	½ (16)	¾ (21)	1 (27)	1¼ (35)	1½ (41)	2 (53)	2½ (63)	3 (78)	3½ (91)	4 (103)	5 (129)	6 (155)
							CONDUCTORS							
RHH, RHW, RHW-2	14	—	4	8	13	22	30	49	70	108	144	186	291	419
	12	—	4	6	11	18	25	41	58	89	120	154	241	348
	10	—	3	5	8	15	20	33	47	72	97	124	195	281
	8	—	1	3	4	8	10	17	24	38	50	65	102	147
	6	—	1	1	3	6	8	14	19	30	40	52	81	118
	4	—	1	1	3	5	6	11	15	23	31	41	63	92
	3	—	1	1	2	4	6	9	13	21	28	36	56	80
	2	—	1	1	1	3	5	8	11	18	24	31	48	70
	1	—	0	1	1	2	3	5	7	12	16	20	32	46
	1/0	—	0	1	1	1	3	4	6	10	14	18	28	40
	2/0	—	0	1	1	1	2	4	6	9	12	15	24	35
	3/0	—	0	0	1	1	1	3	5	7	10	13	20	30
	4/0	—	0	0	1	1	1	3	4	6	9	11	17	25
	250	—	0	0	1	1	1	1	3	5	6	8	13	19
	300	—	0	0	0	1	1	1	3	4	6	7	12	17
	350	—	0	0	0	1	1	1	2	4	5	7	10	15
	400	—	0	0	0	1	1	1	2	3	5	6	9	14
	500	—	0	0	0	1	1	1	1	3	4	5	8	12

Type	Conductor Size (AWG/ kcmil)	Trade Size (Metric Designator)												
		3/8 (12)	½ (16)	¾ (21)	1 (27)	1¼ (35)	1½ (41)	2 (53)	2½ (63)	3 (78)	3½ (91)	4 (103)	5 (129)	6 (155)
	600	—	0	0	0	0	1	1	1	2	3	4	7	10
	700	—	0	0	0	0	1	1	1	2	3	4	6	9
	750	—	0	0	0	0	1	1	1	1	3	4	5	8
	800	—	0	0	0	0	0	1	1	1	3	3	5	8
	900	—	0	0	0	0	0	1	1	1	2	3	5	7
	1000	—	0	0	0	0	0	1	1	1	2	3	4	6
	1250	—	0	0	0	0	0	1	1	1	1	1	3	5
	1500	—	0	0	0	0	0	0	1	1	1	1	3	4
	1750	—	0	0	0	0	0	0	1	1	1	1	2	4
	2000	—	0	0	0	0	0	0	1	1	1	1	2	3
TW, THHW, THW, THW-2	14	—	10	17	27	47	64	104	147	228	304	392	613	885
	12	—	7	13	21	36	49	80	113	175	234	301	471	679
	10	—	5	9	15	27	36	59	84	130	174	224	350	506
	8	—	3	5	8	15	20	33	47	72	97	124	195	281
RHH*, RHW*, RHW-2*	14	—	6	11	18	31	42	69	98	151	202	261	408	588
	12	—	5	9	14	25	34	56	79	122	163	209	328	473
	10	—	4	7	11	19	26	43	61	95	127	163	256	369
	8	—	2	4	7	12	16	26	37	57	76	98	153	221
TW, THW, THHW, THW-2, RHH*, RHW*, RHW-2*	6	—	1	3	5	9	12	20	28	43	58	75	117	169
	4	—	1	2	4	6	9	15	21	32	43	56	87	126
	3	—	1	1	3	6	8	13	18	28	37	48	75	108
	2	—	1	1	3	5	6	11	15	23	31	41	63	92
	1	—	1	1	1	3	4	7	11	16	22	28	44	64
	1/0	—	1	1	1	3	4	6	9	14	19	24	38	55
	2/0	—	0	1	1	2	3	5	8	12	16	20	32	46
	3/0	—	0	1	1	1	3	4	6	10	13	17	27	39
	4/0	—	0	1	1	1	2	4	5	8	11	14	22	33
	250	—	0	0	1	1	1	3	4	7	9	12	18	26
	300	—	0	0	1	1	1	2	4	6	8	10	16	23
	350	—	0	0	1	1	1	2	3	5	7	9	14	20
	400	—	0	0	0	1	1	1	3	4	6	8	12	18
	500	—	0	0	0	1	1	1	2	4	5	7	10	15
	600	—	0	0	0	1	1	1	1	3	4	5	8	12
	700	—	0	0	0	0	1	1	1	3	4	5	7	11
	750	—	0	0	0	0	1	1	1	2	3	4	7	10
	800	—	0	0	0	0	1	1	1	2	3	4	6	10
	900	—	0	0	0	0	1	1	1	2	3	4	6	9
	1000	—	0	0	0	0	0	1	1	1	3	3	5	8
	1250	—	0	0	0	0	0	1	1	1	1	3	4	6
	1500	—	0	0	0	0	0	1	1	1	1	2	3	5
	1750	—	0	0	0	0	0	0	1	1	1	1	3	4

Type	Conductor Size (AWG/ kcmil)	Trade Size (Metric Designator)												
		3⁄8 (12)	½ (16)	¾ (21)	1 (27)	1¼ (35)	1½ (41)	2 (53)	2½ (63)	3 (78)	3½ (91)	4 (103)	5 (129)	6 (155)
	2000	—	0	0	0	0	0	0	1	1	1	1	3	4
THHN, THWN, THWN-2	14	—	14	24	39	68	91	149	211	326	436	562	879	1268
	12	—	10	17	29	49	67	109	154	238	318	410	641	925
	10	—	6	11	18	31	42	69	97	150	200	258	404	583
	8	—	3	6	10	18	24	39	56	86	115	149	233	336
	6	—	2	4	7	13	17	28	40	62	83	107	168	242
	4	—	1	3	4	8	11	17	25	38	51	66	103	149
	3	—	1	2	4	6	9	15	21	32	43	56	87	126
	2	—	1	1	3	5	7	12	17	27	36	47	73	106
	1	—	1	1	2	4	5	9	13	20	27	35	54	78
	1/0	—	1	1	1	3	4	8	11	17	23	29	45	66
	2/0	—	1	1	1	3	4	6	9	14	19	24	38	55
	3/0	—	0	1	1	2	3	5	7	12	16	20	31	45
	4/0	—	0	1	1	1	2	4	6	9	13	17	26	38
	250	—	0	0	1	1	1	3	5	8	10	13	21	30
	300	—	0	0	1	1	1	3	4	7	9	12	18	26
	350	—	0	0	1	1	1	2	4	6	8	10	16	23
	400	—	0	0	1	1	1	2	3	5	7	9	14	20
	500	—	0	0	0	1	1	1	3	4	6	7	12	17
	600	—	0	0	0	1	1	1	2	3	5	6	9	14
	700	—	0	0	0	1	1	1	1	3	4	5	8	12
	750	—	0	0	0	1	1	1	1	3	4	5	8	11
	800	—	0	0	0	0	1	1	1	3	4	5	7	11
	900	—	0	0	0	0	1	1	1	2	3	4	6	9
	1000	—	0	0	0	0	1	1	1	2	3	4	6	9
FEP, FEPB, PFA, PFAH, TFE	14	—	13	23	38	66	89	145	205	317	423	545	852	1230
	12	—	10	17	28	48	65	106	150	231	309	398	622	898
	10	—	7	12	20	34	46	76	107	166	221	285	446	644
	8	—	4	7	11	19	26	43	61	95	127	163	256	369
	6	—	3	5	8	14	19	31	44	67	90	116	182	262
	4	—	1	3	5	10	13	21	30	47	63	81	127	183
	3	—	1	3	4	8	11	18	25	39	52	68	106	153
	2	—	1	2	4	6	9	15	21	32	43	56	87	126
PFA, PFAH, TFE	1	—	1	1	2	4	6	10	14	22	30	39	60	87
PFA, PFAH, TFE, Z	1/0	—	1	1	1	4	5	8	12	19	25	32	50	73
	2/0	—	1	1	1	3	4	7	10	15	21	27	42	60
	3/0	—	0	1	1	2	3	6	8	13	17	22	34	49
	4/0	—	0	1	1	1	3	5	7	10	14	18	28	41
Z	14	—	16	28	46	79	107	175	247	381	510	657	1027	1482
	12	—	11	20	32	56	76	124	175	271	362	466	728	1051

Type	Conductor Size (AWG/ kcmil)	⅜ (12)	½ (16)	¾ (21)	1 (27)	1¼ (35)	1½ (41)	2 (53)	2½ (63)	3 (78)	3½ (91)	4 (103)	5 (129)	6 (155)
	10	—	7	12	20	34	46	76	107	166	221	285	446	644
	8	—	4	7	12	22	29	48	68	105	140	180	282	407
	6	—	3	5	9	15	20	33	47	73	98	127	198	286
	4	—	1	3	6	10	14	23	33	50	67	87	136	196
	3	—	1	2	4	7	10	17	24	37	49	63	99	143
	2	—	1	1	3	6	8	14	20	30	41	53	82	119
	1	—	1	1	3	5	7	11	16	25	33	43	67	96
XHHW, ZW, XHHW-2, XHH	14	—	10	17	27	47	64	104	147	228	304	392	613	885
	12	—	7	13	21	36	49	80	113	175	234	301	471	679
	10	—	5	9	15	27	36	59	84	130	174	224	350	506
	8	—	3	5	8	15	20	33	47	72	97	124	195	281
	6	—	1	4	6	11	15	24	35	53	71	92	144	208
	4	—	1	3	4	8	11	18	25	39	52	67	104	151
	3	—	1	2	4	7	9	15	21	33	44	56	88	127
	2	—	1	1	3	5	7	12	18	27	37	47	74	107
XHHW, XHHW-2, XHH	1	—	1	1	2	4	6	9	13	20	27	35	55	80
	1/0	—	1	1	1	3	5	8	11	17	23	30	46	67
	2/0	—	1	1	1	3	4	6	9	14	19	25	38	56
	3/0	—	0	1	1	2	3	5	7	12	16	20	32	46
	4/0	—	0	1	1	1	2	4	6	10	13	17	26	38
	250	—	0	0	1	1	1	3	5	8	11	14	21	31
	300	—	0	0	1	1	1	3	4	7	9	12	18	27
	350	—	0	0	1	1	1	3	4	6	8	10	16	23
	400	—	0	0	1	1	1	2	3	5	7	9	14	21
	500	—	0	0	0	1	1	1	3	4	6	8	12	17
	600	—	0	0	0	1	1	1	2	3	5	6	9	14
	700	—	0	0	0	1	1	1	1	3	4	5	8	12
	750	—	0	0	0	1	1	1	1	3	4	5	8	11
	800	—	0	0	0	0	1	1	1	3	4	5	7	11
	900	—	0	0	0	0	1	1	1	2	3	4	6	9
	1000	—	0	0	0	0	1	1	1	2	3	4	6	9
	1250	—	0	0	0	0	0	1	1	1	2	3	4	7
	1500	—	0	0	0	0	0	1	1	1	1	2	4	6
	1750	—	0	0	0	0	0	1	1	1	1	2	3	5
	2000	—	0	0	0	0	0	0	1	1	1	1	3	4
FIXTURE WIRES														
RFH-2, FFH-2, RFHH-2	18	—	9	16	26	45	61	100	141	218	292	376	588	848
	16	—	8	13	22	38	51	84	119	184	246	317	495	715
SF-2, SFF-2	18	—	12	20	33	57	77	126	178	275	368	474	741	1069
	16	—	10	17	27	47	64	104	147	228	304	392	613	885
	14	—	8	13	22	38	51	84	119	184	246	317	495	715

Type	Conductor Size (AWG/ kcmil)	Trade Size (Metric Designator)												
		⅜ (12)	½ (16)	¾ (21)	1 (27)	1¼ (35)	1½ (41)	2 (53)	2½ (63)	3 (78)	3½ (91)	4 (103)	5 (129)	6 (155)
SF-1, SFF-1	18	—	21	36	59	101	137	223	316	487	651	839	1312	1892
RFH-1, TF, TFF, XF, XFF	18	—	15	26	43	75	101	165	233	360	481	619	969	1398
	16	—	12	21	35	60	81	133	188	290	388	500	782	1128
XF, XFF	14	—	10	17	27	47	64	104	147	228	304	392	613	885
TFN, TFFN	18	—	25	42	69	119	162	264	373	576	769	991	1550	2237
	16	—	19	32	53	91	123	201	285	440	588	757	1184	1708
PF, PFF, PGF, PGFF, PAF, PTF, PTFF, PAFF	18	—	23	40	66	113	153	250	354	546	730	940	1470	2121
	16	—	18	31	51	88	118	193	274	422	564	727	1137	1640
	14	—	13	23	38	66	89	145	205	317	423	545	852	1230
ZF, ZFF, ZHF	18	—	30	52	85	146	197	322	456	704	941	1211	1895	2734
	16	—	22	38	63	108	146	238	336	519	694	894	1398	2017
	14	—	16	28	46	79	107	175	247	381	510	657	1027	1482
KF-2, KFF-2	18	—	45	78	128	219	296	484	684	1056	1411	1817	2842	4101
	16	—	32	54	89	153	207	337	477	737	984	1268	1983	2861
	14	—	21	36	60	103	139	227	321	495	661	852	1332	1922
	12	—	15	25	41	71	96	158	223	344	460	592	926	1337
	10	—	10	17	27	47	64	104	147	228	304	392	613	885
KF-1, KFF-1	18	—	52	90	147	253	342	558	790	1218	1628	2097	3280	4732
	16	—	37	63	103	178	240	392	555	856	1144	1473	2304	3325
	14	—	25	42	69	119	162	264	373	576	769	991	1550	2237
	12	—	16	28	46	79	107	175	247	381	510	657	1027	1482
	10	—	10	18	30	52	70	114	161	249	333	429	671	968
XF, XFF	12	—	5	9	14	25	34	56	79	122	163	209	—	—
	10	—	4	7	11	19	26	43	61	95	127	163	—	—

Notes:

1. This table is for concentric stranded conductors only. For compact stranded conductors, Table C.4(A) should be used.

2. Two-hour fire-rated RHH cable has ceramifiable insulation, which has much larger diameters than other RHH wires. Consult manufacturer's conduit fill tables.

*Types RHH, RHW, and RHW-2 without outer covering.

Table C.4(A) Maximum Number of Conductors or Fixture Wires in Intermediate Metal Conduit (IMC)
(Based on Chapter 9: Table 1, Table 4, and Table 5A)

Type	Conductor Size (AWG/ kcmil)	Trade Size (Metric Designator)												
		⅜ (12)	½ (16)	¾ (21)	1 (27)	1¼ (35)	1½ (41)	2 (53)	2½ (63)	3 (78)	3½ (91)	4 (103)	5 (129)	6 (155)
COMPACT CONDUCTORS														
THW, THW-2, THHW	8	—	2	4	7	13	17	28	40	62	83	107	—	—
	6	—	1	3	6	10	13	22	31	48	64	82	—	—
	4	—	1	2	4	7	10	16	23	36	48	62	—	—
	2	—	1	1	3	5	7	12	17	26	35	45	—	—
	1	—	1	1	1	4	5	8	12	18	25	32	—	—
	1/0	—	1	1	1	3	4	7	10	16	21	27	—	—
	2/0	—	0	1	1	3	4	6	9	13	18	23	—	—
	3/0	—	0	1	1	2	3	5	7	11	15	20	—	—
	4/0	—	0	1	1	1	2	4	6	9	13	16	—	—
	250	—	0	0	1	1	1	3	5	7	10	13	—	—
	300	—	0	0	1	1	1	3	4	6	9	11	—	—
	350	—	0	0	1	1	1	2	4	6	8	10	—	—
	400	—	0	0	1	1	1	2	3	5	7	9	—	—
	500	—	0	0	0	1	1	1	3	4	6	8	—	—
	600	—	0	0	0	1	1	1	2	3	5	6	—	—
	700	—	0	0	0	1	1	1	1	3	4	5	—	—
	750	—	0	0	0	1	1	1	1	3	4	5	—	—
	900	—	0	0	0	0	1	1	1	2	3	4	—	—
	1000	—	0	0	0	0	1	1	1	2	3	4	—	—
THHN, THWN, THWN-2	8	—	—	—	—	—	—	—	—	—	—	—	—	—
	6	—	3	5	8	14	19	32	45	70	93	120	—	—
	4	—	1	3	5	9	12	20	28	43	58	74	—	—
	2	—	1	1	3	6	8	14	20	31	41	53	—	—
	1	—	1	1	3	5	6	10	15	23	31	40	—	—
	1/0	—	1	1	2	4	5	9	13	20	26	34	—	—
	2/0	—	1	1	1	3	4	7	10	16	22	28	—	—
	3/0	—	0	1	1	3	4	6	9	14	18	24	—	—
	4/0	—	0	1	1	2	3	5	7	11	15	19	—	—
	250	—	0	1	1	1	2	4	6	9	12	15	—	—
	300	—	0	0	1	1	1	3	5	7	10	13	—	—
	350	—	0	0	1	1	1	3	4	7	9	11	—	—
	400	—	0	0	1	1	1	2	4	6	8	10	—	—
	500	—	0	0	1	1	1	2	3	5	7	9	—	—
	600	—	0	0	0	1	1	1	2	4	5	7	—	—
	700	—	0	0	0	1	1	1	2	3	5	6	—	—
	750	—	0	0	0	1	1	1	1	3	4	6	—	—
	900	—	0	0	0	0	1	1	1	3	3	5	—	—
	1000	—	0	0	0	0	1	1	1	2	3	4	—	—
XHHW, XHHW-2	8	—	3	6	9	16	22	37	52	80	107	138	—	—
	6	—	2	4	7	12	16	27	38	59	80	103	—	—

Type	Conductor Size (AWG/ kcmil)	3⁄8 (12)	½ (16)	¾ (21)	1 (27)	1¼ (35)	1½ (41)	2 (53)	2½ (63)	3 (78)	3½ (91)	4 (103)	5 (129)	6 (155)
		Trade Size (Metric Designator)												
	4	—	1	3	5	9	12	20	28	43	58	74	—	—
	2	—	1	1	3	6	8	14	20	31	41	53	—	—
	1	—	1	1	3	5	6	10	15	23	31	40	—	—
	1/0	—	1	1	2	4	5	9	13	20	26	34	—	—
	2/0	—	1	1	1	3	4	7	11	17	22	29	—	—
	3/0	—	0	1	1	3	4	6	9	14	18	24	—	—
	4/0	—	0	1	1	2	3	5	7	11	15	20	—	—
	250	—	0	1	1	1	2	4	6	9	12	16	—	—
	300	—	0	0	1	1	1	3	5	8	10	13	—	—
	350	—	0	0	1	1	1	3	4	7	9	12	—	—
	400	—	0	0	1	1	1	3	4	6	8	11	—	—
	500	—	0	0	1	1	1	2	3	5	7	9	—	—
	600	—	0	0	0	1	1	1	2	4	5	7	—	—
	700	—	0	0	0	1	1	1	2	3	5	6	—	—
	750	—	0	0	0	1	1	1	1	3	4	6	—	—
	900	—	0	0	0	1	1	1	1	3	4	5	—	—
	1000	—	0	0	0	0	1	1	1	2	3	4	—	—

Definition: *Compact stranding* is the result of a manufacturing process where the stranded conductor is
compressed to the extent that interstices (voids between strand wires) are virtually eliminated.

Table C.5 Maximum Number of Conductors or Fixture Wires in Liquidtight Flexible Nonmetallic Conduit (LFNC-A)

(Based on Chapter 9: Table 1, Table 4, and Table 5)

Type	Conductor Size (AWG/ kcmil)	3⁄8 (12)	½ (16)	¾ (21)	1 (27)	1¼ (35)	1½ (41)	2 (53)	2½ (63)	3 (78)	3½ (91)	4 (103)	5 (129)	6 (155)
		Trade Size (Metric Designator)												
CONDUCTORS														
RHH, RHW, RHW-2	14	2	4	7	11	20	27	45	—	—	—	—	—	—
	12	1	3	6	9	17	23	38	—	—	—	—	—	—
	10	1	3	5	8	13	18	30	—	—	—	—	—	—
	8	1	1	2	4	7	9	16	—	—	—	—	—	—
	6	1	1	1	3	5	7	13	—	—	—	—	—	—
	4	0	1	1	2	4	6	10	—	—	—	—	—	—
	3	0	1	1	1	4	5	8	—	—	—	—	—	—
	2	0	1	1	1	3	4	7	—	—	—	—	—	—
	1	0	0	1	1	1	3	5	—	—	—	—	—	—
	1/0	0	0	1	1	1	2	4	—	—	—	—	—	—
	2/0	0	0	1	1	1	1	4	—	—	—	—	—	—
	3/0	0	0	0	1	1	1	3	—	—	—	—	—	—
	4/0	0	0	0	1	1	1	3	—	—	—	—	—	—

Type	Conductor Size (AWG/ kcmil)	⅜ (12)	½ (16)	¾ (21)	1 (27)	1¼ (35)	1½ (41)	2 (53)	2½ (63)	3 (78)	3½ (91)	4 (103)	5 (129)	6 (155)
	250	0	0	0	0	1	1	1	—	—	—	—	—	—
	300	0	0	0	0	1	1	1	—	—	—	—	—	—
	350	0	0	0	0	1	1	1	—	—	—	—	—	—
	400	0	0	0	0	1	1	1	—	—	—	—	—	—
	500	0	0	0	0	0	1	1	—	—	—	—	—	—
	600	0	0	0	0	0	1	1	—	—	—	—	—	—
	700	0	0	0	0	0	0	1	—	—	—	—	—	—
	750	0	0	0	0	0	0	1	—	—	—	—	—	—
	800	0	0	0	0	0	0	1	—	—	—	—	—	—
	900	0	0	0	0	0	0	1	—	—	—	—	—	—
	1000	0	0	0	0	0	0	1	—	—	—	—	—	—
	1250	0	0	0	0	0	0	0	—	—	—	—	—	—
	1500	0	0	0	0	0	0	0	—	—	—	—	—	—
	1750	0	0	0	0	0	0	0	—	—	—	—	—	—
	2000	0	0	0	0	0	0	0	—	—	—	—	—	—
TW, THHW, THW, THW-2	14	5	9	15	24	43	58	96	—	—	—	—	—	—
	12	4	7	12	19	33	44	74	—	—	—	—	—	—
	10	3	5	9	14	24	33	55	—	—	—	—	—	—
	8	1	3	5	8	13	18	30	—	—	—	—	—	—
RHH*, RHW*, RHW-2*	14	3	6	10	16	28	38	64	—	—	—	—	—	—
	12	3	5	8	13	23	31	51	—	—	—	—	—	—
	10	1	3	6	10	18	24	40	—	—	—	—	—	—
	8	1	1	4	6	11	14	24	—	—	—	—	—	—
TW, THW, THHW, THW-2, RHH*, RHW*, RHW-2*	6	1	1	3	4	8	11	18	—	—	—	—	—	—
	4	1	1	1	3	6	8	13	—	—	—	—	—	—
	3	1	1	1	3	5	7	11	—	—	—	—	—	—
	2	0	1	1	2	4	6	10	—	—	—	—	—	—
	1	0	1	1	1	3	4	7	—	—	—	—	—	—
	1/0	0	0	1	1	2	3	6	—	—	—	—	—	—
	2/0	0	0	1	1	1	3	5	—	—	—	—	—	—
	3/0	0	0	1	1	1	2	4	—	—	—	—	—	—
	4/0	0	0	0	1	1	1	3	—	—	—	—	—	—
	250	0	0	0	1	1	1	3	—	—	—	—	—	—
	300	0	0	0	1	1	1	2	—	—	—	—	—	—
	350	0	0	0	0	1	1	1	—	—	—	—	—	—
	400	0	0	0	0	1	1	1	—	—	—	—	—	—
	500	0	0	0	0	1	1	1	—	—	—	—	—	—
	600	0	0	0	0	1	1	1	—	—	—	—	—	—
	700	0	0	0	0	0	1	1	—	—	—	—	—	—
	750	0	0	0	0	0	1	1	—	—	—	—	—	—
	800	0	0	0	0	0	1	1	—	—	—	—	—	—

Type	Conductor Size (AWG/ kcmil)	Trade Size (Metric Designator)												
		⅜ (12)	½ (16)	¾ (21)	1 (27)	1¼ (35)	1½ (41)	2 (53)	2½ (63)	3 (78)	3½ (91)	4 (103)	5 (129)	6 (155)
	900	0	0	0	0	0	0	1	—	—	—	—	—	—
	1000	0	0	0	0	0	0	1	—	—	—	—	—	—
	1250	0	0	0	0	0	0	1	—	—	—	—	—	—
	1500	0	0	0	0	0	0	1	—	—	—	—	—	—
	1750	0	0	0	0	0	0	0	—	—	—	—	—	—
	2000	0	0	0	0	0	0	0	—	—	—	—	—	—
THHN, THWN, THWN-2	14	8	13	22	35	62	83	138	—	—	—	—	—	—
	12	5	9	16	25	45	60	100	—	—	—	—	—	—
	10	3	6	10	16	28	38	63	—	—	—	—	—	—
	8	1	3	6	9	16	22	36	—	—	—	—	—	—
	6	1	2	4	6	12	16	26	—	—	—	—	—	—
	4	1	1	2	4	7	9	16	—	—	—	—	—	—
	3	1	1	1	3	6	8	13	—	—	—	—	—	—
	2	1	1	1	3	5	7	11	—	—	—	—	—	—
	1	0	1	1	1	4	5	8	—	—	—	—	—	—
	1/0	0	1	1	1	3	4	7	—	—	—	—	—	—
	2/0	0	0	1	1	2	3	6	—	—	—	—	—	—
	3/0	0	0	1	1	1	3	5	—	—	—	—	—	—
	4/0	0	0	1	1	1	2	4	—	—	—	—	—	—
	250	0	0	0	1	1	1	3	—	—	—	—	—	—
	300	0	0	0	1	1	1	3	—	—	—	—	—	—
	350	0	0	0	1	1	1	2	—	—	—	—	—	—
	400	0	0	0	0	1	1	1	—	—	—	—	—	—
	500	0	0	0	0	1	1	1	—	—	—	—	—	—
	600	0	0	0	0	1	1	1	—	—	—	—	—	—
	700	0	0	0	0	1	1	1	—	—	—	—	—	—
	750	0	0	0	0	0	1	1	—	—	—	—	—	—
	800	0	0	0	0	0	1	1	—	—	—	—	—	—
	900	0	0	0	0	0	1	1	—	—	—	—	—	—
	1000	0	0	0	0	0	0	1	—	—	—	—	—	—
FEP, FEPB, PFA, PFAH, TFE	14	7	12	21	34	60	80	133	—	—	—	—	—	—
	12	5	9	15	25	44	59	97	—	—	—	—	—	—
	10	4	6	11	18	31	42	70	—	—	—	—	—	—
	8	1	3	6	10	18	24	40	—	—	—	—	—	—
	6	1	2	4	7	13	17	28	—	—	—	—	—	—
	4	1	1	3	5	9	12	20	—	—	—	—	—	—
	3	1	1	2	4	7	10	16	—	—	—	—	—	—
	2	1	1	1	3	6	8	13	—	—	—	—	—	—
PFA, PFAH, TFE	1	0	1	1	2	4	5	9	—	—	—	—	—	—

Type	Conductor Size (AWG/ kcmil)	Trade Size (Metric Designator)												
		⅜ (12)	½ (16)	¾ (21)	1 (27)	1¼ (35)	1½ (41)	2 (53)	2½ (63)	3 (78)	3½ (91)	4 (103)	5 (129)	6 (155)
PFA, PFAH, TFE, Z	1/0	0	1	1	1	3	5	8	—	—	—	—	—	—
	2/0	0	1	1	1	3	4	6	—	—	—	—	—	—
	3/0	0	0	1	1	2	3	5	—	—	—	—	—	—
	4/0	0	0	1	1	1	2	4	—	—	—	—	—	—
Z	14	9	15	25	41	72	97	161	—	—	—	—	—	—
	12	6	10	18	29	51	69	114	—	—	—	—	—	—
	10	4	6	11	18	31	42	70	—	—	—	—	—	—
	8	2	4	7	11	20	26	44	—	—	—	—	—	—
	6	1	3	5	8	14	18	31	—	—	—	—	—	—
	4	1	1	3	5	9	13	21	—	—	—	—	—	—
	3	1	1	2	4	7	9	15	—	—	—	—	—	—
	2	1	1	1	3	6	8	13	—	—	—	—	—	—
	1	1	1	1	2	4	6	10	—	—	—	—	—	—
XHHW, ZW, XHHW-2, XHH	14	5	9	15	24	43	58	96	—	—	—	—	—	—
	12	4	7	12	19	33	44	74	—	—	—	—	—	—
	10	3	5	9	14	24	33	55	—	—	—	—	—	—
	8	1	3	5	8	13	18	30	—	—	—	—	—	—
	6	1	1	3	5	10	13	22	—	—	—	—	—	—
	4	1	1	2	4	7	10	16	—	—	—	—	—	—
	3	1	1	1	3	6	8	14	—	—	—	—	—	—
	2	1	1	1	3	5	7	11	—	—	—	—	—	—
XHHW, XHHW-2, XHH	1	0	1	1	1	4	5	8	—	—	—	—	—	—
	1/0	0	1	1	1	3	4	7	—	—	—	—	—	—
	2/0	0	0	1	1	2	3	6	—	—	—	—	—	—
	3/0	0	0	1	1	1	3	5	—	—	—	—	—	—
	4/0	0	0	1	1	1	2	4	—	—	—	—	—	—
	250	0	0	0	1	1	1	3	—	—	—	—	—	—
	300	0	0	0	1	1	1	3	—	—	—	—	—	—
	350	0	0	0	1	1	1	2	—	—	—	—	—	—
	400	0	0	0	0	1	1	1	—	—	—	—	—	—
	500	0	0	0	0	1	1	1	—	—	—	—	—	—
	600	0	0	0	0	1	1	1	—	—	—	—	—	—
	700	0	0	0	0	1	1	1	—	—	—	—	—	—
	750	0	0	0	0	0	1	1	—	—	—	—	—	—
	800	0	0	0	0	0	1	1	—	—	—	—	—	—
	900	0	0	0	0	0	1	1	—	—	—	—	—	—
	1000	0	0	0	0	0	0	1	—	—	—	—	—	—
	1250	0	0	0	0	0	0	1	—	—	—	—	—	—
	1500	0	0	0	0	0	0	1	—	—	—	—	—	—
	1750	0	0	0	0	0	0	0	—	—	—	—	—	—
	2000	0	0	0	0	0	0	0	—	—	—	—	—	—

Type	Conductor Size (AWG/ kcmil)	Trade Size (Metric Designator)												
		3⁄8 (12)	½ (16)	¾ (21)	1 (27)	1¼ (35)	1½ (41)	2 (53)	2½ (63)	3 (78)	3½ (91)	4 (103)	5 (129)	6 (155)
FIXTURE WIRES														
RFH-2, FFH-2, RFHH-2	18	5	8	14	23	41	55	92	—	—	—	—	—	—
	16	4	7	12	20	35	47	77	—	—	—	—	—	—
SF-2, SFF-2	18	6	11	18	29	52	70	116	—	—	—	—	—	—
	16	5	9	15	24	43	58	96	—	—	—	—	—	—
	14	4	7	12	20	35	47	77	—	—	—	—	—	—
SF-1, SFF-1	18	12	19	33	52	92	124	205	—	—	—	—	—	—
RFH-1, TF, TFF, XF, XFF	18	8	14	24	39	68	91	152	—	—	—	—	—	—
	16	7	11	19	31	55	74	122	—	—	—	—	—	—
XF, XFF	14	5	9	15	24	43	58	96	—	—	—	—	—	—
TFN, TFFN	18	14	22	39	62	109	146	243	—	—	—	—	—	—
	16	10	17	29	47	83	112	185	—	—	—	—	—	—
PF, PFF, PGF, PGFF, PAF, PTF, PTFF, PAFF	18	13	21	37	59	103	139	230	—	—	—	—	—	—
	16	10	16	28	45	80	107	178	—	—	—	—	—	—
	14	7	12	21	34	60	80	133	—	—	—	—	—	—
ZF, ZFF, ZHF	18	17	27	47	76	133	179	297	—	—	—	—	—	—
	16	12	20	35	56	98	132	219	—	—	—	—	—	—
	14	9	15	25	41	72	97	161	—	—	—	—	—	—
KF-2, KFF-2	18	25	41	71	114	200	269	445	—	—	—	—	—	—
	16	18	29	49	79	139	187	311	—	—	—	—	—	—
	14	12	19	33	53	94	126	209	—	—	—	—	—	—
	12	8	13	23	37	65	87	145	—	—	—	—	—	—
	10	5	9	15	24	43	58	96	—	—	—	—	—	—
KF-1, KFF-1	18	29	48	82	131	231	310	514	—	—	—	—	—	—
	16	20	33	58	92	162	218	361	—	—	—	—	—	—
	14	14	22	39	62	109	146	243	—	—	—	—	—	—
	12	9	15	25	41	72	97	161	—	—	—	—	—	—
	10	6	10	17	27	47	63	105	—	—	—	—	—	—
XF, XFF	12	3	5	8	13	23	31	51	—	—	—	—	—	—
	10	1	3	6	10	18	24	40	—	—	—	—	—	—

Notes:

1. This table is for concentric stranded conductors only. For compact stranded conductors, Table C.6(A)
should be used.

2. Two-hour fire-rated RHH cable has ceramifiable insulation, which has much larger diameters than other RHH wires.

Consult manufacturer's conduit fill tables.

*Types RHH, RHW, and RHW-2 without outer covering.

Table C.5(A) Maximum Number of Conductors or Fixture Wires in Liquidtight Flexible Nonmetallic Conduit (LFNC-A)

(Based on Chapter 9: Table 1, Table 4, and Table 5A)

Type	Conductor Size (AWG/ kcmil)	Trade Size (Metric Designator)												
		3⁄8 (12)	½ (16)	¾ (21)	1 (27)	1¼ (35)	1½ (41)	2 (53)	2½ (63)	3 (78)	3½ (91)	4 (103)	5 (129)	6 (155)
COMPACT CONDUCTORS														
THW, THW-2, THHW	8	1	2	4	6	11	16	26	—	—	—	—	—	—
	6	1	1	3	5	9	12	20	—	—	—	—	—	—
	4	1	1	2	4	7	9	15	—	—	—	—	—	—
	2	1	1	1	3	5	6	11	—	—	—	—	—	—
	1	0	1	1	1	3	4	8	—	—	—	—	—	—
	1/0	0	1	1	1	3	4	7	—	—	—	—	—	—
	2/0	0	0	1	1	2	3	5	—	—	—	—	—	—
	3/0	0	0	1	1	1	3	5	—	—	—	—	—	—
	4/0	0	0	1	1	1	2	4	—	—	—	—	—	—
	250	0	0	0	1	1	1	3	—	—	—	—	—	—
	300	0	0	0	1	1	1	3	—	—	—	—	—	—
	350	0	0	0	1	1	1	2	—	—	—	—	—	—
	400	0	0	0	0	1	1	1	—	—	—	—	—	—
	500	0	0	0	0	1	1	1	—	—	—	—	—	—
	600	0	0	0	0	1	1	1	—	—	—	—	—	—
	700	0	0	0	0	1	1	1	—	—	—	—	—	—
	750	0	0	0	0	0	1	1	—	—	—	—	—	—
	900	0	0	0	0	0	1	1	—	—	—	—	—	—
	1000	0	0	0	0	0	1	1	—	—	—	—	—	—
THHN, THWN, THWN-2	8	—	—	—	—	—	—	—	—	—	—	—	—	—
	6	1	2	4	7	13	18	29	—	—	—	—	—	—
	4	1	1	3	4	8	11	18	—	—	—	—	—	—
	2	1	1	1	3	6	8	13	—	—	—	—	—	—
	1	0	1	1	2	4	6	10	—	—	—	—	—	—
	1/0	0	1	1	1	3	5	8	—	—	—	—	—	—
	2/0	0	1	1	1	3	4	7	—	—	—	—	—	—
	3/0	0	0	1	1	2	3	6	—	—	—	—	—	—
	4/0	0	0	1	1	1	3	5	—	—	—	—	—	—
	250	0	0	1	1	1	1	3	—	—	—	—	—	—
	300	0	0	0	1	1	1	3	—	—	—	—	—	—
	350	0	0	0	1	1	1	3	—	—	—	—	—	—
	400	0	0	0	1	1	1	2	—	—	—	—	—	—
	500	0	0	0	0	1	1	1	—	—	—	—	—	—
	600	0	0	0	0	1	1	1	—	—	—	—	—	—

Type	Conductor Size (AWG/ kcmil)	Trade Size (Metric Designator)												
		⅜ (12)	½ (16)	¾ (21)	1 (27)	1¼ (35)	1½ (41)	2 (53)	2½ (63)	3 (78)	3½ (91)	4 (103)	5 (129)	6 (155)
	700	0	0	0	0	1	1	1	—	—	—	—	—	—
	750	0	0	0	0	1	1	1	—	—	—	—	—	—
	900	0	0	0	0	0	1	1	—	—	—	—	—	—
	1000	0	0	0	0	0	1	1	—	—	—	—	—	—
XHHW, XHHW-2	8	1	3	5	8	15	20	34	—	—	—	—	—	—
	6	1	2	4	6	11	15	25	—	—	—	—	—	—
	4	1	1	3	4	8	11	18	—	—	—	—	—	—
	2	1	1	1	3	6	8	13	—	—	—	—	—	—
	1	0	1	1	2	4	6	10	—	—	—	—	—	—
	1/0	0	1	1	1	3	5	8	—	—	—	—	—	—
	2/0	0	1	1	1	3	4	7	—	—	—	—	—	—
	3/0	0	0	1	1	2	3	6	—	—	—	—	—	—
	4/0	0	0	1	1	1	3	5	—	—	—	—	—	—
	250	0	0	1	1	1	2	4	—	—	—	—	—	—
	300	0	0	0	1	1	1	3	—	—	—	—	—	—
	350	0	0	0	1	1	1	3	—	—	—	—	—	—
	400	0	0	0	1	1	1	2	—	—	—	—	—	—
	500	0	0	0	0	1	1	1	—	—	—	—	—	—
	600	0	0	0	0	1	1	1	—	—	—	—	—	—
	700	0	0	0	0	1	1	1	—	—	—	—	—	—
	750	0	0	0	0	1	1	1	—	—	—	—	—	—
	900	0	0	0	0	0	1	1	—	—	—	—	—	—
	1000	0	0	0	0	0	1	1	—	—	—	—	—	—

Definition: *Compact stranding* is the result of a manufacturing process where the stranded conductor is
compressed to the extent that the interstices (voids between strand wires) are virtually eliminated.

Table C.6 Maximum Number of Conductors or Fixture Wires in Liquidtight Flexible Nonmetallic Conduit (LFNC-B*)
(Based on Chapter 9: Table 1, Table 4, and Table 5)

Type	Conductor Size (AWG/ kcmil)	Trade Size (Metric Designator)												
		⅜ (12)	½ (16)	¾ (21)	1 (27)	1¼ (35)	1½ (41)	2 (53)	2½ (63)	3 (78)	3½ (91)	4 (103)	5 (129)	6 (155)
CONDUCTORS														
RHH, RHW, RHW-2	14	2	4	7	12	21	27	44	—	—	—	—	—	—
	12	1	3	6	10	17	22	36	—	—	—	—	—	—
	10	1	3	5	8	14	18	29	—	—	—	—	—	—
	8	1	1	2	4	7	9	15	—	—	—	—	—	—
	6	1	1	1	3	6	7	12	—	—	—	—	—	—
	4	0	1	1	2	4	6	9	—	—	—	—	—	—
	3	0	1	1	1	4	5	8	—	—	—	—	—	—

Type	Conductor Size (AWG/ kcmil)	Trade Size (Metric Designator)												
		3⁄8 (12)	½ (16)	¾ (21)	1 (27)	1¼ (35)	1½ (41)	2 (53)	2½ (63)	3 (78)	3½ (91)	4 (103)	5 (129)	6 (155)
	2	0	1	1	1	3	4	7	—	—	—	—	—	—
	1	0	0	1	1	1	3	5	—	—	—	—	—	—
	1/0	0	0	1	1	1	2	4	—	—	—	—	—	—
	2/0	0	0	1	1	1	1	3	—	—	—	—	—	—
	3/0	0	0	0	1	1	1	3	—	—	—	—	—	—
	4/0	0	0	0	1	1	1	2	—	—	—	—	—	—
	250	0	0	0	0	1	1	1	—	—	—	—	—	—
	300	0	0	0	0	1	1	1	—	—	—	—	—	—
	350	0	0	0	0	1	1	1	—	—	—	—	—	—
	400	0	0	0	0	1	1	1	—	—	—	—	—	—
	500	0	0	0	0	1	1	1	—	—	—	—	—	—
	600	0	0	0	0	0	1	1	—	—	—	—	—	—
	700	0	0	0	0	0	0	1	—	—	—	—	—	—
	750	0	0	0	0	0	0	1	—	—	—	—	—	—
	800	0	0	0	0	0	0	1	—	—	—	—	—	—
	900	0	0	0	0	0	0	1	—	—	—	—	—	—
	1000	0	0	0	0	0	0	1	—	—	—	—	—	—
	1250	0	0	0	0	0	0	0	—	—	—	—	—	—
	1500	0	0	0	0	0	0	0	—	—	—	—	—	—
	1750	0	0	0	0	0	0	0	—	—	—	—	—	—
	2000	0	0	0	0	0	0	0	—	—	—	—	—	—
TW, THHW, THW, THW-2	14	5	9	15	25	44	57	93	—	—	—	—	—	—
	12	4	7	12	19	33	43	71	—	—	—	—	—	—
	10	3	5	9	14	25	32	53	—	—	—	—	—	—
	8	1	3	5	8	14	18	29	—	—	—	—	—	—
RHH*, RHW*, RHW-2*	14	3	6	10	16	29	38	62	—	—	—	—	—	—
	12	3	5	8	13	23	30	50	—	—	—	—	—	—
	10	1	3	6	10	18	23	39	—	—	—	—	—	—
	8	1	1	4	6	11	14	23	—	—	—	—	—	—
TW, THW, THHW, THW-2, RHH*, RHW*, RHW-2*	6	1	1	3	5	8	11	18	—	—	—	—	—	—
	4	1	1	1	3	6	8	13	—	—	—	—	—	—
	3	1	1	1	3	5	7	11	—	—	—	—	—	—
	2	0	1	1	2	4	6	9	—	—	—	—	—	—
	1	0	1	1	1	3	4	7	—	—	—	—	—	—
	1/0	0	0	1	1	2	3	6	—	—	—	—	—	—
	2/0	0	0	1	1	2	3	5	—	—	—	—	—	—
	3/0	0	0	1	1	1	2	4	—	—	—	—	—	—
	4/0	0	0	0	1	1	1	3	—	—	—	—	—	—
	250	0	0	0	1	1	1	3	—	—	—	—	—	—
	300	0	0	0	1	1	1	2	—	—	—	—	—	—
	350	0	0	0	0	1	1	1	—	—	—	—	—	—

Type	Conductor Size (AWG/ kcmil)	Trade Size (Metric Designator)												
		3⁄8 (12)	½ (16)	¾ (21)	1 (27)	1¼ (35)	1½ (41)	2 (53)	2½ (63)	3 (78)	3½ (91)	4 (103)	5 (129)	6 (155)
	400	0	0	0	0	1	1	1	—	—	—	—	—	—
	500	0	0	0	0	1	1	1	—	—	—	—	—	—
	600	0	0	0	0	1	1	1	—	—	—	—	—	—
	700	0	0	0	0	0	1	1	—	—	—	—	—	—
	750	0	0	0	0	0	1	1	—	—	—	—	—	—
	800	0	0	0	0	0	1	1	—	—	—	—	—	—
	900	0	0	0	0	0	0	1	—	—	—	—	—	—
	1000	0	0	0	0	0	0	1	—	—	—	—	—	—
	1250	0	0	0	0	0	0	1	—	—	—	—	—	—
	1500	0	0	0	0	0	0	0	—	—	—	—	—	—
	1750	0	0	0	0	0	0	0	—	—	—	—	—	—
	2000	0	0	0	0	0	0	0	—	—	—	—	—	—
THHN, THWN, THWN-2	14	8	13	22	36	63	81	134	—	—	—	—	—	—
	12	5	9	16	26	46	59	97	—	—	—	—	—	—
	10	3	6	10	16	29	37	61	—	—	—	—	—	—
	8	1	3	6	9	16	21	35	—	—	—	—	—	—
	6	1	2	4	7	12	15	25	—	—	—	—	—	—
	4	1	1	2	4	7	9	15	—	—	—	—	—	—
	3	1	1	1	3	6	8	13	—	—	—	—	—	—
	2	1	1	1	3	5	7	11	—	—	—	—	—	—
	1	0	1	1	1	4	5	8	—	—	—	—	—	—
	1/0	0	1	1	1	3	4	7	—	—	—	—	—	—
	2/0	0	0	1	1	2	3	6	—	—	—	—	—	—
	3/0	0	0	1	1	1	3	5	—	—	—	—	—	—
	4/0	0	0	1	1	1	2	4	—	—	—	—	—	—
	250	0	0	0	1	1	1	3	—	—	—	—	—	—
	300	0	0	0	1	1	1	3	—	—	—	—	—	—
	350	0	0	0	1	1	1	2	—	—	—	—	—	—
	400	0	0	0	0	1	1	1	—	—	—	—	—	—
	500	0	0	0	0	1	1	1	—	—	—	—	—	—
	600	0	0	0	0	1	1	1	—	—	—	—	—	—
	700	0	0	0	0	1	1	1	—	—	—	—	—	—
	750	0	0	0	0	0	1	1	—	—	—	—	—	—
	800	0	0	0	0	0	1	1	—	—	—	—	—	—
	900	0	0	0	0	0	1	1	—	—	—	—	—	—
	1000	0	0	0	0	0	0	1	—	—	—	—	—	—
FEP, FEPB, PFA, PFAH, TFE	14	7	12	21	35	61	79	130	—	—	—	—	—	—
	12	5	9	15	25	44	58	94	—	—	—	—	—	—
	10	4	6	11	18	32	41	68	—	—	—	—	—	—
	8	1	3	6	10	18	23	39	—	—	—	—	—	—
	6	1	2	4	7	13	17	27	—	—	—	—	—	—

Type	Conductor Size (AWG/ kcmil)	Trade Size (Metric Designator)												
		⅜ (12)	½ (16)	¾ (21)	1 (27)	1¼ (35)	1½ (41)	2 (53)	2½ (63)	3 (78)	3½ (91)	4 (103)	5 (129)	6 (155)
	4	1	1	3	5	9	12	19	—	—	—	—	—	—
	3	1	1	2	4	7	10	16	—	—	—	—	—	—
	2	1	1	1	3	6	8	13	—	—	—	—	—	—
PFA, PFAH, TFE	1	0	1	1	2	4	5	9	—	—	—	—	—	—
PFA, PFAH, TFE, Z	1/0	0	1	1	1	3	4	7	—	—	—	—	—	—
	2/0	0	1	1	1	3	4	6	—	—	—	—	—	—
	3/0	0	0	1	1	2	3	5	—	—	—	—	—	—
	4/0	0	0	1	1	1	2	4	—	—	—	—	—	—
Z	14	9	15	26	42	73	95	156	—	—	—	—	—	—
	12	6	10	18	30	52	67	111	—	—	—	—	—	—
	10	4	6	11	18	32	41	68	—	—	—	—	—	—
	8	2	4	7	11	20	26	43	—	—	—	—	—	—
	6	1	3	5	8	14	18	30	—	—	—	—	—	—
	4	1	1	3	5	9	12	20	—	—	—	—	—	—
	3	1	1	2	4	7	9	15	—	—	—	—	—	—
	2	1	1	1	3	6	7	12	—	—	—	—	—	—
	1	1	1	1	2	5	6	10	—	—	—	—	—	—
XHHW, ZW, XHHW-2, XHH	14	5	9	15	25	44	57	93	—	—	—	—	—	—
	12	4	7	12	19	33	43	71	—	—	—	—	—	—
	10	3	5	9	14	25	32	53	—	—	—	—	—	—
	8	1	3	5	8	14	18	29	—	—	—	—	—	—
	6	1	1	3	6	10	13	22	—	—	—	—	—	—
	4	1	1	2	4	7	9	16	—	—	—	—	—	—
	3	1	1	1	3	6	8	13	—	—	—	—	—	—
	2	1	1	1	3	5	7	11	—	—	—	—	—	—
XHHW, XHHW-2, XHH	1	0	1	1	1	4	5	8	—	—	—	—	—	—
	1/0	0	1	1	1	3	4	7	—	—	—	—	—	—
	2/0	0	0	1	1	2	3	6	—	—	—	—	—	—
	3/0	0	0	1	1	1	3	5	—	—	—	—	—	—
	4/0	0	0	1	1	1	2	4	—	—	—	—	—	—
	250	0	0	0	1	1	1	3	—	—	—	—	—	—
	300	0	0	0	1	1	1	3	—	—	—	—	—	—
	350	0	0	0	1	1	1	2	—	—	—	—	—	—
	400	0	0	0	1	1	1	1	—	—	—	—	—	—
	500	0	0	0	0	1	1	1	—	—	—	—	—	—
	600	0	0	0	0	1	1	1	—	—	—	—	—	—
	700	0	0	0	0	1	1	1	—	—	—	—	—	—
	750	0	0	0	0	0	1	1	—	—	—	—	—	—
	800	0	0	0	0	0	1	1	—	—	—	—	—	—
	900	0	0	0	0	0	1	1	—	—	—	—	—	—

Type	Conductor Size (AWG/ kcmil)	Trade Size (Metric Designator)												
		⅜ (12)	½ (16)	¾ (21)	1 (27)	1¼ (35)	1½ (41)	2 (53)	2½ (63)	3 (78)	3½ (91)	4 (103)	5 (129)	6 (155)
	1000	0	0	0	0	0	0	1	—	—	—	—	—	—
	1250	0	0	0	0	0	0	1	—	—	—	—	—	—
	1500	0	0	0	0	0	0	1	—	—	—	—	—	—
	1750	0	0	0	0	0	0	0	—	—	—	—	—	—
	2000	0	0	0	0	0	0	0	—	—	—	—	—	—
FIXTURE WIRES														
RFH-2, FFH-2, RFHH-2	18	5	8	15	24	42	54	89	—	—	—	—	—	—
	16	4	7	12	20	35	46	75	—	—	—	—	—	—
SF-2, SFF-2	18	6	11	19	30	53	69	113	—	—	—	—	—	—
	16	5	9	15	25	44	57	93	—	—	—	—	—	—
	14	4	7	12	20	35	46	75	—	—	—	—	—	—
SF-1, SFF-1	18	12	19	33	53	94	122	199	—	—	—	—	—	—
RFH-1, TF, TFF, XF, XFF	18	8	14	24	39	69	90	147	—	—	—	—	—	—
	16	7	11	20	32	56	72	119	—	—	—	—	—	—
XF, XFF	14	5	9	15	25	44	57	93	—	—	—	—	—	—
TFN, TFFN	18	14	23	39	63	111	144	236	—	—	—	—	—	—
	16	10	17	30	48	85	110	180	—	—	—	—	—	—
PF, PFF, PGF, PGFF, PAF, PTF, PTFF, PAFF	18	13	21	37	60	105	136	224	—	—	—	—	—	—
	16	10	16	29	46	81	105	173	—	—	—	—	—	—
	14	7	12	21	35	61	79	130	—	—	—	—	—	—
ZF, ZFF, ZHF	18	17	28	48	77	136	176	288	—	—	—	—	—	—
	16	12	20	35	57	100	130	213	—	—	—	—	—	—
	14	9	15	26	42	73	95	156	—	—	—	—	—	—
KF-2, KFF-2	18	25	42	72	116	203	264	433	—	—	—	—	—	—
	16	18	29	50	81	142	184	302	—	—	—	—	—	—
	14	12	19	34	54	95	124	203	—	—	—	—	—	—
	12	8	13	23	38	66	86	141	—	—	—	—	—	—
	10	5	9	15	25	44	57	93	—	—	—	—	—	—
KF-1, KFF-1	18	29	48	83	134	235	304	499	—	—	—	—	—	—
	16	20	34	58	94	165	214	351	—	—	—	—	—	—
	14	14	23	39	63	111	144	236	—	—	—	—	—	—
	12	9	15	26	42	73	95	156	—	—	—	—	—	—
	10	6	10	17	27	48	62	102	—	—	—	—	—	—
XF, XFF	12	3	5	8	13	23	30	50	—	—	—	—	—	—
	10	1	3	6	10	18	23	39	—	—	—	—	—	—

Notes:

1. This table is for concentric stranded conductors only. For compact stranded conductors, Table C.5(A)
should be used.

2. Two-hour fire-rated RHH cable has ceramifiable insulation, which has much larger diameters than other RHH wires.
Consult manufacturer's conduit fill tables.

*Types RHH, RHW, and RHW-2 without outer covering.

Table C.6(A) Maximum Number of Conductors or Fixture Wires in Liquidtight Flexible Nonmetallic Conduit (LFNC-B) (Based on Chapter 9: Table 1, Table 4, and Table 5A)

Type	Conductor Size (AWG/ kcmil)	Trade Size (Metric Designator)												
		⅜ (12)	½ (16)	¾ (21)	1 (27)	1¼ (35)	1½ (41)	2 (53)	2½ (63)	3 (78)	3½ (91)	4 (103)	5 (129)	6 (155)
COMPACT CONDUCTORS														
THW, THW-2, THHW	8	1	2	4	7	12	15	25	—	—	—	—	—	—
	6	1	1	3	5	9	12	19	—	—	—	—	—	—
	4	1	1	2	4	7	9	14	—	—	—	—	—	—
	2	1	1	1	3	5	6	11	—	—	—	—	—	—
	1	0	1	1	1	3	4	7	—	—	—	—	—	—
	1/0	0	1	1	1	3	4	6	—	—	—	—	—	—
	2/0	0	0	1	1	2	3	5	—	—	—	—	—	—
	3/0	0	0	1	1	1	3	4	—	—	—	—	—	—
	4/0	0	0	1	1	1	2	4	—	—	—	—	—	—
	250	0	0	0	1	1	1	3	—	—	—	—	—	—
	300	0	0	0	1	1	1	2	—	—	—	—	—	—
	350	0	0	0	1	1	1	2	—	—	—	—	—	—
	400	0	0	0	0	1	1	1	—	—	—	—	—	—
	500	0	0	0	0	1	1	1	—	—	—	—	—	—
	600	0	0	0	0	1	1	1	—	—	—	—	—	—
	700	0	0	0	0	1	1	1	—	—	—	—	—	—
	750	0	0	0	0	0	1	1	—	—	—	—	—	—
	900	0	0	0	0	0	1	1	—	—	—	—	—	—
	1000	0	0	0	0	0	1	1	—	—	—	—	—	—
THHN, THWN, THWN-2	8	—	—	—	—	—	—	—	—	—	—	—	—	—
	6	1	2	4	7	13	17	28	—	—	—	—	—	—
	4	1	1	3	4	8	11	17	—	—	—	—	—	—
	2	1	1	1	3	6	7	12	—	—	—	—	—	—
	1	0	1	1	2	4	6	9	—	—	—	—	—	—
	1/0	0	1	1	1	4	5	8	—	—	—	—	—	—
	2/0	0	1	1	1	3	4	6	—	—	—	—	—	—
	3/0	0	0	1	1	2	3	5	—	—	—	—	—	—
	4/0	0	0	1	1	1	3	4	—	—	—	—	—	—
	250	0	0	1	1	1	1	3	—	—	—	—	—	—
	300	0	0	0	1	1	1	3	—	—	—	—	—	—
	350	0	0	0	1	1	1	2	—	—	—	—	—	—

Type	Conductor Size (AWG/ kcmil)	Trade Size (Metric Designator)												
		⅜ (12)	½ (16)	¾ (21)	1 (27)	1¼ (35)	1½ (41)	2 (53)	2½ (63)	3 (78)	3½ (91)	4 (103)	5 (129)	6 (155)
	400	0	0	0	1	1	1	2	—	—	—	—	—	—
	500	0	0	0	0	1	1	1	—	—	—	—	—	—
	600	0	0	0	0	1	1	1	—	—	—	—	—	—
	700	0	0	0	0	1	1	1	—	—	—	—	—	—
	750	0	0	0	0	1	1	1	—	—	—	—	—	—
	900	0	0	0	0	0	1	1	—	—	—	—	—	—
	1000	0	0	0	0	0	1	1	—	—	—	—	—	—
XHHW, XHHW-2	8	1	3	5	9	15	20	33	—	—	—	—	—	—
	6	1	2	4	6	11	15	24	—	—	—	—	—	—
	4	1	1	3	4	8	11	17	—	—	—	—	—	—
	2	1	1	1	3	6	7	12	—	—	—	—	—	—
	1	0	1	1	2	4	6	9	—	—	—	—	—	—
	1/0	0	1	1	1	4	5	8	—	—	—	—	—	—
	2/0	0	1	1	1	3	4	7	—	—	—	—	—	—
	3/0	0	0	1	1	2	3	5	—	—	—	—	—	—
	4/0	0	0	1	1	1	3	4	—	—	—	—	—	—
	250	0	0	1	1	1	1	3	—	—	—	—	—	—
	300	0	0	0	1	1	1	3	—	—	—	—	—	—
	350	0	0	0	1	1	1	3	—	—	—	—	—	—
	400	0	0	0	1	1	1	2	—	—	—	—	—	—
	500	0	0	0	0	1	1	1	—	—	—	—	—	—
	600	0	0	0	0	1	1	1	—	—	—	—	—	—
	700	0	0	0	0	1	1	1	—	—	—	—	—	—
	750	0	0	0	0	1	1	1	—	—	—	—	—	—
	900	0	0	0	0	0	1	1	—	—	—	—	—	—
	1000	0	0	0	0	0	1	1	—	—	—	—	—	—

Definition: *Compact stranding* is the result of a manufacturing process where the stranded conductor is
compressed to the extent that the interstices (voids between strand wires) are virtually eliminated.

Table C.7 Maximum Number of Conductors of Fixture Wires in Liquidtight Flexible Nonmetallic Conduit (LFNC-C)

(Based on Chapter 9: Table 1, Table 4, and Table 5)

Type	Conductor Size (AWG/kcmil)	Trade Size (Metric Designator)												
		⅜ (12)	½ (16)	¾ (21)	1 (27)	1¼ (35)	1½ (41)	2 (53)	2½ (63)	3 (78)	3½ (91)	4 (103)	5 (129)	6 (155)
CONDUCTORS														
RHH, RHW, RHW-2	14	2	4	7	11	20	27	45	—	—	—	—	—	—
	12	1	3	6	9	16	22	37	—	—	—	—	—	—
	10	1	2	4	7	13	18	30	—	—	—	—	—	—

Type	Conductor Size (AWG/kcmil)	Trade Size (Metric Designator)												
		⅜ (12)	½ (16)	¾ (21)	1 (27)	1¼ (35)	1½ (41)	2 (53)	2½ (63)	3 (78)	3½ (91)	4 (103)	5 (129)	6 (155)
	8	1	1	2	4	7	9	15	—	—	—	—	—	—
	6	0	1	1	3	5	7	12	—	—	—	—	—	—
	4	0	1	1	2	4	6	10	—	—	—	—	—	—
	3	0	1	1	1	4	5	8	—	—	—	—	—	—
	2	0	0	1	1	3	4	7	—	—	—	—	—	—
	1	0	0	1	1	1	3	5	—	—	—	—	—	—
	1/0	0	0	0	1	1	2	4	—	—	—	—	—	—
	2/0	0	0	0	1	1	1	3	—	—	—	—	—	—
	3/0	0	0	0	1	1	1	3	—	—	—	—	—	—
	4/0	0	0	0	0	1	1	2	—	—	—	—	—	—
	250	0	0	0	0	1	1	1	—	—	—	—	—	—
	300	0	0	0	0	1	1	1	—	—	—	—	—	—
	350	0	0	0	0	0	1	1	—	—	—	—	—	—
	400	0	0	0	0	0	1	1	—	—	—	—	—	—
	500	0	0	0	0	0	1	1	—	—	—	—	—	—
	600	0	0	0	0	0	0	1	—	—	—	—	—	—
	700	0	0	0	0	0	0	1	—	—	—	—	—	—
	750	0	0	0	0	0	0	1	—	—	—	—	—	—
	800	0	0	0	0	0	0	1	—	—	—	—	—	—
	900	0	0	0	0	0	0	1	—	—	—	—	—	—
	1000	0	0	0	0	0	0	0	—	—	—	—	—	—
	1250	0	0	0	0	0	0	0	—	—	—	—	—	—
	1500	0	0	0	0	0	0	0	—	—	—	—	—	—
	1750	0	0	0	0	0	0	0	—	—	—	—	—	—
	2000	0	0	0	0	0	0	0	—	—	—	—	—	—
TW, THHW, THW, THW-2	14	5	8	15	24	42	56	94	—	—	—	—	—	—
	12	4	6	11	18	32	43	72	—	—	—	—	—	—
	10	3	5	8	13	24	32	54	—	—	—	—	—	—
	8	1	2	4	7	13	18	30	—	—	—	—	—	—
RHH*, RHW*, RHW-2*	14	2	5	10	16	28	37	63	—	—	—	—	—	—
	12	2	4	8	13	22	30	50	—	—	—	—	—	—
	10	1	3	6	10	17	23	39	—	—	—	—	—	—
	8	1	1	3	6	10	14	23	—	—	—	—	—	—
TW, THW, THHW, THW-2, RHH*, RHW*, RHW-2	6	1	1	3	4	8	11	18	—	—	—	—	—	—
	4	1	1	1	3	6	8	13	—	—	—	—	—	—
	3	0	1	1	3	5	7	11	—	—	—	—	—	—
	2	0	1	1	2	4	6	10	—	—	—	—	—	—
	1	0	0	1	1	3	4	7	—	—	—	—	—	—
	1/0	0	0	1	1	2	3	6	—	—	—	—	—	—
	2/0	0	0	1	1	1	3	5	—	—	—	—	—	—
	3/0	0	0	0	1	1	2	4	—	—	—	—	—	—
	4/0	0	0	0	1	1	1	3	—	—	—	—	—	—

Type	**Conductor Size (AWG/kcmil)**	**Trade Size (Metric Designator)**												
		⅜ (12)	**½ (16)**	**¾ (21)**	**1 (27)**	**1¼ (35)**	**1½ (41)**	**2 (53)**	**2½ (63)**	**3 (78)**	**3½ (91)**	**4 (103)**	**5 (129)**	**6 (155)**
	250	0	0	0	0	1	1	3	—	—	—	—	—	—
	300	0	0	0	0	1	1	2	—	—	—	—	—	—
	350	0	0	0	0	1	1	1	—	—	—	—	—	—
	400	0	0	0	0	1	1	1	—	—	—	—	—	—
	500	0	0	0	0	0	1	1	—	—	—	—	—	—
	600	0	0	0	0	0	1	1	—	—	—	—	—	—
	700	0	0	0	0	0	0	1	—	—	—	—	—	—
	750	0	0	0	0	0	0	1	—	—	—	—	—	—
	800	0	0	0	0	0	0	1	—	—	—	—	—	—
	900	0	0	0	0	0	0	1	—	—	—	—	—	—
	1000	0	0	0	0	0	0	1	—	—	—	—	—	—
	1250	0	0	0	0	0	0	0	—	—	—	—	—	—
	1500	0	0	0	0	0	0	0	—	—	—	—	—	—
	1750	0	0	0	0	0	0	0	—	—	—	—	—	—
	2000	0	0	0	0	0	0	0	—	—	—	—	—	—
THHW, THWN, THWN-2	14	7	12	21	34	61	81	135	—	—	—	—	—	—
	12	5	9	15	25	44	59	98	—	—	—	—	—	—
	10	3	5	10	15	28	37	62	—	—	—	—	—	—
	8	1	3	5	9	16	21	36	—	—	—	—	—	—
	6	1	2	4	6	11	15	26	—	—	—	—	—	—
	4	1	1	2	4	7	9	16	—	—	—	—	—	—
	3	0	1	1	3	6	8	13	—	—	—	—	—	—
	2	0	1	1	3	5	7	11	—	—	—	—	—	—
	1	0	1	1	1	3	5	8	—	—	—	—	—	—
	1/0	0	1	1	1	3	4	7	—	—	—	—	—	—
	2/0	0	0	1	1	2	3	6	—	—	—	—	—	—
	3/0	0	0	1	1	1	3	5	—	—	—	—	—	—
	4/0	0	0	1	1	1	2	4	—	—	—	—	—	—
	250	0	0	0	1	1	1	3	—	—	—	—	—	—
	300	0	0	0	1	1	1	3	—	—	—	—	—	—
	350	0	0	0	1	1	1	2	—	—	—	—	—	—
	400	0	0	0	0	1	1	1	—	—	—	—	—	—
	500	0	0	0	0	1	1	1	—	—	—	—	—	—
	600	0	0	0	0	1	1	1	—	—	—	—	—	—
	700	0	0	0	0	0	1	1	—	—	—	—	—	—
	750	0	0	0	0	0	1	1	—	—	—	—	—	—
	800	0	0	0	0	0	1	1	—	—	—	—	—	—
	900	0	0	0	0	0	1	1	—	—	—	—	—	—
	1000	0	0	0	0	0	0	1	—	—	—	—	—	—
FEP, FEPB, PFA,	14	7	12	21	33	59	79	131	—	—	—	—	—	—
	12	5	9	15	24	43	57	96	—	—	—	—	—	—
	10	4	6	11	17	31	41	68	—	—	—	—	—	—

Type	Conductor Size (AWG/kcmil)	Trade Size (Metric Designator)												
		⅜ (12)	½ (16)	¾ (21)	1 (27)	1¼ (35)	1½ (41)	2 (53)	2½ (63)	3 (78)	3½ (91)	4 (103)	5 (129)	6 (155)
PFAH, TFE	8	1	3	6	10	17	23	39	—	—	—	—	—	—
	6	1	2	4	7	12	17	28	—	—	—	—	—	—
	4	1	1	3	5	9	11	19	—	—	—	—	—	—
	3	1	1	2	4	7	10	16	—	—	—	—	—	—
	2	1	1	1	3	6	8	13	—	—	—	—	—	—
PFA, PFAH, TFE	1	0	1	1	2	4	5	9	—	—	—	—	—	—
PFA, PFAH, TFE, Z	1/0	0	1	1	1	3	4	8	—	—	—	—	—	—
	2/0	0	0	1	1	3	4	6	—	—	—	—	—	—
	3/0	0	0	1	1	2	3	5	—	—	—	—	—	—
	4/0	0	0	1	1	1	2	4	—	—	—	—	—	—
Z	14	9	14	25	40	71	95	158	—	—	—	—	—	—
	12	6	10	18	28	50	67	112	—	—	—	—	—	—
	10	4	6	11	17	31	41	68	—	—	—	—	—	—
	8	2	4	7	11	19	26	43	—	—	—	—	—	—
	6	1	3	5	7	13	18	30	—	—	—	—	—	—
	4	1	1	3	5	9	12	21	—	—	—	—	—	—
	3	1	1	2	4	7	9	15	—	—	—	—	—	—
	2	1	1	1	3	5	7	12	—	—	—	—	—	—
	1	0	1	1	2	4	6	10	—	—	—	—	—	—
XHHW, ZW, XHHW-2, XHH	14	5	8	15	24	42	56	94	—	—	—	—	—	—
	12	4	6	11	18	32	43	72	—	—	—	—	—	—
	10	3	5	8	13	24	32	54	—	—	—	—	—	—
	8	1	2	4	7	13	18	30	—	—	—	—	—	—
	6	1	1	3	5	10	13	22	—	—	—	—	—	—
	4	1	1	2	4	7	9	16	—	—	—	—	—	—
	3	1	1	1	3	6	8	13	—	—	—	—	—	—
	2	1	1	1	3	5	7	11	—	—	—	—	—	—
XHHW, XHHW-2, XHH	1	0	1	1	1	4	5	8	—	—	—	—	—	—
	1/0	0	1	1	1	3	4	7	—	—	—	—	—	—
	2/0	0	0	1	1	2	3	6	—	—	—	—	—	—
	3/0	0	0	1	1	2	3	5	—	—	—	—	—	—
	4/0	0	0	1	1	1	2	4	—	—	—	—	—	—
	250	0	0	0	1	1	1	3	—	—	—	—	—	—
	300	0	0	0	1	1	1	3	—	—	—	—	—	—
	350	0	0	0	1	1	1	2	—	—	—	—	—	—
	400	0	0	0	0	1	1	1	—	—	—	—	—	—
	500	0	0	0	0	1	1	1	—	—	—	—	—	—
	600	0	0	0	0	1	1	1	—	—	—	—	—	—
	700	0	0	0	0	0	1	1	—	—	—	—	—	—
	750	0	0	0	0	0	1	1	—	—	—	—	—	—

Type	Conductor Size (AWG/kcmil)	Trade Size (Metric Designator)												
		⅜ (12)	½ (16)	¾ (21)	1 (27)	1¼ (35)	1½ (41)	2 (53)	2½ (63)	3 (78)	3½ (91)	4 (103)	5 (129)	6 (155)
	800	0	0	0	0	0	1	1	—	—	—	—	—	—
	900	0	0	0	0	0	1	1	—	—	—	—	—	—
	1000	0	0	0	0	0	0	1	—	—	—	—	—	—
	1250	0	0	0	0	0	0	1	—	—	—	—	—	—
	1500	0	0	0	0	0	0	1	—	—	—	—	—	—
	1750	0	0	0	0	0	0	0	—	—	—	—	—	—
	2000	0	0	0	0	0	0	0	—	—	—	—	—	—
FIXTURE WIRES														
RFH-2, FFH-2, RFHH-2	18	5	8	14	23	40	54	90	—	—	—	—	—	—
	16	4	7	12	19	34	46	76	—	—	—	—	—	—
SF-2, SFF-2	18	6	10	18	29	51	68	114	—	—	—	—	—	—
	16	5	8	15	24	42	56	94	—	—	—	—	—	—
	14	4	7	12	19	34	46	76	—	—	—	—	—	—
SF-1, SFF-1	18	11	18	32	51	90	121	202	—	—	—	—	—	—
RFH-1, TF, TFF, XF, XFF	18	8	13	23	38	67	89	149	—	—	—	—	—	—
	16	6	11	19	30	54	72	120	—	—	—	—	—	—
XF, XFF	14	5	8	15	24	42	56	94	—	—	—	—	—	—
TFN, TFFN	18	13	22	38	60	107	143	239	—	—	—	—	—	—
	16	10	17	29	46	82	109	182	—	—	—	—	—	—
PF, PFF, PGF, PGFF, PAF, PTF, PTFF, PAFF	18	12	21	36	57	101	136	226	—	—	—	—	—	—
	16	10	16	28	44	78	105	175	—	—	—	—	—	—
	14	7	12	21	33	59	79	131	—	—	—	—	—	—
ZF, ZFF, ZHF	18	16	27	46	74	131	175	292	—	—	—	—	—	—
	16	12	20	34	54	96	129	215	—	—	—	—	—	—
	14	9	14	25	40	71	95	131	—	—	—	—	—	—
KF-2, KFF-2	18	24	40	69	111	196	263	438	—	—	—	—	—	—
	16	17	28	48	77	137	183	305	—	—	—	—	—	—
	14	11	19	32	52	92	123	205	—	—	—	—	—	—
	12	8	13	22	36	64	85	142	—	—	—	—	—	—
	10	5	8	15	24	42	56	94	—	—	—	—	—	—
KF-1, KFF-1	18	28	46	80	128	227	303	505	—	—	—	—	—	—
	16	20	32	56	90	159	213	355	—	—	—	—	—	—
	14	13	22	38	60	107	143	239	—	—	—	—	—	—
	12	9	14	25	40	71	95	158	—	—	—	—	—	—

Type	Conductor Size (AWG/kcmil)	Trade Size (Metric Designator)												
		⅜ (12)	½ (16)	¾ (21)	1 (27)	1¼ (35)	1½ (41)	2 (53)	2½ (63)	3 (78)	3½ (91)	4 (103)	5 (129)	6 (155)
	10	6	9	16	26	46	62	103	—	—	—	—	—	—
XF, XFF	12	3	4	8	13	22	30	50	—	—	—	—	—	—
	10	1	3	6	10	17	23	39	—	—	—	—	—	—

Notes:

1. This table is for concentric stranded conductors only. For compact stranded conductors, Table C.5(A) should be used.

2. Two-hour fire-rated RHH cable has ceramifiable insulation, which has larger diameters than other RHH wires.

Consult manufacturer's conduit fill tables.

*Types RHH, RHW, and RHW-2 without outer covering.

Table C.7(A) Maximum Number of Conductors of Fixture Wires in Liquidtight Flexible Nonmetallic Conduit (LFNC-C) (Based on Chapter 9: Table 1, Table 4, and Table 5A)

Type	Conductor Size (AWG/kcmil)	Trade Size (Metric Designator)												
		⅜ (12)	½ (16)	¾ (21)	1 (27)	1¼ (35)	1½ (41)	2 (53)	2½ (63)	3 (78)	3½ (91)	4 (103)	5 (129)	6 (155)
COMPACT CONDUCTORS														
THW, THW-2, THHW	8	1	2	4	6	11	15	25	—	—	—	—	—	—
	6	1	1	3	5	9	12	20	—	—	—	—	—	—
	4	1	1	2	3	6	9	15	—	—	—	—	—	—
	2	1	1	1	2	5	6	11	—	—	—	—	—	—
	1	0	1	1	1	3	4	7	—	—	—	—	—	—
	1/0	0	1	1	1	3	4	6	—	—	—	—	—	—
	2/0	0	0	1	1	2	3	5	—	—	—	—	—	—
	3/0	0	0	1	1	1	3	5	—	—	—	—	—	—
	4/0	0	0	1	1	1	2	4	—	—	—	—	—	—
	250	0	0	0	1	1	1	3	—	—	—	—	—	—
	300	0	0	0	1	1	1	2	—	—	—	—	—	—
	350	0	0	0	1	1	1	2	—	—	—	—	—	—
	400	0	0	0	0	1	1	1	—	—	—	—	—	—
	500	0	0	0	0	1	1	1	—	—	—	—	—	—
	600	0	0	0	0	1	1	1	—	—	—	—	—	—
	700	0	0	0	0	1	1	1	—	—	—	—	—	—
	750	0	0	0	0	0	1	1	—	—	—	—	—	—
	900	0	0	0	0	0	1	1	—	—	—	—	—	—
	1000	0	0	0	0	0	1	1	—	—	—	—	—	—
THHN, THWN, THWN-2	8	—	—	—	—	—	—	—	—	—	—	—	—	—
	6	1	2	4	7	13	17	29	—	—	—	—	—	—
	4	1	1	3	4	8	11	18	—	—	—	—	—	—
	2	1	1	1	3	6	7	13	—	—	—	—	—	—
	1	0	1	1	2	4	6	9	—	—	—	—	—	—
	1/0	0	1	1	1	3	5	8	—	—	—	—	—	—

Type	Conductor Size (AWG/kcmil)	Trade Size (Metric Designator)												
		⅜ (12)	½ (16)	¾ (21)	1 (27)	1¼ (35)	1½ (41)	2 (53)	2½ (63)	3 (78)	3½ (91)	4 (103)	5 (129)	6 (155)
	2/0	0	1	1	1	3	4	7	—	—	—	—	—	—
	3/0	0	0	1	1	2	3	5	—	—	—	—	—	—
	4/0	0	0	1	1	1	3	4	—	—	—	—	—	—
	250	0	0	0	1	1	1	3	—	—	—	—	—	—
	300	0	0	0	1	1	1	3	—	—	—	—	—	—
	350	0	0	0	1	1	1	3	—	—	—	—	—	—
	400	0	0	0	1	1	1	2	—	—	—	—	—	—
	500	0	0	0	0	1	1	1	—	—	—	—	—	—
	600	0	0	0	0	1	1	1	—	—	—	—	—	—
	700	0	0	0	0	1	1	1	—	—	—	—	—	—
	750	0	0	0	0	1	1	1	—	—	—	—	—	—
	900	0	0	0	0	0	1	1	—	—	—	—	—	—
	1000	0	0	0	0	0	1	1	—	—	—	—	—	—
XHHW, XHHW-2	8	1	3	5	8	15	20	33	—	—	—	—	—	—
	6	1	1	4	6	11	15	24	—	—	—	—	—	—
	4	1	1	3	4	8	11	18	—	—	—	—	—	—
	2	1	1	1	3	6	7	13	—	—	—	—	—	—
	1	0	1	1	2	4	6	9	—	—	—	—	—	—
	1/0	0	1	1	1	3	5	8	—	—	—	—	—	—
	2/0	0	1	1	1	3	4	7	—	—	—	—	—	—
	3/0	0	0	1	1	2	3	5	—	—	—	—	—	—
	4/0	0	0	1	1	1	3	5	—	—	—	—	—	—
	250	0	0	1	1	1	1	4	—	—	—	—	—	—
	300	0	0	0	1	1	1	3	—	—	—	—	—	—
	350	0	0	0	1	1	1	3	—	—	—	—	—	—
	400	0	0	0	1	1	1	2	—	—	—	—	—	—
	500	0	0	0	0	1	1	1	—	—	—	—	—	—
	600	0	0	0	0	1	1	1	—	—	—	—	—	—
	700	0	0	0	0	1	1	1	—	—	—	—	—	—
	750	0	0	0	0	1	1	1	—	—	—	—	—	—
	900	0	0	0	0	0	1	1	—	—	—	—	—	—
	1000	0	0	0	0	0	1	1	—	—	—	—	—	—

Definition: Compact stranding is the result of a manufacturing process where the stranded conductor is compressed to the extent that the interstices (voids between stranded wires) are virtually eliminated.

Table C.8 Maximum Number of Conductors or Fixture Wires in Liquidtight Flexible Metal Conduit (LFMC)

(Based on Chapter 9: Table 1, Table 4, and Table 5)

Type	Conductor Size (AWG/ kcmil)	Trade Size (Metric Designator)												
		⅜ (12)	½ (16)	¾ (21)	1 (27)	1¼ (35)	1½ (41)	2 (53)	2½ (63)	3 (78)	3½ (91)	4 (103)	5 (129)	6 (155)
CONDUCTORS														
RHH, RHW, RHW-2	14	2	4	7	12	21	27	44	66	102	133	173	—	—
	12	1	3	6	10	17	22	36	55	84	110	144	—	—
	10	1	3	5	8	14	18	29	44	68	89	116	—	—
	8	1	1	2	4	7	9	15	23	36	46	61	—	—
	6	1	1	1	3	6	7	12	18	28	37	48	—	—
	4	0	1	1	2	4	6	9	14	22	29	38	—	—
	3	0	1	1	1	4	5	8	13	19	25	33	—	—
	2	0	1	1	1	3	4	7	11	17	22	29	—	—
	1	0	0	1	1	1	3	5	7	11	14	19	—	—
	1/0	0	0	1	1	1	2	4	6	10	13	16	—	—
	2/0	0	0	1	1	1	1	3	5	8	11	14	—	—
	3/0	0	0	0	1	1	1	3	4	7	9	12	—	—
	4/0	0	0	0	1	1	1	2	4	6	8	10	—	—
	250	0	0	0	0	1	1	1	3	4	6	8	—	—
	300	0	0	0	0	1	1	1	2	4	5	7	—	—
	350	0	0	0	0	1	1	1	2	3	5	6	—	—
	400	0	0	0	0	1	1	1	1	3	4	6	—	—
	500	0	0	0	0	1	1	1	1	3	4	5	—	—
	600	0	0	0	0	0	1	1	1	2	3	4	—	—
	700	0	0	0	0	0	0	1	1	1	3	3	—	—
	750	0	0	0	0	0	0	1	1	1	2	3	—	—
	800	0	0	0	0	0	0	1	1	1	2	3	—	—
	900	0	0	0	0	0	0	1	1	1	2	3	—	—
	1000	0	0	0	0	0	0	1	1	1	1	3	—	—
	1250	0	0	0	0	0	0	0	1	1	1	1	—	—
	1500	0	0	0	0	0	0	0	1	1	1	1	—	—
	1750	0	0	0	0	0	0	0	1	1	1	1	—	—
	2000	0	0	0	0	0	0	0	0	1	1	1	—	—
TW, THHW, THW, THW-2	14	5	9	15	25	44	57	93	140	215	280	365	—	—
	12	4	7	12	19	33	43	71	108	165	215	280	—	—
	10	3	5	9	14	25	32	53	80	123	160	209	—	—
	8	1	3	5	8	14	18	29	44	68	89	116	—	—
RHH*, RHW*, RHW-2*	14	3	6	10	16	29	38	62	93	143	186	243	—	—
	12	3	5	8	13	23	30	50	75	115	149	195	—	—
	10	1	3	6	10	18	23	39	58	89	117	152	—	—
	8	1	1	4	6	11	14	23	35	53	70	91	—	—
TW, THW, THHW, THW-2, RHH*,	6	1	1	3	5	8	11	18	27	41	53	70	—	—
	4	1	1	1	3	6	8	13	20	30	40	52	—	—
	3	1	1	1	3	5	7	11	17	26	34	44	—	—
	2	0	1	1	2	4	6	9	14	22	29	38	—	—

Type	Conductor Size (AWG/ kcmil)	Trade Size (Metric Designator)												
		⅜ (12)	½ (16)	¾ (21)	1 (27)	1¼ (35)	1½ (41)	2 (53)	2½ (63)	3 (78)	3½ (91)	4 (103)	5 (129)	6 (155)
RHW*, RHW-2*	1	0	1	1	1	3	4	7	10	15	20	26	—	—
	1/0	0	0	1	1	2	3	6	8	13	17	23	—	—
	2/0	0	0	1	1	2	3	5	7	11	15	19	—	—
	3/0	0	0	1	1	1	2	4	6	9	12	16	—	—
	4/0	0	0	0	1	1	1	3	5	8	10	13	—	—
	250	0	0	0	1	1	1	3	4	6	8	11	—	—
	300	0	0	0	1	1	1	2	3	5	7	9	—	—
	350	0	0	0	0	1	1	1	3	5	6	8	—	—
	400	0	0	0	0	1	1	1	3	4	6	7	—	—
	500	0	0	0	0	1	1	1	2	3	5	6	—	—
	600	0	0	0	0	1	1	1	1	3	4	5	—	—
	700	0	0	0	0	0	1	1	1	2	3	4	—	—
	750	0	0	0	0	0	1	1	1	2	3	4	—	—
	800	0	0	0	0	0	1	1	1	2	3	4	—	—
	900	0	0	0	0	0	0	1	1	1	3	3	—	—
	1000	0	0	0	0	0	0	1	1	1	2	3	—	—
	1250	0	0	0	0	0	0	1	1	1	1	2	—	—
	1500	0	0	0	0	0	0	0	1	1	1	2	—	—
	1750	0	0	0	0	0	0	0	1	1	1	1	—	—
	2000	0	0	0	0	0	0	0	1	1	1	1	—	—
THHN, THWN, THWN-2	14	8	13	22	36	63	81	134	201	308	401	523	—	—
	12	5	9	16	26	46	59	97	146	225	292	381	—	—
	10	3	6	10	16	29	37	61	92	141	184	240	—	—
	8	1	3	6	9	16	21	35	53	81	106	138	—	—
	6	1	2	4	7	12	15	25	38	59	76	100	—	—
	4	1	1	2	4	7	9	15	23	36	47	61	—	—
	3	1	1	1	3	6	8	13	20	30	40	52	—	—
	2	1	1	1	3	5	7	11	17	26	33	44	—	—
	1	0	1	1	1	4	5	8	12	19	25	32	—	—
	1/0	0	1	1	1	3	4	7	10	16	21	27	—	—
	2/0	0	0	1	1	2	3	6	8	13	17	23	—	—
	3/0	0	0	1	1	1	3	5	7	11	14	19	—	—
	4/0	0	0	1	1	1	2	4	6	9	12	15	—	—
	250	0	0	0	1	1	1	3	5	7	10	12	—	—
	300	0	0	0	1	1	1	3	4	6	8	11	—	—
	350	0	0	0	1	1	1	2	3	5	7	9	—	—
	400	0	0	0	0	1	1	1	3	5	6	8	—	—
	500	0	0	0	0	1	1	1	2	4	5	7	—	—
	600	0	0	0	0	1	1	1	1	3	4	6	—	—
	700	0	0	0	0	1	1	1	1	3	4	5	—	—
	750	0	0	0	0	0	1	1	1	3	3	5	—	—

Type	Conductor Size (AWG/ kcmil)	⅜ (12)	½ (16)	¾ (21)	1 (27)	1¼ (35)	1½ (41)	2 (53)	2½ (63)	3 (78)	3½ (91)	4 (103)	5 (129)	6 (155)
		Trade Size (Metric Designator)												
	800	0	0	0	0	0	1	1	1	2	3	4	—	—
	900	0	0	0	0	0	1	1	1	2	3	4	—	—
	1000	0	0	0	0	0	0	1	1	1	3	3	—	—
FEP, FEPB, PFA, PFAH, TFE	14	7	12	21	35	61	79	130	195	299	389	507	—	—
	12	5	9	15	25	44	58	94	142	218	284	370	—	—
	10	4	6	11	18	32	41	68	102	156	203	266	—	—
	8	1	3	6	10	18	23	39	58	89	117	152	—	—
	6	1	2	4	7	13	17	27	41	64	83	108	—	—
	4	1	1	3	5	9	12	19	29	44	58	75	—	—
	3	1	1	2	4	7	10	16	24	37	48	63	—	—
	2	1	1	1	3	6	8	13	20	30	40	52	—	—
PFA, PFAH, TFE	1	0	1	1	2	4	5	9	14	21	28	36	—	—
PFA, PFAH, TFE, Z	1/0	0	1	1	1	3	4	7	11	18	23	30	—	—
	2/0	0	1	1	1	3	4	6	9	14	19	25	—	—
	3/0	0	0	1	1	2	3	5	8	12	16	20	—	—
	4/0	0	0	1	1	1	2	4	6	10	13	17	—	—
Z	14	9	15	26	42	73	95	156	235	360	469	611	—	—
	12	6	10	18	30	52	67	111	167	255	332	434	—	—
	10	4	6	11	18	32	41	68	102	156	203	266	—	—
	8	2	4	7	11	20	26	43	64	99	129	168	—	—
	6	1	3	5	8	14	18	30	45	69	90	118	—	—
	4	1	1	3	5	9	12	20	31	48	62	81	—	—
	3	1	1	2	4	7	9	15	23	35	45	59	—	—
	2	1	1	1	3	6	7	12	19	29	38	49	—	—
	1	1	1	1	2	5	6	10	15	23	30	40	—	—
XHHW, ZW, XHHW-2, XHH	14	5	9	15	25	44	57	93	140	215	280	365	—	—
	12	4	7	12	19	33	43	71	108	165	215	280	—	—
	10	3	5	9	14	25	32	53	80	123	160	209	—	—
	8	1	3	5	8	14	18	29	44	68	89	116	—	—
	6	1	1	3	6	10	13	22	33	50	66	86	—	—
	4	1	1	2	4	7	9	16	24	36	48	62	—	—
	3	1	1	1	3	6	8	13	20	31	40	52	—	—
	2	1	1	1	3	5	7	11	17	26	34	44	—	—
XHHW, XHHW-2, XHH	1	0	1	1	1	4	5	8	12	19	25	33	—	—
	1/0	0	1	1	1	3	4	7	10	16	21	28	—	—
	2/0	0	0	1	1	2	3	6	9	13	17	23	—	—
	3/0	0	0	1	1	1	3	5	7	11	14	19	—	—
	4/0	0	0	1	1	1	2	4	6	9	12	16	—	—
	250	0	0	0	1	1	1	3	5	7	10	13	—	—
	300	0	0	0	1	1	1	3	4	6	8	11	—	—

Type	Conductor Size (AWG/ kcmil)	⅜ (12)	½ (16)	¾ (21)	1 (27)	1¼ (35)	1½ (41)	2 (53)	2½ (63)	3 (78)	3½ (91)	4 (103)	5 (129)	6 (155)
	350	0	0	0	1	1	1	2	3	5	7	10	—	—
	400	0	0	0	1	1	1	1	3	5	6	8	—	—
	500	0	0	0	0	1	1	1	2	4	5	7	—	—
	600	0	0	0	0	1	1	1	1	3	4	6	—	—
	700	0	0	0	0	1	1	1	1	3	4	5	—	—
	750	0	0	0	0	0	1	1	1	3	3	5	—	—
	800	0	0	0	0	0	1	1	1	2	3	4	—	—
	900	0	0	0	0	0	1	1	1	2	3	4	—	—
	1000	0	0	0	0	0	0	1	1	1	3	3	—	—
	1250	0	0	0	0	0	0	1	1	1	1	3	—	—
	1500	0	0	0	0	0	0	1	1	1	1	2	—	—
	1750	0	0	0	0	0	0	0	1	1	1	1	—	—
	2000	0	0	0	0	0	0	0	1	1	1	1	—	—
FIXTURE WIRES														
RFH-2, FFH-2, RFHH-2	18	5	8	15	24	42	54	89	134	206	268	350	—	—
	16	4	7	12	20	35	46	75	113	174	226	295	—	—
SF-2, SFF-2	18	6	11	19	30	53	69	113	169	260	338	441	—	—
	16	5	9	15	25	44	57	93	140	215	280	365	—	—
	14	4	7	12	20	35	46	75	113	174	226	295	—	—
SF-1, SFF-1	18	12	19	33	53	94	122	199	300	460	599	781	—	—
RFH-1, TF, TFF, XF, XFF	18	8	14	24	39	69	90	147	222	339	442	577	—	—
	16	7	11	20	32	56	72	119	179	274	357	465	—	—
XF, XFF	14	5	9	15	25	44	57	93	140	215	280	365	—	—
TFN, TFFN	18	14	23	39	63	111	144	236	355	543	707	923	—	—
	16	10	17	30	48	85	110	180	271	415	540	705	—	—
PF, PFF, PGF, PGFF, PAF, PTF, PTFF, PAFF	18	13	21	37	60	105	136	224	336	515	671	875	—	—
	16	10	16	29	46	81	105	173	260	398	519	677	—	—
	14	7	12	21	35	61	79	130	195	299	389	507	—	—
ZF, ZFF, ZHF	18	17	28	48	77	136	176	288	434	664	865	1128	—	—
	16	12	20	35	57	100	130	213	320	490	638	832	—	—
	14	9	15	26	42	73	95	156	235	360	469	611	—	—
KF-2, KFF-2	18	25	42	72	116	203	264	433	651	996	1297	1692	—	—
	16	18	29	50	81	142	184	302	454	695	905	1180	—	—
	14	12	19	34	54	95	124	203	305	467	608	793	—	—
	12	8	13	23	38	66	86	141	212	325	423	552	—	—
	10	5	9	15	25	44	57	93	140	215	280	365	—	—

Type	Conductor Size (AWG/ kcmil)	Trade Size (Metric Designator)												
		⅜ (12)	½ (16)	¾ (21)	1 (27)	1¼ (35)	1½ (41)	2 (53)	2½ (63)	3 (78)	3½ (91)	4 (103)	5 (129)	6 (155)
KF-1, KFF-1	18	29	48	83	134	235	304	499	751	1150	1497	1952	—	—
	16	20	34	58	94	165	214	351	527	808	1052	1372	—	—
	14	14	23	39	63	111	144	236	355	543	707	923	—	—
	12	9	15	26	42	73	95	156	235	360	469	611	—	—
	10	6	10	17	27	48	62	102	153	235	306	399	—	—
XF, XFF	12	3	5	8	13	23	30	50	75	115	149	195	—	—
	10	1	3	6	10	18	23	39	58	89	117	152	—	—

Notes:

1. This table is for concentric stranded conductors only. For compact stranded conductors, Table C.7(A)
should be used.

2. Two-hour fire-rated RHH cable has ceramifiable insulation, which has much larger diameters than other RHH wires. Consult manufacturer's conduit fill tables.

*Types RHH, RHW, and RHW-2 without outer covering.

Table C.8(A) Maximum Number of Conductors or Fixture Wires in Liquidtight Flexible Metal Conduit (LFMC)

(Based on Chapter 9: Table 1, Table 4, and Table 5A)

Type	Conductor Size (AWG/ kcmil)	Trade Size (Metric Designator)												
		⅜ (12)	½ (16)	¾ (21)	1 (27)	1¼ (35)	1½ (41)	2 (53)	2½ (63)	3 (78)	3½ (91)	4 (103)	5 (129)	6 (155)
COMPACT CONDUCTORS														
THW, THW-2, THHW	8	1	2	4	7	12	15	25	38	58	76	99	—	—
	6	1	1	3	5	9	12	19	29	45	59	77	—	—
	4	1	1	2	4	7	9	14	22	34	44	57	—	—
	2	1	1	1	3	5	6	11	16	25	32	42	—	—
	1	0	1	1	1	3	4	7	11	17	23	30	—	—
	1/0	0	1	1	1	3	4	6	10	15	20	26	—	—
	2/0	0	0	1	1	2	3	5	8	13	16	21	—	—
	3/0	0	0	1	1	1	3	4	7	11	14	18	—	—
	4/0	0	0	1	1	1	2	4	6	9	12	15	—	—
	250	0	0	0	1	1	1	3	4	7	9	12	—	—
	300	0	0	0	1	1	1	2	4	6	8	10	—	—
	350	0	0	0	1	1	1	2	3	5	7	9	—	—
	400	0	0	0	0	1	1	1	3	5	6	8	—	—
	500	0	0	0	0	1	1	1	3	4	5	7	—	—
	600	0	0	0	0	1	1	1	1	3	4	6	—	—
	700	0	0	0	0	1	1	1	1	3	4	5	—	—
	750	0	0	0	0	0	1	1	1	3	3	5	—	—
	900	0	0	0	0	0	1	1	1	2	3	4	—	—
	1000	0	0	0	0	0	1	1	1	1	3	4	—	—

Type	Conductor Size (AWG/ kcmil)	Trade Size (Metric Designator)												
		⅜ (12)	½ (16)	¾ (21)	1 (27)	1¼ (35)	1½ (41)	2 (53)	2½ (63)	3 (78)	3½ (91)	4 (103)	5 (129)	6 (155)
THHN, THWN, THWN-2	8	—	—	—	—	—	—	—	—	—	—	—	—	—
	6	1	2	4	7	13	17	28	43	66	86	112	—	—
	4	1	1	3	4	8	11	17	26	41	53	69	—	—
	2	1	1	1	3	6	7	12	19	29	38	50	—	—
	1	0	1	1	2	4	6	9	14	22	28	37	—	—
	1/0	0	1	1	1	4	5	8	12	19	24	32	—	—
	2/0	0	1	1	1	3	4	6	10	15	20	26	—	—
	3/0	0	0	1	1	2	3	5	8	13	17	22	—	—
	4/0	0	0	1	1	1	3	4	7	10	14	18	—	—
	250	0	0	1	1	1	1	3	5	8	11	14	—	—
	300	0	0	0	1	1	1	3	4	7	9	12	—	—
	350	0	0	0	1	1	1	2	4	6	8	11	—	—
	400	0	0	0	1	1	1	2	3	5	7	9	—	—
	500	0	0	0	0	1	1	1	3	5	6	8	—	—
	600	0	0	0	0	1	1	1	2	4	5	6	—	—
	700	0	0	0	0	1	1	1	1	3	4	6	—	—
	750	0	0	0	0	1	1	1	1	3	4	5	—	—
	900	0	0	0	0	0	1	1	1	2	3	4	—	—
	1000	0	0	0	0	0	1	1	1	2	3	4	—	—
XHHW, XHHW-2	8	1	3	5	9	15	20	33	49	76	98	129	—	—
	6	1	2	4	6	11	15	24	37	56	73	95	—	—
	4	1	1	3	4	8	11	17	26	41	53	69	—	—
	2	1	1	1	3	6	7	12	19	29	38	50	—	—
	1	0	1	1	2	4	6	9	14	22	28	37	—	—
	1/0	0	1	1	1	4	5	8	12	19	24	32	—	—
	2/0	0	1	1	1	3	4	7	10	16	20	27	—	—
	3/0	0	0	1	1	2	3	5	8	13	17	22	—	—
	4/0	0	0	1	1	1	3	4	7	11	14	18	—	—
	250	0	0	1	1	1	1	3	5	8	11	15	—	—
	300	0	0	0	1	1	1	3	5	7	9	12	—	—
	350	0	0	0	1	1	1	3	4	6	8	11	—	—
	400	0	0	0	1	1	1	2	4	6	7	10	—	—
	500	0	0	0	0	1	1	1	3	5	6	8	—	—
	600	0	0	0	0	1	1	1	2	4	5	6	—	—
	700	0	0	0	0	1	1	1	1	3	4	6	—	—
	750	0	0	0	0	1	1	1	1	3	4	5	—	—
	900	0	0	0	0	0	1	1	1	2	3	4	—	—
	1000	0	0	0	0	0	1	1	1	2	3	4	—	—

Definition: *Compact stranding* is the result of a manufacturing process where the stranded conductor is

compressed to the extent that the interstices (voids between strand wires) are virtually eliminated.

Table C.9 Maximum Number of Conductors or Fixture Wires in Rigid Metal Conduit (RMC) (Based on Chapter 9: Table 1, Table 4, and Table 5)

Type	Conductor Size (AWG/ kcmil)	Trade Size (Metric Designator)												
		⅜ (12)	½ (16)	¾ (21)	1 (27)	1¼ (35)	1½ (41)	2 (53)	2½ (63)	3 (78)	3½ (91)	4 (103)	5 (129)	6 (155)
CONDUCTORS														
RHH, RHW, RHW-2	14	—	4	7	12	21	28	46	66	102	136	176	276	398
	12	—	3	6	10	17	23	38	55	85	113	146	229	330
	10	—	3	5	8	14	19	31	44	68	91	118	185	267
	8	—	1	2	4	7	10	16	23	36	48	61	97	139
	6	—	1	1	3	6	8	13	18	29	38	49	77	112
	4	—	1	1	2	4	6	10	14	22	30	38	60	87
	3	—	1	1	2	4	5	9	12	19	26	34	53	76
	2	—	1	1	1	3	4	7	11	17	23	29	46	66
	1	—	0	1	1	1	3	5	7	11	15	19	30	44
	1/0	—	0	1	1	1	2	4	6	10	13	17	26	38
	2/0	—	0	1	1	1	2	4	5	8	11	14	23	33
	3/0	—	0	0	1	1	1	3	4	7	10	12	20	28
	4/0	—	0	0	1	1	1	3	4	6	8	11	17	24
	250	—	0	0	0	1	1	1	3	4	6	8	13	18
	300	—	0	0	0	1	1	1	2	4	5	7	11	16
	350	—	0	0	0	1	1	1	2	4	5	6	10	15
	400	—	0	0	0	1	1	1	1	3	4	6	9	13
	500	—	0	0	0	1	1	1	1	3	4	5	8	11
	600	—	0	0	0	0	1	1	1	2	3	4	6	9
	700	—	0	0	0	0	1	1	1	1	3	3	6	8
	750	—	0	0	0	0	0	1	1	1	3	3	5	8
	800	—	0	0	0	0	0	1	1	1	2	3	5	7
	900	—	0	0	0	0	0	1	1	1	2	3	5	7
	1000	—	0	0	0	0	0	1	1	1	1	3	4	6
	1250	—	0	0	0	0	0	0	1	1	1	1	3	5
	1500	—	0	0	0	0	0	0	1	1	1	1	3	4
	1750	—	0	0	0	0	0	0	1	1	1	1	2	4
	2000	—	0	0	0	0	0	0	0	1	1	1	2	3
TW, THHW, THW, THW-2	14	—	9	15	25	44	59	98	140	215	288	370	581	839
	12	—	7	12	19	33	45	75	107	165	221	284	446	644
	10	—	5	9	14	25	34	56	80	123	164	212	332	480
	8	—	3	5	8	14	19	31	44	68	91	118	185	267
RHH*, RHW*, RHW-2*	14	—	6	10	17	29	39	65	93	143	191	246	387	558
	12	—	5	8	13	23	32	52	75	115	154	198	311	448
	10	—	3	6	10	18	25	41	58	90	120	154	242	350
	8	—	1	4	6	11	15	24	35	54	72	92	145	209
TW, THW, THHW,	6	—	1	3	5	8	11	18	27	41	55	71	111	160
	4	—	1	1	3	6	8	14	20	31	41	53	83	120

Type	Conductor Size (AWG/ kcmil)	Trade Size (Metric Designator)												
		⅜ (12)	½ (16)	¾ (21)	1 (27)	1¼ (35)	1½ (41)	2 (53)	2½ (63)	3 (78)	3½ (91)	4 (103)	5 (129)	6 (155)
THW-2, RHH*, RHW*, RHW-2*	3	—	1	1	3	5	7	12	17	26	35	45	71	103
	2	—	1	1	2	4	6	10	14	22	30	38	60	87
	1	—	1	1	1	3	4	7	10	15	21	27	42	61
	1/0	—	0	1	1	2	3	6	8	13	18	23	36	52
	2/0	—	0	1	1	2	3	5	7	11	15	19	31	44
	3/0	—	0	1	1	1	2	4	6	9	13	16	26	37
	4/0	—	0	0	1	1	1	3	5	8	10	14	21	31
	250	—	0	0	1	1	1	3	4	6	8	11	17	25
	300	—	0	0	1	1	1	2	3	5	7	9	15	22
	350	—	0	0	0	1	1	1	3	5	6	8	13	19
	400	—	0	0	0	1	1	1	3	4	6	7	12	17
	500	—	0	0	0	1	1	1	2	3	5	6	10	14
	600	—	0	0	0	1	1	1	1	3	4	5	8	12
	700	—	0	0	0	0	1	1	1	2	3	4	7	10
	750	—	0	0	0	0	1	1	1	2	3	4	7	10
	800	—	0	0	0	0	1	1	1	2	3	4	6	9
	900	—	0	0	0	0	1	1	1	1	3	3	6	8
	1000	—	0	0	0	0	0	1	1	1	2	3	5	8
	1250	—	0	0	0	0	0	1	1	1	1	2	4	6
	1500	—	0	0	0	0	0	1	1	1	1	2	3	5
	1750	—	0	0	0	0	0	0	1	1	1	1	3	4
	2000	—	0	0	0	0	0	0	1	1	1	1	3	4
THHN, THWN, THWN-2	14	—	13	22	36	63	85	140	200	309	412	531	833	1202
	12	—	9	16	26	46	62	102	146	225	301	387	608	877
	10	—	6	10	17	29	39	64	92	142	189	244	383	552
	8	—	3	6	9	16	22	37	53	82	109	140	221	318
	6	—	2	4	7	12	16	27	38	59	79	101	159	230
	4	—	1	2	4	7	10	16	23	36	48	62	98	141
	3	—	1	1	3	6	8	14	20	31	41	53	83	120
	2	—	1	1	3	5	7	11	17	26	34	44	70	100
	1	—	1	1	1	4	5	8	12	19	25	33	51	74
	1/0	—	1	1	1	3	4	7	10	16	21	27	43	63
	2/0	—	0	1	1	2	3	6	8	13	18	23	36	52
	3/0	—	0	1	1	1	3	5	7	11	15	19	30	43
	4/0	—	0	1	1	1	2	4	6	9	12	16	25	36
	250	—	0	0	1	1	1	3	5	7	10	13	20	29
	300	—	0	0	1	1	1	3	4	6	8	11	17	25
	350	—	0	0	1	1	1	2	3	5	7	10	15	22
	400	—	0	0	1	1	1	2	3	5	7	8	13	20
	500		0	0	0	1	1	1	2	4	5	7	11	16
	600	—	0	0	0	1	1	1	1	3	4	6	9	13

Type	Conductor Size (AWG/ kcmil)	-	Trade Size (Metric Designator)											
		⅜ (12)	½ (16)	¾ (21)	1 (27)	1¼ (35)	1½ (41)	2 (53)	2½ (63)	3 (78)	3½ (91)	4 (103)	5 (129)	6 (155)
	700	—	0	0	0	1	1	1	1	3	4	5	8	11
	750	—	0	0	0	0	1	1	1	3	4	5	7	11
	800	—	0	0	0	0	1	1	1	2	3	4	7	10
	900	—	0	0	0	0	1	1	1	2	3	4	6	9
	1000	—	0	0	0	0	1	1	1	1	3	4	6	8
FEP, FEPB, PFA, PFAH, TFE	14	—	12	22	35	61	83	136	194	300	400	515	808	1166
	12	—	9	16	26	44	60	99	142	219	292	376	590	851
	10	—	6	11	18	32	43	71	102	157	209	269	423	610
	8	—	3	6	10	18	25	41	58	90	120	154	242	350
	6	—	2	4	7	13	17	29	41	64	85	110	172	249
	4	—	1	3	5	9	12	20	29	44	59	77	120	174
	3	—	1	2	4	7	10	17	24	37	50	64	100	145
	2		1	1	3	6	8	14	20	31	41	53	83	120
PFA, PFAH, TFE	1	—	1	1	2	4	6	9	14	21	28	37	57	83
PFA, PFAH, TFE, Z	1/0	—	1	1	1	3	5	8	11	18	24	30	48	69
	2/0	—	1	1	1	3	4	6	9	14	19	25	40	57
	3/0	—	0	1	1	2	3	5	8	12	16	21	33	47
	4/0	—	0	1	1	1	2	4	6	10	13	17	27	39
Z	14	—	15	26	42	73	100	164	234	361	482	621	974	1405
	12	—	10	18	30	52	71	116	166	256	342	440	691	997
	10	—	6	11	18	32	43	71	102	157	209	269	423	610
	8	—	4	7	11	20	27	45	64	99	132	170	267	386
	6	—	3	5	8	14	19	31	45	69	93	120	188	271
	4	—	1	3	5	9	13	22	31	48	64	82	129	186
	3	—	1	2	4	7	9	16	22	35	47	60	94	136
	2	—	1	1	3	6	8	13	19	29	39	50	78	113
	1	—	1	1	2	5	6	10	15	23	31	40	63	92
XHHW, ZW. XHHW-2, XHH	14	—	9	15	25	44	59	98	140	215	288	370	581	839
	12	—	7	12	19	33	45	75	107	165	221	284	446	644
	10	—	5	9	14	25	34	56	80	123	164	212	332	480
	8	—	3	5	8	14	19	31	44	68	91	118	185	267
	6	—	1	3	6	10	14	23	33	51	68	87	137	197
	4	—	1	2	4	7	10	16	24	37	49	63	99	143
	3	—	1	1	3	6	8	14	20	31	41	53	84	121
	2	—	1	1	3	5	7	12	17	26	35	45	70	101
XHHW, XHHW-2, XHH	1	—	1	1	1	4	5	9	12	19	26	33	52	76
	1/0	—	1	1	1	3	4	7	10	16	22	28	44	64
	2/0	—	0	1	1	2	3	6	9	13	18	23	37	53
	3/0	—	0	1	1	1	3	5	7	11	15	19	30	44
	4/0	—	0	1	1	1	2	4	6	9	12	16	25	36

Type	Conductor Size (AWG/ kcmil)	Trade Size (Metric Designator)												
		3/8 (12)	1/2 (16)	3/4 (21)	1 (27)	1 1/4 (35)	1 1/2 (41)	2 (53)	2 1/2 (63)	3 (78)	3 1/2 (91)	4 (103)	5 (129)	6 (155)
	250	—	0	0	1	1	1	3	5	7	10	13	20	30
	300	—	0	0	1	1	1	3	4	6	9	11	18	25
	350	—	0	0	1	1	1	2	3	6	7	10	15	22
	400	—	0	0	1	1	1	2	3	5	7	9	14	20
	500	—	0	0	0	1	1	1	2	4	5	7	11	16
	600	—	0	0	0	1	1	1	1	3	4	6	9	13
	700	—	0	0	0	1	1	1	1	3	4	5	8	11
	750	—	0	0	0	0	1	1	1	3	4	5	7	11
	800	—	0	0	0	0	1	1	1	2	3	4	7	10
	900	—	0	0	0	0	1	1	1	2	3	4	6	9
	1000	—	0	0	0	0	1	1	1	1	3	4	6	8
	1250	—	0	0	0	0	0	1	1	1	2	3	4	6
	1500	—	0	0	0	0	0	1	1	1	1	2	4	5
	1750	—	0	0	0	0	0	0	1	1	1	1	3	5
	2000	—	0	0	0	0	0	0	1	1	1	1	3	4
FIXTURE WIRES														
RFH-2, FFH-2, RFHH-2	18	—	8	15	24	42	57	94	134	207	276	355	557	804
	16	—	7	12	20	35	48	79	113	174	232	299	470	678
SF-2, SFF-2	18	—	11	19	31	53	72	118	169	261	348	448	703	1014
	16	—	9	15	25	44	59	98	140	215	288	370	581	839
	14	—	7	12	20	35	48	79	113	174	232	299	470	678
SF-1, SFF-1	18	—	19	33	54	94	127	209	299	461	616	792	1244	1794
RFH-1, TF, TFF, XF, XFF	18	—	14	25	40	69	94	155	221	341	455	585	918	1325
	16	—	11	20	32	56	76	125	178	275	367	472	741	1070
XF, XFF	14	—	9	15	25	44	59	98	140	215	288	370	581	839
TFN, TFFN	18	—	23	40	64	111	150	248	354	545	728	937	1470	2120
	16	—	17	30	49	84	115	189	270	416	556	715	1123	1620
PF, PFF, PGF, PGFF, PAF, PTF, PTFF, PAFF	18	—	21	38	61	105	143	235	335	517	690	888	1394	2011
	16	—	16	29	47	81	110	181	259	400	534	687	1078	1555
	14	—	12	22	35	61	83	136	194	300	400	515	808	1166
ZF, ZFF, ZHF	18	—	28	49	79	135	184	303	432	666	889	1145	1796	2592
	16	—	20	36	58	100	136	223	319	491	656	844	1325	1912
	14	—	15	26	42	73	100	164	234	361	482	621	974	1405
KF-2, KFF-2	18	—	42	73	118	203	276	454	648	1000	1334	1717	2695	3887
	16	—	29	51	82	142	192	317	452	697	931	1198	1880	2712
	14	—	19	34	55	95	129	213	304	468	625	805	1263	1822

Type	Conductor Size (AWG/ kcmil)	Trade Size (Metric Designator)												
		⅜ (12)	½ (16)	¾ (21)	1 (27)	1¼ (35)	1½ (41)	2 (53)	2½ (63)	3 (78)	3½ (91)	4 (103)	5 (129)	6 (155)
	12	—	13	24	38	66	90	148	211	326	435	560	878	1267
	10	—	9	15	25	44	59	98	140	215	288	370	581	839
KF-1, KFF-1	18	—	48	84	136	234	318	524	748	1153	1540	1982	3109	4486
	16	—	34	59	96	165	224	368	526	810	1082	1392	2185	3152
	14	—	23	40	64	111	150	248	354	545	728	937	1470	2120
	12	—	15	26	42	73	100	164	234	361	482	621	974	1405
	10	—	10	17	28	48	65	107	153	236	315	405	636	918
XF, XFF	12	—	5	8	13	23	32	52	75	115	154	198	311	448
	10	—	3	6	10	18	25	41	58	90	120	154	242	350

Notes:

1. This table is for concentric stranded conductors only. For compact stranded conductors, Table C.8(A)
should be used.

2. Two-hour fire-rated RHH cable has ceramifiable insulation, which has much larger diameters than other RHH wires. Consult manufacturer's conduit fill tables.

*Types RHH, RHW, and RHW-2 without outer covering.

Table C.9(A) Maximum Number of Conductors or Fixture Wires in Rigid Metal Conduit (RMC)
(Based on Chapter 9: Table 1, Table 4, and Table 5A)

Type	Conductor Size (AWG/ kcmil)	Trade Size (Metric Designator)												
		⅜ (12)	½ (16)	¾ (21)	1 (27)	1¼ (35)	1½ (41)	2 (53)	2½ (63)	3 (78)	3½ (91)	4 (103)	5 (129)	6 (155)
COMPACT CONDUCTORS														
THW, THW-2, THHW	8	—	2	4	7	12	16	26	38	59	78	101	158	228
	6	—	1	3	5	9	12	20	29	45	60	78	122	176
	4	—	1	2	4	7	9	15	22	34	45	58	91	132
	2	—	1	1	3	5	7	11	16	25	33	43	67	97
	1	—	1	1	1	3	5	8	11	17	23	30	47	68
	1/0	—	1	1	1	3	4	7	10	15	20	26	41	59
	2/0	—	0	1	1	2	3	6	8	13	17	22	34	50
	3/0	—	0	1	1	1	3	5	7	11	14	19	29	42
	4/0	—	0	1	1	1	2	4	6	9	12	15	24	35
	250	—	0	0	1	1	1	3	4	7	9	12	19	28
	300	—	0	0	1	1	1	3	4	6	8	11	17	24
	350	—	0	0	1	1	1	2	3	5	7	9	15	22
	400	—	0	0	1	1	1	1	3	5	7	8	13	20
	500	—	0	0	0	1	1	1	3	4	5	7	11	17
	600	—	0	0	0	1	1	1	1	3	4	6	9	13
	700	—	0	0	0	1	1	1	1	3	4	5	8	12
	750	—	0	0	0	0	1	1	1	3	4	5	7	11
	900	—	0	0	0	0	1	1	1	2	3	4	7	10

Type	Conductor Size (AWG/ kcmil)	Trade Size (Metric Designator)												
		3/8 (12)	½ (16)	¾ (21)	1 (27)	1¼ (35)	1½ (41)	2 (53)	2½ (63)	3 (78)	3½ (91)	4 (103)	5 (129)	6 (155)
	1000	—	0	0	0	0	1	1	1	1	3	4	6	9
THHN, THWN, THWN-2	8	—	—	—	—	—	—	—	—	—	—	—	—	—
	6	—	2	5	8	13	18	30	43	66	88	114	179	258
	4	—	1	3	5	8	11	18	26	41	55	70	110	159
	2	—	1	1	3	6	8	13	19	29	39	50	79	114
	1	—	1	1	2	4	6	10	14	22	29	38	59	86
	1/0	—	1	1	1	4	5	8	12	19	25	32	51	73
	2/0	—	1	1	1	3	4	7	10	15	21	26	42	60
	3/0	—	0	1	1	2	3	6	8	13	17	22	35	51
	4/0	—	0	1	1	1	3	5	7	10	14	18	29	42
	250	—	0	1	1	1	2	4	5	8	11	14	23	33
	300	—	0	0	1	1	1	3	4	7	10	12	20	28
	350	—	0	0	1	1	1	3	4	6	8	11	17	25
	400	—	0	0	1	1	1	2	3	5	7	10	15	22
	500	—	0	0	0	1	1	1	3	5	6	8	13	19
	600	—	0	0	0	1	1	1	2	4	5	6	10	15
	700	—	0	0	0	1	1	1	1	3	4	6	9	13
	750	—	0	0	0	1	1	1	1	3	4	5	9	13
	900	—	0	0	0	0	1	1	1	2	3	4	7	10
	1000	—	0	0	0	0	1	1	1	2	3	4	6	9
XHHW, XHHW-2	8	—	3	5	9	15	21	34	49	76	101	130	205	296
	6	—	2	4	6	11	15	25	36	56	75	97	152	220
	4	—	1	3	5	8	11	18	26	41	55	70	110	159
	2	—	1	1	3	6	8	13	19	29	39	50	79	114
	1	—	1	1	2	4	6	10	14	22	29	38	59	86
	1/0	—	1	1	1	4	5	8	12	19	25	32	51	73
	2/0	—	1	1	1	3	4	7	10	16	21	27	43	62
	3/0	—	0	1	1	2	3	6	8	13	17	22	35	51
	4/0	—	0	1	1	1	3	5	7	11	14	19	29	42
	250	—	0	1	1	1	2	4	5	8	11	15	23	34
	300	—	0	0	1	1	1	3	5	7	10	13	20	29
	350	—	0	0	1	1	1	3	4	6	9	11	18	25
	400	—	0	0	1	1	1	2	4	6	8	10	16	23
	500	—	0	0	0	1	1	1	3	5	6	8	13	19
	600	—	0	0	0	1	1	1	2	4	5	7	10	15
	700	—	0	0	0	1	1	1	1	3	4	6	9	13
	750	—	0	0	0	1	1	1	1	3	4	5	8	12
	900	—	0	0	0	0	1	1	1	2	3	5	7	11
	1000	—	0	0	0	0	1	1	1	2	3	4	7	10

Definition: *Compact stranding* is the result of a manufacturing process where the stranded conductor is

compressed to the extent that the interstices (voids between strand wires) are virtually eliminated.

Table C.10 Maximum Number of Conductors or Fixture Wires in Rigid PVC Conduit, Schedule 80

(Based on Chapter 9: Table 1, Table 4, and Table 5)

Type	Conductor Size (AWG/ kcmil)	Trade Size (Metric Designator)												
		⅜ (12)	½ (16)	¾ (21)	1 (27)	1¼ (35)	1½ (41)	2 (53)	2½ (63)	3 (78)	3½ (91)	4 (103)	5 (129)	6 (155)
CONDUCTORS														
RHH, RHW, RHW-2	14	—	3	5	9	17	23	39	56	88	118	153	243	349
	12	—	2	4	7	14	19	32	46	73	98	127	202	290
	10	—	1	3	6	11	15	26	37	59	79	103	163	234
	8	—	1	1	3	6	8	13	19	31	41	54	85	122
	6	—	1	1	2	4	6	11	16	24	33	43	68	98
	4	—	1	1	1	3	5	8	12	19	26	33	53	77
	3	—	0	1	1	3	4	7	11	17	23	29	47	67
	2	—	0	1	1	3	4	6	9	14	20	25	41	58
	1	—	0	1	1	1	2	4	6	9	13	17	27	38
	1/0	—	0	0	1	1	1	3	5	8	11	15	23	33
	2/0	—	0	0	1	1	1	3	4	7	10	13	20	29
	3/0	—	0	0	1	1	1	3	4	6	8	11	17	25
	4/0	—	0	0	0	1	1	2	3	5	7	9	15	21
	250	—	0	0	0	1	1	1	2	4	5	7	11	16
	300	—	0	0	0	1	1	1	2	3	5	6	10	14
	350	—	0	0	0	1	1	1	1	3	4	5	9	13
	400	—	0	0	0	0	1	1	1	3	4	5	8	12
	500	—	0	0	0	0	1	1	1	2	3	4	7	10
	600	—	0	0	0	0	0	1	1	1	3	3	6	8
	700	—	0	0	0	0	0	1	1	1	2	3	5	7
	750	—	0	0	0	0	0	1	1	1	2	3	5	7
	800	—	0	0	0	0	0	1	1	1	2	3	4	7
	900	—	0	0	0	0	0	1	1	1	1	2	4	6
	1000	—	0	0	0	0	0	1	1	1	1	2	4	5
	1250	—	0	0	0	0	0	0	1	1	1	1	3	4
	1500	—	0	0	0	0	0	0	1	1	1	1	2	4
	1750	—	0	0	0	0	0	0	0	1	1	1	2	3
	2000	—	0	0	0	0	0	0	0	1	1	1	1	3
TW, THHW, THW, THW-2	14	—	6	11	19	35	49	82	118	185	250	324	514	736
	12	—	4	9	15	27	38	63	91	142	192	248	394	565
	10	—	3	6	11	20	28	47	68	106	143	185	294	421
	8	—	1	3	6	11	15	26	37	59	79	103	163	234
RHH*, RHW*, RHW-2*	14	—	4	8	13	23	32	55	79	123	166	215	341	490
	12	—	3	6	10	19	26	44	63	99	133	173	274	394
	10	—	2	5	8	15	20	34	49	77	104	135	214	307
	8	—	1	3	5	9	12	20	29	46	62	81	128	184

Type	Conductor Size (AWG/ kcmil)	Trade Size (Metric Designator)												
		⅜ (12)	½ (16)	¾ (21)	1 (27)	1¼ (35)	1½ (41)	2 (53)	2½ (63)	3 (78)	3½ (91)	4 (103)	5 (129)	6 (155)
TW, THW, THHW, THW-2, RHH*, RHW*, RHW-2*	6	—	1	1	3	7	9	16	22	35	48	62	98	141
	4	—	1	1	3	5	7	12	17	26	35	46	73	105
	3	—	1	1	2	4	6	10	14	22	30	39	63	90
	2	—	1	1	1	3	5	8	12	19	26	33	53	77
	1	—	0	1	1	2	3	6	8	13	18	23	37	54
	1/0	—	0	1	1	1	3	5	7	11	15	20	32	46
	2/0	—	0	1	1	1	2	4	6	10	13	17	27	39
	3/0	—	0	0	1	1	1	3	5	8	11	14	23	33
	4/0	—	0	0	1	1	1	3	4	7	9	12	19	27
	250	—	0	0	0	1	1	2	3	5	7	9	15	22
	300	—	0	0	0	1	1	1	3	5	6	8	13	19
	350	—	0	0	0	1	1	1	2	4	6	7	12	17
	400	—	0	0	0	1	1	1	2	4	5	7	10	15
	500	—	0	0	0	1	1	1	1	3	4	5	9	13
	600	—	0	0	0	0	1	1	1	2	3	4	7	10
	700	—	0	0	0	0	1	1	1	2	3	4	6	9
	750	—	0	0	0	0	0	1	1	1	3	4	6	8
	800	—	0	0	0	0	0	1	1	1	3	3	6	8
	900	—	0	0	0	0	0	1	1	1	2	3	5	7
	1000	—	0	0	0	0	0	1	1	1	2	3	5	7
	1250	—	0	0	0	0	0	1	1	1	1	2	4	5
	1500	—	0	0	0	0	0	0	1	1	1	1	3	4
	1750	—	0	0	0	0	0	0	1	1	1	1	3	4
	2000	—	0	0	0	0	0	0	0	1	1	1	2	3
THHN, THWN, THWN-2	14	—	9	17	28	51	70	118	170	265	358	464	736	1055
	12	—	6	12	20	37	51	86	124	193	261	338	537	770
	10	—	4	7	13	23	32	54	78	122	164	213	338	485
	8	—	2	4	7	13	18	31	45	70	95	123	195	279
	6	—	1	3	5	9	13	22	32	51	68	89	141	202
	4	—	1	1	3	6	8	14	20	31	42	54	86	124
	3	—	1	1	3	5	7	12	17	26	35	46	73	105
	2	—	1	1	2	4	6	10	14	22	30	39	61	88
	1	—	0	1	1	3	4	7	10	16	22	29	45	65
	1/0	—	0	1	1	2	3	6	9	14	18	24	38	55
	2/0	—	0	1	1	1	3	5	7	11	15	20	32	46
	3/0	—	0	1	1	1	2	4	6	9	13	17	26	38
	4/0	—	0	0	1	1	1	3	5	8	10	14	22	31
	250	—	0	0	1	1	1	3	4	6	8	11	18	25
	300	—	0	0	0	1	1	2	3	5	7	9	15	22
	350	—	0	0	0	1	1	1	3	5	6	8	13	19
	400	—	0	0	0	1	1	1	3	4	6	7	12	17

Type	Conductor Size (AWG/ kcmil)	Trade Size (Metric Designator)												
		⅜ (12)	½ (16)	¾ (21)	1 (27)	1¼ (35)	1½ (41)	2 (53)	2½ (63)	3 (78)	3½ (91)	4 (103)	5 (129)	6 (155)
	500	—	0	0	0	1	1	1	2	3	5	6	10	14
	600	—	0	0	0	0	1	1	1	3	4	5	8	12
	700	—	0	0	0	0	1	1	1	2	3	4	7	10
	750	—	0	0	0	0	1	1	1	2	3	4	7	9
	800	—	0	0	0	0	1	1	1	2	3	4	6	9
	900	—	0	0	0	0	0	1	1	1	3	3	6	8
	1000	—	0	0	0	0	0	1	1	1	2	3	5	7
FEP, FEPB, PFA, PFAH, TFE	14	—	8	16	27	49	68	115	164	257	347	450	714	1024
	12	—	6	12	20	36	50	84	120	188	253	328	521	747
	10	—	4	8	14	26	36	60	86	135	182	235	374	536
	8	—	2	5	8	15	20	34	49	77	104	135	214	307
	6	—	1	3	6	10	14	24	35	55	74	96	152	218
	4	—	1	2	4	7	10	17	24	38	52	67	106	153
	3	—	1	1	3	6	8	14	20	32	43	56	89	127
	2	—	1	1	3	5	7	12	17	26	35	46	73	105
PFA, PFAH, TFE	1	—	1	1	1	3	5	8	11	18	25	32	51	73
PFA, PFAH, TFE, Z	1/0	—	0	1	1	3	4	7	10	15	20	27	42	61
	2/0	—	0	1	1	2	3	5	8	12	17	22	35	50
	3/0	—	0	1	1	1	2	4	6	10	14	18	29	41
	4/0	—	0	0	1	1	1	4	5	8	11	15	24	34
Z	14	—	10	19	33	59	82	138	198	310	418	542	860	1233
	12	—	7	14	23	42	58	98	141	220	297	385	610	875
	10	—	4	8	14	26	36	60	86	135	182	235	374	536
	8	—	3	5	9	16	22	38	54	85	115	149	236	339
	6	—	1	4	6	11	16	26	38	60	81	104	166	238
	4	—	1	2	4	8	11	18	26	41	55	72	114	164
	3	—	1	1	3	5	8	13	19	30	40	52	83	119
	2	—	1	1	2	5	6	11	16	25	33	43	69	99
	1	—	1	1	1	4	5	9	13	20	27	35	56	80
XHHW, ZW, XHHW-2, XHH	14	—	6	11	19	35	49	82	118	185	250	324	514	736
	12	—	4	9	15	27	38	63	91	142	192	248	394	565
	10	—	3	6	11	20	28	47	68	106	143	185	294	421
	8	—	1	3	6	11	15	26	37	59	79	103	163	234
	6	—	1	2	4	8	11	19	28	43	59	76	121	173
	4	—	1	1	3	6	8	14	20	31	42	55	87	125
	3	—	1	1	3	5	7	12	17	26	36	47	74	106
	2	—	1	1	2	4	6	10	14	22	30	39	62	89
XHHW, XHHW-2, XHH	1	—	0	1	1	3	4	7	10	16	22	29	46	66
	1/0	—	0	1	1	2	3	6	9	14	19	24	39	56
	2/0	—	0	1	1	1	3	5	7	11	16	20	32	46

Type	Conductor Size (AWG/ kcmil)	Trade Size (Metric Designator)												
		⅜ (12)	½ (16)	¾ (21)	1 (27)	1¼ (35)	1½ (41)	2 (53)	2½ (63)	3 (78)	3½ (91)	4 (103)	5 (129)	6 (155)
	3/0	—	0	1	1	1	2	4	6	9	13	17	27	38
	4/0	—	0	0	1	1	1	3	5	8	11	14	22	32
	250	—	0	0	1	1	1	3	4	6	9	11	18	26
	300	—	0	0	1	1	1	2	3	5	7	10	15	22
	350	—	0	0	0	1	1	1	3	5	6	8	14	20
	400	—	0	0	0	1	1	1	3	4	6	7	12	17
	500	—	0	0	0	1	1	1	2	3	5	6	10	14
	600	—	0	0	0	0	1	1	1	3	4	5	8	11
	700	—	0	0	0	0	1	1	1	2	3	4	7	10
	750	—	0	0	0	0	1	1	1	2	3	4	6	9
	800	—	0	0	0	0	1	1	1	1	3	4	6	9
	900	—	0	0	0	0	0	1	1	1	3	3	5	8
	1000	—	0	0	0	0	0	1	1	1	2	3	5	7
	1250	—	0	0	0	0	0	1	1	1	1	2	4	6
	1500	—	0	0	0	0	0	0	1	1	1	1	3	5
	1750	—	0	0	0	0	0	0	1	1	1	1	3	4
	2000	—	0	0	0	0	0	0	1	1	1	1	2	4
FIXTURE WIRES														
RFH-2, FFH-2, RFHH-2	18	—	6	11	19	34	47	79	113	177	239	310	492	706
	16	—	5	9	16	28	39	67	95	150	202	262	415	595
SF-2, SFF-2	18	—	7	14	24	43	59	100	143	224	302	391	621	890
	16	—	6	11	19	35	49	82	118	185	250	324	514	736
	14	—	5	9	16	28	39	67	95	150	202	262	415	595
SF-1, SFF-1	18	—	13	25	42	76	105	177	253	396	534	692	1098	1575
RFH-1, TF, TFF, XF, XFF	18	—	10	18	31	56	77	130	187	293	395	511	811	1163
	16	—	8	15	25	45	62	105	151	236	319	413	655	939
XF, XFF	14	—	6	11	19	35	49	82	118	185	250	324	514	736
TFN, TFFN	18	—	15	29	50	90	124	209	299	468	632	818	1298	1861
	16	—	12	22	38	68	95	159	229	358	482	625	992	1422
PF, PFF, PGF, PGFF, PAF, PTF, PTFF, PAFF	18	—	15	28	47	85	118	198	284	444	599	776	1231	1765
	16	—	11	22	36	66	91	153	219	343	463	600	952	1365
	14	—	8	16	27	49	68	115	164	257	347	450	714	1024
ZF, ZFF, ZHF	18	—	19	36	61	110	152	255	366	572	772	1000	1587	2275
	16	—	14	27	45	81	112	188	270	422	569	738	1171	1678
	14	—	10	19	33	59	82	138	198	310	418	542	860	1233
KF-2, KFF-2	18	—	29	54	91	165	228	383	549	859	1158	1501	2380	3413

Type	Conductor Size (AWG/ kcmil)	Trade Size (Metric Designator)												
		3⁄8 (12)	½ (16)	¾ (21)	1 (27)	1¼ (35)	1½ (41)	2 (53)	2½ (63)	3 (78)	3½ (91)	4 (103)	5 (129)	6 (155)
	16	—	20	38	64	115	159	267	383	599	808	1047	1661	2381
	14	—	13	25	43	77	107	179	257	402	543	703	1116	1600
	12	—	9	17	30	53	74	125	179	280	377	489	776	1113
	10	—	6	11	19	35	49	82	118	185	250	324	514	736
KF-1, KFF-1	18	—	33	63	106	190	263	442	633	991	1336	1732	2747	3938
	16	—	23	44	74	133	185	310	445	696	939	1217	1930	2767
	14	—	15	29	50	90	124	209	299	468	632	818	1298	1861
	12	—	10	19	33	59	82	138	198	310	418	542	860	1233
	10	—	7	13	21	39	54	90	129	203	273	354	562	806
XF, XFF	12	—	3	6	10	19	26	44	63	99	133	173	274	394
	10	—	2	5	8	15	20	34	49	77	104	135	214	307

Notes:

1. This table is for concentric stranded conductors only. For compact stranded conductors, Table C.9(A)
should be used.

2. Two-hour fire-rated RHH cable has ceramifiable insulation, which has much larger diameters than other RHH wires. Consult manufacturer's conduit fill tables.

*Types RHH, RHW, and RHW-2 without outer covering.

Table C.10(A) Maximum Number of Conductors or Fixture Wires in Rigid PVC Conduit, Schedule 80
(Based on Chapter 9: Table 1, Table 4, and Table 5A)

Type	Conductor Size (AWG/ kcmil)	Trade Size (Metric Designator)												
		3⁄8 (12)	½ (16)	¾ (21)	1 (27)	1¼ (35)	1½ (41)	2 (53)	2½ (63)	3 (78)	3½ (91)	4 (103)	5 (129)	6 (155)
COMPACT CONDUCTORS														
THW, THW-2, THHW	8	—	1	3	5	9	13	22	32	50	68	88	140	200
	6	—	1	2	4	7	10	17	25	39	52	68	108	155
	4	—	1	1	3	5	7	13	18	29	39	51	81	116
	2	—	1	1	1	4	5	9	13	21	29	37	60	85
	1	—	0	1	1	3	4	6	9	15	20	26	42	60
	1/0	—	0	1	1	2	3	6	8	13	17	23	36	52
	2/0	—	0	1	1	1	3	5	7	11	15	19	30	44
	3/0	—	0	0	1	1	2	4	6	9	12	16	26	37
	4/0	—	0	0	1	1	1	3	5	8	10	13	22	31
	250	—	0	0	1	1	1	2	4	6	8	11	17	25
	300	—	0	0	0	1	1	2	3	5	7	9	15	21
	350	—	0	0	0	1	1	1	3	5	6	8	13	19
	400	—	0	0	0	1	1	1	3	4	6	7	12	17
	500	—	0	0	0	1	1	1	2	3	5	6	10	14
	600	—	0	0	0	0	1	1	1	3	4	5	8	12

Type	Conductor Size (AWG/ kcmil)	-					Trade Size (Metric Designator)							
		⅜ (12)	½ (16)	¾ (21)	1 (27)	1¼ (35)	1½ (41)	2 (53)	2½ (63)	3 (78)	3½ (91)	4 (103)	5 (129)	6 (155)
	700	—	0	0	0	0	1	1	1	2	3	4	7	10
	750	—	0	0	0	0	1	1	1	2	3	4	7	10
	900	—	0	0	0	0	0	1	1	1	3	4	6	8
	1000	—	0	0	0	0	0	1	1	1	2	3	5	8
THHN, THWN, THWN-2	8	—	—	—	—	—	—	—	—	—	—	—	—	—
	6	—	1	3	6	11	15	25	36	57	77	99	158	226
	4	—	1	1	3	6	9	15	22	35	47	61	98	140
	2	—	1	1	2	5	6	11	16	25	34	44	70	100
	1	—	1	1	1	3	5	8	12	19	25	33	53	75
	1/0	—	0	1	1	3	4	7	10	16	22	28	45	64
	2/0	—	0	1	1	2	3	6	8	13	18	23	37	53
	3/0	—	0	1	1	1	3	5	7	11	15	19	31	44
	4/0	—	0	0	1	1	2	4	6	9	12	16	25	37
	250	—	0	0	1	1	1	3	4	7	10	12	20	29
	300	—	0	0	1	1	1	3	4	6	8	11	17	25
	350	—	0	0	0	1	1	2	3	5	7	9	15	22
	400	—	0	0	0	1	1	1	3	5	6	8	13	19
	500	—	0	0	0	1	1	1	2	4	5	7	11	16
	600	—	0	0	0	1	1	1	1	3	4	6	9	13
	700	—	0	0	0	0	1	1	1	3	4	5	8	12
	750	—	0	0	0	0	1	1	1	3	4	5	8	11
	900	—	0	0	0	0	1	1	1	1	3	4	6	9
	1000	—	0	0	0	0	0	1	1	1	3	3	5	8
XHHW, XHHW-2	8	—	1	4	7	12	17	29	42	65	88	114	181	260
	6	—	1	3	5	9	13	21	31	48	65	85	134	193
	4	—	1	1	3	6	9	15	22	35	47	61	98	140
	2	—	1	1	2	5	6	11	16	25	34	44	70	100
	1	—	1	1	1	3	5	8	12	19	25	33	53	75
	1/0	—	0	1	1	3	4	7	10	16	22	28	45	64
	2/0	—	0	1	1	2	3	6	8	13	18	24	38	54
	3/0	—	0	1	1	1	3	5	7	11	15	19	31	44
	4/0	—	0	0	1	1	2	4	6	9	12	16	26	37
	250	—	0	0	1	1	1	3	5	7	10	13	21	30
	300	—	0	0	1	1	1	3	4	6	8	11	17	25
	350	—	0	0	1	1	1	2	3	5	7	10	15	22
	400	—	0	0	0	1	1	1	3	5	7	9	14	20
	500	—	0	0	0	1	1	1	2	4	5	7	11	17
	600	—	0	0	0	1	1	1	1	3	4	6	9	13
	700	—	0	0	0	0	1	1	1	3	4	5	8	12
	750	—	0	0	0	0	1	1	1	2	3	5	7	11
	900	—	0	0	0	0	1	1	1	2	3	4	6	9

Type	Conductor Size (AWG/ kcmil)	Trade Size (Metric Designator)												
		⅜ (12)	½ (16)	¾ (21)	1 (27)	1¼ (35)	1½ (41)	2 (53)	2½ (63)	3 (78)	3½ (91)	4 (103)	5 (129)	6 (155)
	1000	—	0	0	0	0	0	1	1	1	3	3	6	8

Definition: *Compact stranding* is the result of a manufacturing process where the stranded conductor is
compressed to the extent that the interstices (voids between strand wires) are virtually eliminated.

Table C.11 Maximum Number of Conductors or Fixture Wires in Rigid PVC Conduit, Schedule 40 and HDPE Conduit

(Based on Chapter 9: Table 1, Table 4, and Table 5)

Type	Conductor Size (AWG/ kcmil)	Trade Size (Metric Designator)												
		⅜ (12)	½ (16)	¾ (21)	1 (27)	1¼ (35)	1½ (41)	2 (53)	2½ (63)	3 (78)	3½ (91)	4 (103)	5 (129)	6 (155)
								CONDUCTORS						
RHH, RHW, RHW-2	14	—	4	7	11	20	27	45	64	99	133	171	269	390
	12	—	3	5	9	16	22	37	53	82	110	142	224	323
	10	—	2	4	7	13	18	30	43	66	89	115	181	261
	8	—	1	2	4	7	9	15	22	35	46	60	94	137
	6	—	1	1	3	5	7	12	18	28	37	48	76	109
	4	—	1	1	2	4	6	10	14	22	29	37	59	85
	3	—	1	1	1	4	5	8	12	19	25	33	52	75
	2	—	1	1	1	3	4	7	10	16	22	28	45	65
	1	—	0	1	1	1	3	5	7	11	14	19	29	43
	1/0	—	0	1	1	1	2	4	6	9	13	16	26	37
	2/0	—	0	0	1	1	1	3	5	8	11	14	22	32
	3/0	—	0	0	1	1	1	3	4	7	9	12	19	28
	4/0	—	0	0	1	1	1	2	4	6	8	10	16	24
	250	—	0	0	0	1	1	1	3	4	6	8	12	18
	300	—	0	0	0	1	1	1	2	4	5	7	11	16
	350	—	0	0	0	1	1	1	2	3	5	6	10	14
	400	—	0	0	0	1	1	1	1	3	4	6	9	13
	500	—	0	0	0	0	1	1	1	3	4	5	8	11
	600	—	0	0	0	0	1	1	1	2	3	4	6	9
	700	—	0	0	0	0	0	1	1	1	3	3	6	8
	750	—	0	0	0	0	0	1	1	1	2	3	5	8
	800	—	0	0	0	0	0	1	1	1	2	3	5	7
	900	—	0	0	0	0	0	1	1	1	2	3	5	7
	1000	—	0	0	0	0	0	1	1	1	1	3	4	6
	1250	—	0	0	0	0	0	0	1	1	1	1	3	5
	1500	—	0	0	0	0	0	0	1	1	1	1	3	4
	1750	—	0	0	0	0	0	0	1	1	1	1	2	3
	2000	—	0	0	0	0	0	0	0	1	1	1	2	3

Type	Conductor Size (AWG/ kcmil)	-						Trade Size (Metric Designator)						
		⅜ (12)	½ (16)	¾ (21)	1 (27)	1¼ (35)	1½ (41)	2 (53)	2½ (63)	3 (78)	3½ (91)	4 (103)	5 (129)	6 (155)
TW, THHW, THW, THW-2	14	—	8	14	24	42	57	94	135	209	280	361	568	822
	12	—	6	11	18	32	44	72	103	160	215	277	436	631
	10	—	4	8	13	24	32	54	77	119	160	206	325	470
	8	—	2	4	7	13	18	30	43	66	89	115	181	261
RHH*, RHW*, RHW-2*	14	—	5	9	16	28	38	63	90	139	186	240	378	546
	12	—	4	8	13	22	30	50	72	112	150	193	304	439
	10	—	3	6	10	17	24	39	56	87	117	150	237	343
	8	—	1	3	6	10	14	23	33	52	70	90	142	205
TW, THW, THHW, THW-2, RHH*, RHW*, RHW-2*	6	—	1	2	4	8	11	18	26	40	53	69	109	157
	4	—	1	1	3	6	8	13	19	30	40	51	81	117
	3	—	1	1	3	5	7	11	16	25	34	44	69	100
	2	—	1	1	2	4	6	10	14	22	29	37	59	85
	1	—	0	1	1	3	4	7	10	15	20	26	41	60
	1/0	—	0	1	1	2	3	6	8	13	17	22	35	51
	2/0	—	0	1	1	1	3	5	7	11	15	19	30	43
	3/0	—	0	1	1	1	2	4	6	9	12	16	25	36
	4/0	—	0	0	1	1	1	3	5	8	10	13	21	30
	250	—	0	0	1	1	1	3	4	6	8	11	17	25
	300	—	0	0	1	1	1	2	3	5	7	9	15	21
	350	—	0	0	0	1	1	1	3	5	6	8	13	19
	400	—	0	0	0	1	1	1	3	4	6	7	12	17
	500	—	0	0	0	1	1	1	2	3	5	6	10	14
	600	—	0	0	0	0	1	1	1	3	4	5	8	11
	700	—	0	0	0	0	1	1	1	2	3	4	7	10
	750	—	0	0	0	0	1	1	1	2	3	4	6	10
	800	—	0	0	0	0	1	1	1	2	3	4	6	9
	900	—	0	0	0	0	0	1	1	1	3	3	6	8
	1000	—	0	0	0	0	0	1	1	1	2	3	5	7
	1250	—	0	0	0	0	0	1	1	1	1	2	4	6
	1500	—	0	0	0	0	0	1	1	1	1	1	3	5
	1750	—	0	0	0	0	0	0	1	1	1	1	3	4
	2000	—	0	0	0	0	0	0	1	1	1	1	3	4
THHN, THWN, THWN-2	14	—	11	21	34	60	82	135	193	299	401	517	815	1178
	12	—	8	15	25	43	59	99	141	218	293	377	594	859
	10	—	5	9	15	27	37	62	89	137	184	238	374	541
	8	—	3	5	9	16	21	36	51	79	106	137	216	312
	6	—	1	4	6	11	15	26	37	57	77	99	156	225
	4	—	1	2	4	7	9	16	22	35	47	61	96	138
	3	—	1	1	3	6	8	13	19	30	40	51	81	117
	2	—	1	1	3	5	7	11	16	25	33	43	68	98
	1	—	1	1	1	3	5	8	12	18	25	32	50	73

Type	Conductor Size (AWG/ kcmil)	Trade Size (Metric Designator)												
		⅜ (12)	½ (16)	¾ (21)	1 (27)	1¼ (35)	1½ (41)	2 (53)	2½ (63)	3 (78)	3½ (91)	4 (103)	5 (129)	6 (155)
	1/0	—	1	1	1	3	4	7	10	15	21	27	42	61
	2/0	—	0	1	1	2	3	6	8	13	17	22	35	51
	3/0	—	0	1	1	1	3	5	7	11	14	18	29	42
	4/0	—	0	1	1	1	2	4	6	9	12	15	24	35
	250	—	0	0	1	1	1	3	4	7	10	12	20	28
	300	—	0	0	1	1	1	3	4	6	8	11	17	24
	350	—	0	0	1	1	1	2	3	5	7	9	15	21
	400	—	0	0	0	1	1	1	3	5	6	8	13	19
	500	—	0	0	0	1	1	1	2	4	5	7	11	16
	600	—	0	0	0	1	1	1	1	3	4	5	9	13
	700	—	0	0	0	0	1	1	1	3	4	5	8	11
	750	—	0	0	0	0	1	1	1	2	3	4	7	11
	800	—	0	0	0	0	1	1	1	2	3	4	7	10
	900	—	0	0	0	0	1	1	1	2	3	4	6	9
	1000	—	0	0	0	0	0	1	1	1	3	3	6	8
FEP, FEPB, PFA, PFAH, TFE	14	—	11	20	33	58	79	131	188	290	389	502	790	1142
	12	—	8	15	24	42	58	96	137	212	284	366	577	834
	10	—	6	10	17	30	41	69	98	152	204	263	414	598
	8	—	3	6	10	17	24	39	56	87	117	150	237	343
	6	—	2	4	7	12	17	28	40	62	83	107	169	244
	4	—	1	3	5	8	12	19	28	43	58	75	118	170
	3	—	1	2	4	7	10	16	23	36	48	62	98	142
	2	—	1	1	3	6	8	13	19	30	40	51	81	117
PFA, PFAH, TFE	1	—	1	1	2	4	5	9	13	20	28	36	56	81
PFA, PFAH, TFE, Z	1/0	—	1	1	1	3	4	8	11	17	23	30	47	68
	2/0	—	0	1	1	3	4	6	9	14	19	24	39	56
	3/0	—	0	1	1	2	3	5	7	12	16	20	32	46
	4/0	—	0	1	1	1	2	4	6	9	13	16	26	38
Z	14	—	13	24	40	70	95	158	226	350	469	605	952	1376
	12	—	9	17	28	49	68	112	160	248	333	429	675	976
	10	—	6	10	17	30	41	69	98	152	204	263	414	598
	8	—	3	6	11	19	26	43	62	96	129	166	261	378
	6	—	2	4	7	13	18	30	43	67	90	116	184	265
	4	—	1	3	5	9	12	21	30	46	62	80	126	183
	3	—	1	2	4	6	9	15	22	34	45	58	92	133
	2	—	1	1	3	5	7	12	18	28	38	49	77	111
	1	—	1	1	2	4	6	10	14	23	30	39	62	90
XHHW, ZW, XHHW-2, XHH	14	—	8	14	24	42	57	94	135	209	280	361	568	822
	12	—	6	11	18	32	44	72	103	160	215	277	436	631
	10	—	4	8	13	24	32	54	77	119	160	206	325	470

Type	Conductor Size (AWG/ kcmil)	Trade Size (Metric Designator)												
		⅜ (12)	½ (16)	¾ (21)	1 (27)	1¼ (35)	1½ (41)	2 (53)	2½ (63)	3 (78)	3½ (91)	4 (103)	5 (129)	6 (155)
	8	—	2	4	7	13	18	30	43	66	89	115	181	261
	6	—	1	3	5	10	13	22	32	49	66	85	134	193
	4	—	1	2	4	7	9	16	23	35	48	61	97	140
	3	—	1	1	3	6	8	13	19	30	40	52	82	118
	2	—	1	1	3	5	7	11	16	25	34	44	69	99
XHHW, XHHW-2, XHH	1	—	1	1	1	3	5	8	12	19	25	32	51	74
	1/0	—	1	1	1	3	4	7	10	16	21	27	43	62
	2/0	—	0	1	1	2	3	6	8	13	17	23	36	52
	3/0	—	0	1	1	1	3	5	7	11	14	19	30	43
	4/0	—	0	1	1	1	2	4	6	9	12	15	24	35
	250	—	0	0	1	1	1	3	5	7	10	13	20	29
	300	—	0	0	1	1	1	3	4	6	8	11	17	25
	350	—	0	0	1	1	1	2	3	5	7	9	15	22
	400	—	0	0	0	1	1	1	3	5	6	8	13	19
	500	—	0	0	0	1	1	1	2	4	5	7	11	16
	600	—	0	0	0	1	1	1	1	3	4	5	9	13
	700	—	0	0	0	0	1	1	1	3	4	5	8	11
	750	—	0	0	0	0	1	1	1	2	3	4	7	11
	800	—	0	0	0	0	1	1	1	2	3	4	7	10
	900	—	0	0	0	0	1	1	1	2	3	4	6	9
	1000	—	0	0	0	0	0	1	1	1	3	3	6	8
	1250	—	0	0	0	0	0	1	1	1	1	3	4	6
	1500	—	0	0	0	0	0	1	1	1	1	2	4	5
	1750	—	0	0	0	0	0	0	1	1	1	1	3	5
	2000	—	0	0	0	0	0	0	1	1	1	1	3	4
FIXTURE WIRES														
RFH-2, FFH-2, RFHH-2	18	—	8	14	23	40	54	90	129	200	268	346	545	788
	16	—	6	12	19	33	46	76	109	169	226	292	459	664
SF-2, SFF-2	18	—	10	17	29	50	69	114	163	253	338	436	687	993
	16	—	8	14	24	42	57	94	135	209	280	361	568	822
	14	—	6	12	19	33	46	76	109	169	226	292	459	664
SF-1, SFF-1	18	—	17	31	51	89	122	202	289	447	599	772	1216	1758
RFH-1, TF, TFF, XF, XFF	18	—	13	23	38	66	90	149	213	330	442	570	898	1298
	16	—	10	18	30	53	73	120	172	266	357	460	725	1048
XF, XFF	14	—	8	14	24	42	57	94	135	209	280	361	568	822
TFN, TFFN	18	—	20	37	60	105	144	239	341	528	708	913	1437	2077
	16	—	16	28	46	80	110	183	261	403	541	697	1098	1587
PF, PFF, PGF,	18	—	19	35	57	100	137	227	323	501	671	865	1363	1970

Type	Conductor Size (AWG/ kcmil)	⅜ (12)	½ (16)	¾ (21)	1 (27)	1¼ (35)	1½ (41)	2 (53)	2½ (63)	3 (78)	3½ (91)	4 (103)	5 (129)	6 (155)
PGFF, PAF, PTF, PTFF, PAFF	16	—	15	27	44	77	106	175	250	387	519	669	1054	1523
	14	—	11	20	33	58	79	131	188	290	389	502	790	1142
ZF, ZFF, ZHF	18	—	25	45	74	129	176	292	417	646	865	1116	1756	2539
	16	—	18	33	54	95	130	216	308	476	638	823	1296	1873
	14	—	13	24	40	70	95	158	226	350	469	605	952	1376
KF-2, KFF-2	18	—	38	67	111	193	265	439	626	969	1298	1674	2634	3809
	16	—	26	47	77	135	184	306	436	676	905	1168	1838	2657
	14	—	18	31	52	91	124	205	293	454	608	784	1235	1785
	12	—	12	22	36	63	86	143	204	316	423	546	859	1242
	10	—	8	14	24	42	57	94	135	209	280	361	568	822
KF-1, KFF-1	18	—	44	78	128	223	305	506	722	1118	1498	1931	3040	4395
	16	—	31	55	90	157	214	355	507	785	1052	1357	2136	3088
	14	—	20	37	60	105	144	239	341	528	708	913	1437	2077
	12	—	13	24	40	70	95	158	226	350	469	605	952	1376
	10	—	9	16	26	45	62	103	148	229	306	395	622	899
XF, XFF	12	—	4	8	13	22	30	50	72	112	150	193	304	439
	10	—	3	6	10	17	24	39	56	87	117	150	237	343

Notes:

1. This table is for concentric stranded conductors only. For compact stranded conductors, Table C.10(A)
should be used.

2. Two-hour fire-rated RHH cable has ceramifiable insulation, which has much larger diameters than other RHH wires. Consult manufacturer's conduit fill tables.

*Types RHH, RHW, and RHW-2 without outer covering.

Table C.11(A) Maximum Number of Conductors or Fixture Wires in Rigid PVC Conduit, Schedule 40 and HDPE Conduit

(Based on Chapter 9: Table 1, Table 4, and Table 5A)

Type	Conductor Size (AWG/ kcmil)	⅜ (12)	½ (16)	¾ (21)	1 (27)	1¼ (35)	1½ (41)	2 (53)	2½ (63)	3 (78)	3½ (91)	4 (103)	5 (129)	6 (155)
COMPACT CONDUCTORS														
THW, THW-2, THHW	8	—	1	4	6	11	15	26	37	57	76	98	155	224
	6	—	1	3	5	9	12	20	28	44	59	76	119	173
	4	—	1	1	3	6	9	15	21	33	44	57	89	129
	2	—	1	1	2	5	6	11	15	24	32	42	66	95
	1	—	1	1	1	3	4	7	11	17	23	29	46	67
	1/0	—	0	1	1	3	4	6	9	15	20	25	40	58
	2/0	—	0	1	1	2	3	5	8	12	16	21	34	49

Type	Conductor Size (AWG/ kcmil)	⅜ (12)	½ (16)	¾ (21)	1 (27)	1¼ (35)	1½ (41)	2 (53)	2½ (63)	3 (78)	3½ (91)	4 (103)	5 (129)	6 (155)
		Trade Size (Metric Designator)												
	3/0	—	0	1	1	1	3	5	7	10	14	18	29	42
	4/0	—	0	1	1	1	2	4	5	9	12	15	24	35
	250	—	0	0	1	1	1	3	4	7	9	12	19	27
	300	—	0	0	1	1	1	2	4	6	8	10	16	24
	350	—	0	0	1	1	1	2	3	5	7	9	15	21
	400	—	0	0	0	1	1	1	3	5	6	8	13	19
	500	—	0	0	0	1	1	1	2	4	5	7	11	16
	600	—	0	0	0	1	1	1	1	3	4	5	9	13
	700	—	0	0	0	0	1	1	1	3	4	5	8	12
	750	—	0	0	0	0	1	1	1	2	3	5	7	11
	900	—	0	0	0	0	1	1	1	2	3	4	6	9
	1000	—	0	0	0	0	1	1	1	1	3	4	6	9
THHN, THWN, THWN-2	8	—	—	—	—	—	—	—	—	—	—	—	—	—
	6	—	2	4	7	13	17	29	41	64	86	111	175	253
	4	—	1	2	4	8	11	18	25	40	53	68	108	156
	2	—	1	1	3	5	8	13	18	28	38	49	77	112
	1	—	1	1	2	4	6	9	14	21	29	37	58	84
	1/0	—	1	1	1	3	5	8	12	18	24	31	49	72
	2/0	—	0	1	1	3	4	7	9	15	20	26	41	59
	3/0	—	0	1	1	2	3	5	8	12	17	22	34	50
	4/0	—	0	1	1	1	3	4	6	10	14	18	28	41
	250	—	0	0	1	1	1	3	5	8	11	14	22	32
	300	—	0	0	1	1	1	3	4	7	9	12	19	28
	350	—	0	0	1	1	1	3	4	6	8	10	17	24
	400	—	0	0	1	1	1	2	3	5	7	9	15	22
	500	—	0	0	0	1	1	1	3	4	6	8	13	18
	600	—	0	0	0	1	1	1	2	4	5	6	10	15
	700	—	0	0	0	1	1	1	1	3	4	5	9	13
	750	—	0	0	0	1	1	1	1	3	4	5	8	12
	900	—	0	0	0	0	1	1	1	2	3	4	7	10
	1000	—	0	0	0	0	1	1	1	2	3	4	6	9
XHHW, XHHW-2	8	—	3	5	8	14	20	33	47	73	99	127	200	290
	6	—	1	4	6	11	15	25	35	55	73	94	149	215
	4	—	1	2	4	8	11	18	25	40	53	68	108	156
	2	—	1	1	3	5	8	13	18	28	38	49	77	112
	1	—	1	1	2	4	6	9	14	21	29	37	58	84
	1/0	—	1	1	1	3	5	8	12	18	24	31	49	72
	2/0	—	1	1	1	3	4	7	10	15	20	26	42	60
	3/0	—	0	1	1	2	3	5	8	12	17	22	34	50
	4/0	—	0	1	1	1	3	5	7	10	14	18	29	42
	250	—	0	0	1	1	1	4	5	8	11	14	23	33

Type	Conductor Size (AWG/ kcmil)	Trade Size (Metric Designator)												
		⅜ (12)	½ (16)	¾ (21)	1 (27)	1¼ (35)	1½ (41)	2 (53)	2½ (63)	3 (78)	3½ (91)	4 (103)	5 (129)	6 (155)
	300	—	0	0	1	1	1	3	4	7	9	12	19	28
	350	—	0	0	1	1	1	3	4	6	8	11	17	25
	400	—	0	0	1	1	1	2	3	5	7	10	15	22
	500	—	0	0	0	1	1	1	3	4	6	8	13	18
	600	—	0	0	0	1	1	1	2	4	5	6	10	15
	700	—	0	0	0	1	1	1	1	3	4	5	9	13
	750	—	0	0	0	1	1	1	1	3	4	5	8	12
	900	—	0	0	0	0	1	1	1	2	3	4	7	10
	1000	—	0	0	0	0	1	1	1	2	3	4	6	9

Definition: *Compact stranding* is the result of a manufacturing process where the stranded conductor is
compressed to the extent that the interstices (voids between strand wires) are virtually eliminated.

Table C.12 Maximum Number of Conductors or Fixture Wires in Type A, Rigid PVC Conduit (Based on Chapter 9: Table 1, Table 4, and Table 5)

Type	Conductor Size (AWG/ kcmil)	Trade Size (Metric Designator)												
		⅜ (12)	½ (16)	¾ (21)	1 (27)	1¼ (35)	1½ (41)	2 (53)	2½ (63)	3 (78)	3½ (91)	4 (103)	5 (129)	6 (155)
CONDUCTORS														
RHH, RHW, RHW-2	14	—	5	9	14	24	31	49	74	112	146	187	—	—
	12	—	4	7	12	20	26	41	61	93	121	155	—	—
	10	—	3	6	10	16	21	33	50	75	98	125	—	—
	8	—	1	3	5	8	11	17	26	39	51	65	—	—
	6	—	1	2	4	6	9	14	21	31	41	52	—	—
	4	—	1	1	3	5	7	11	16	24	32	41	—	—
	3	—	1	1	3	4	6	9	14	21	28	36	—	—
	2	—	1	1	2	4	5	8	12	18	24	31	—	—
	1	—	0	1	1	2	3	5	8	12	16	20	—	—
	1/0	—	0	1	1	2	3	5	7	10	14	18	—	—
	2/0	—	0	1	1	1	2	4	6	9	12	15	—	—
	3/0	—	0	1	1	1	1	3	5	8	10	13	—	—
	4/0	—	0	0	1	1	1	3	4	7	9	11	—	—
	250	—	0	0	1	1	1	1	3	5	6	8	—	—
	300	—	0	0	1	1	1	1	3	4	6	7	—	—
	350	—	0	0	0	1	1	1	2	4	5	7	—	—
	400	—	0	0	0	1	1	1	2	3	5	6	—	—
	500	—	0	0	0	1	1	1	1	3	4	5	—	—
	600	—	0	0	0	0	1	1	1	2	3	4	—	—
	700	—	0	0	0	0	1	1	1	2	3	4	—	—
	750	—	0	0	0	0	1	1	1	1	3	4	—	—
	800	—	0	0	0	0	1	1	1	1	3	3	—	—

Type	Conductor Size (AWG/ kcmil)	Trade Size (Metric Designator)												
		3⁄8 (12)	½ (16)	¾ (21)	1 (27)	1¼ (35)	1½ (41)	2 (53)	2½ (63)	3 (78)	3½ (91)	4 (103)	5 (129)	6 (155)
	900	—	0	0	0	0	0	1	1	1	2	3	—	—
	1000	—	0	0	0	0	0	1	1	1	2	3	—	—
	1250	—	0	0	0	0	0	1	1	1	1	2	—	—
	1500	—	0	0	0	0	0	0	1	1	1	1	—	—
	1750	—	0	0	0	0	0	0	1	1	1	1	—	—
	2000	—	0	0	0	0	0	0	1	1	1	1	—	—
TW, THHW, THW, THW-2	14	—	11	18	31	51	67	105	157	235	307	395	—	—
	12	—	8	14	24	39	51	80	120	181	236	303	—	—
	10	—	6	10	18	29	38	60	89	135	176	226	—	—
	8	—	3	6	10	16	21	33	50	75	98	125	—	—
RHH*, RHW*, RHW-2*	14	—	7	12	20	34	44	69	104	157	204	262	—	—
	12	—	6	10	16	27	35	56	84	126	164	211	—	—
	10	—	4	8	13	21	28	44	65	98	128	165	—	—
	8	—	2	4	7	12	16	26	39	59	77	98	—	—
TW, THW, THHW, THW-2, RHH*, RHW*, RHW-2*	6	—	1	3	6	9	13	20	30	45	59	75	—	—
	4	—	1	2	4	7	9	15	22	33	44	56	—	—
	3	—	1	1	4	6	8	13	19	29	37	48	—	—
	2	—	1	1	3	5	7	11	16	24	32	41	—	—
	1	—	1	1	1	3	5	7	11	17	22	29	—	—
	1/0	—	1	1	1	3	4	6	10	14	19	24	—	—
	2/0	—	0	1	1	2	3	5	8	12	16	21	—	—
	3/0	—	0	1	1	1	3	4	7	10	13	17	—	—
	4/0	—	0	1	1	1	2	4	6	9	11	14	—	—
	250	—	0	0	1	1	1	3	4	7	9	12	—	—
	300	—	0	0	1	1	1	2	4	6	8	10	—	—
	350	—	0	0	1	1	1	2	3	5	7	9	—	—
	400	—	0	0	1	1	1	1	3	5	6	8	—	—
	500	—	0	0	0	1	1	1	2	4	5	7	—	—
	600	—	0	0	0	1	1	1	1	3	4	5	—	—
	700	—	0	0	0	1	1	1	1	3	4	5	—	—
	750	—	0	0	0	1	1	1	1	3	3	4	—	—
	800	—	0	0	0	0	1	1	1	2	3	4	—	—
	900	—	0	0	0	0	1	1	1	2	3	4	—	—
	1000	—	0	0	0	0	1	1	1	1	3	3	—	—
	1250	—	0	0	0	0	0	1	1	1	1	3	—	—
	1500	—	0	0	0	0	0	1	1	1	1	2	—	—
	1750	—	0	0	0	0	0	0	1	1	1	1	—	—
	2000	—	0	0	0	0	0	0	1	1	1	1	—	—
THHN, THWN, THWN-2	14	—	16	27	44	73	96	150	225	338	441	566	—	—
	12	—	11	19	32	53	70	109	164	246	321	412	—	—
	10	—	7	12	20	33	44	69	103	155	202	260	—	—

Type	Conductor Size (AWG/ kcmil)	Trade Size (Metric Designator)												
		⅜ (12)	½ (16)	¾ (21)	1 (27)	1¼ (35)	1½ (41)	2 (53)	2½ (63)	3 (78)	3½ (91)	4 (103)	5 (129)	6 (155)
	8	—	4	7	12	19	25	40	59	89	117	150	—	—
	6	—	3	5	8	14	18	28	43	64	84	108	—	—
	4	—	1	3	5	8	11	17	26	39	52	66	—	—
	3	—	1	2	4	7	9	15	22	33	44	56	—	—
	2	—	1	1	3	6	8	12	19	28	37	47	—	—
	1	—	1	1	2	4	6	9	14	21	27	35	—	—
	1/0	—	1	1	2	4	5	8	11	17	23	29	—	—
	2/0	—	1	1	1	3	4	6	10	14	19	24	—	—
	3/0	—	0	1	1	2	3	5	8	12	16	20	—	—
	4/0	—	0	1	1	1	3	4	6	10	13	17	—	—
	250	—	0	1	1	1	2	3	5	8	10	14	—	—
	300	—	0	0	1	1	1	3	4	7	9	12	—	—
	350	—	0	0	1	1	1	2	4	6	8	10	—	—
	400	—	0	0	1	1	1	2	3	5	7	9	—	—
	500	—	0	0	1	1	1	1	3	4	6	7	—	—
	600	—	0	0	0	1	1	1	2	3	5	6	—	—
	700	—	0	0	0	1	1	1	1	3	4	5	—	—
	750	—	0	0	0	1	1	1	1	3	4	5	—	—
	800	—	0	0	0	1	1	1	1	3	4	5	—	—
	900	—	0	0	0	0	1	1	1	2	3	4	—	—
	1000	—	0	0	0	0	1	1	1	2	3	4	—	—
FEP, FEPB, PFA, PFAH, TFE	14	—	15	26	43	70	93	146	218	327	427	549	—	—
	12	—	11	19	31	51	68	106	159	239	312	400	—	—
	10	—	8	13	22	37	48	76	114	171	224	287	—	—
	8	—	4	8	13	21	28	44	65	98	128	165	—	—
	6	—	3	5	9	15	20	31	46	70	91	117	—	—
	4	—	1	4	6	10	14	21	32	49	64	82	—	—
	3	—	1	3	5	8	11	18	27	40	53	68	—	—
	2	—	1	2	4	7	9	15	22	33	44	56	—	—
PFA, PFAH, TFE	1	—	1	1	3	5	6	10	15	23	30	39	—	—
PFA, PFAH, TFE, Z	1/0	—	1	1	2	4	5	8	13	19	25	32	—	—
	2/0	—	1	1	1	3	4	7	10	16	21	27	—	—
	3/0	—	1	1	1	3	3	6	9	13	17	22	—	—
	4/0	—	0	1	1	2	3	5	7	11	14	18	—	—
Z	14	—	18	31	52	85	112	175	262	395	515	661	—	—
	12	—	13	22	37	60	79	124	186	280	365	469	—	—
	10	—	8	13	22	37	48	76	114	171	224	287	—	—
	8	—	5	8	14	23	30	48	72	108	141	181	—	—
	6	—	3	6	10	16	21	34	50	76	99	127	—	—
	4	—	2	4	7	11	15	23	35	52	68	88	—	—

Type	Conductor Size (AWG/ kcmil)	Trade Size (Metric Designator)												
		⅜ (12)	½ (16)	¾ (21)	1 (27)	1¼ (35)	1½ (41)	2 (53)	2½ (63)	3 (78)	3½ (91)	4 (103)	5 (129)	6 (155)
	3	—	1	3	5	8	11	17	25	38	50	64	—	—
	2	—	1	2	4	7	9	14	21	32	41	53	—	—
	1	—	1	1	3	5	7	11	17	26	33	43	—	—
XHHW, ZW, XHHW-2, XHH	14	—	11	18	31	51	67	105	157	235	307	395	—	—
	12	—	8	14	24	39	51	80	120	181	236	303	—	—
	10	—	6	10	18	29	38	60	89	135	176	226	—	—
	8	—	3	6	10	16	21	33	50	75	98	125	—	—
	6	—	2	4	7	12	15	24	37	55	72	93	—	—
	4	—	1	3	5	8	11	18	26	40	52	67	—	—
	3	—	1	2	4	7	9	15	22	34	44	57	—	—
	2	—	1	1	3	6	8	12	19	28	37	48	—	—
XHHW, XHHW-2, XHH	1	—	1	1	3	4	6	9	14	21	28	35	—	—
	1/0	—	1	1	2	4	5	8	12	18	23	30	—	—
	2/0	—	1	1	1	3	4	6	10	15	19	25	—	—
	3/0	—	0	1	1	2	3	5	8	12	16	20	—	—
	4/0	—	0	1	1	1	3	4	7	10	13	17	—	—
	250	—	0	1	1	1	2	3	5	8	11	14	—	—
	300	—	0	0	1	1	1	3	5	7	9	12	—	—
	350	—	0	0	1	1	1	3	4	6	8	10	—	—
	400	—	0	0	1	1	1	2	3	5	7	9	—	—
	500	—	0	0	1	1	1	1	3	4	6	8	—	—
	600	—	0	0	0	1	1	1	2	3	5	6	—	—
	700	—	0	0	0	1	1	1	1	3	4	5	—	—
	750	—	0	0	0	1	1	1	1	3	4	5	—	—
	800	—	0	0	0	1	1	1	1	3	4	5	—	—
	900	—	0	0	0	0	1	1	1	2	3	4	—	—
	1000	—	0	0	0	0	1	1	1	2	3	4	—	—
	1250	—	0	0	0	0	0	1	1	1	2	3	—	—
	1500	—	0	0	0	0	0	1	1	1	1	2	—	—
	1750	—	0	0	0	0	0	1	1	1	1	2	—	—
	2000	—	0	0	0	0	0	0	1	1	1	1	—	—
FIXTURE WIRES														
RFH-2, FFH-2, RFHH-2	18	—	10	18	30	48	64	100	150	226	295	378	—	—
	16	—	9	15	25	41	54	85	127	190	248	319	—	—
SF-2, SFF-2	18	—	13	22	37	61	81	127	189	285	372	477	—	—
	16	—	11	18	31	51	67	105	157	235	307	395	—	—
	14	—	9	15	25	41	54	85	127	190	248	319	—	—
SF-1, SFF-1	18	—	23	40	66	108	143	224	335	504	658	844	—	—
RFH-1, TF, TFF, XF, XFF	18	—	17	29	49	80	105	165	248	372	486	623	—	—
	16	—	14	24	39	65	85	134	200	300	392	503	—	—

Type	Conductor Size (AWG/ kcmil)	Trade Size (Metric Designator)												
		⅜ (12)	½ (16)	¾ (21)	1 (27)	1¼ (35)	1½ (41)	2 (53)	2½ (63)	3 (78)	3½ (91)	4 (103)	5 (129)	6 (155)
XF, XFF	14	—	11	18	31	51	67	105	157	235	307	395	—	—
TFN, TFFN	18	—	28	47	79	128	169	265	396	596	777	998	—	—
	16	—	21	36	60	98	129	202	303	455	594	762	—	—
PF, PFF, PGF, PGFF, PAF, PTF, PTFF, PAFF	18	—	26	45	74	122	160	251	376	565	737	946	—	—
	16	—	20	34	58	94	124	194	291	437	570	732	—	—
	14	—	15	26	43	70	93	146	218	327	427	549	—	—
ZF, ZFF, ZHF	18	—	34	57	96	157	206	324	484	728	950	1220	—	—
	16	—	25	42	71	116	152	239	357	537	701	900	—	—
	14	—	18	31	52	85	112	175	262	395	515	661	—	—
KF-2, KFF-2	18	—	51	86	144	235	310	486	727	1092	1426	1829	—	—
	16	—	36	60	101	164	216	339	507	762	994	1276	—	—
	14	—	24	40	67	110	145	228	341	512	668	857	—	—
	12	—	16	28	47	77	101	158	237	356	465	596	—	—
	10	—	11	18	31	51	67	105	157	235	307	395	—	—
KF-1, KFF-1	18	—	59	100	166	272	357	561	839	1260	1645	2111	—	—
	16	—	41	70	117	191	251	394	589	886	1156	1483	—	—
	14	—	28	47	79	128	169	265	396	596	777	998	—	—
	12	—	18	31	52	85	112	175	262	395	515	661	—	—
	10	—	12	20	34	55	73	115	171	258	337	432	—	—
XF, XFF	12	—	6	10	16	27	35	56	84	126	164	211	—	—
	10	—	4	8	13	21	28	44	65	98	128	165	—	—

Notes:

1. This table is for concentric stranded conductors only. For compact stranded conductors, Table C.11(A)
should be used.

2. Two-hour fire-rated RHH cable has ceramifiable insulation, which has much larger diameters than other RHH wires. Consult manufacturer's conduit fill tables.

*Types RHH, RHW, and RHW-2 without outer covering.

Table C.12(A) Maximum Number of Conductors or Fixture Wires in Type A, Rigid PVC Conduit (Based on Chapter 9: Table 1, Table 4, and Table 5A)

Type	Conductor Size (AWG/ kcmil)	Trade Size (Metric Designator)												
		⅜ (12)	½ (16)	¾ (21)	1 (27)	1¼ (35)	1½ (41)	2 (53)	2½ (63)	3 (78)	3½ (91)	4 (103)	5 (129)	6 (155)
COMPACT CONDUCTORS														
THW, THW-2, THHW	8	—	3	5	8	14	18	28	42	64	84	107	—	—
	6	—	2	4	6	10	14	22	33	49	65	83	—	—
	4	—	1	3	5	8	10	16	24	37	48	62	—	—

Type	Conductor Size (AWG/ kcmil)	Trade Size (Metric Designator)												
		⅜ (12)	½ (16)	¾ (21)	1 (27)	1¼ (35)	1½ (41)	2 (53)	2½ (63)	3 (78)	3½ (91)	4 (103)	5 (129)	6 (155)
	2	—	1	1	3	6	7	12	18	27	36	46	—	—
	1	—	1	1	2	4	5	8	13	19	25	32	—	—
	1/0	—	1	1	1	3	4	7	11	16	21	28	—	—
	2/0	—	1	1	1	3	4	6	9	14	18	23	—	—
	3/0	—	0	1	1	2	3	5	8	12	15	20	—	—
	4/0	—	0	1	1	1	3	4	6	10	13	17	—	—
	250	—	0	1	1	1	1	3	5	8	10	13	—	—
	300	—	0	0	1	1	1	3	4	7	9	11	—	—
	350	—	0	0	1	1	1	2	4	6	8	10	—	—
	400	—	0	0	1	1	1	2	3	5	7	9	—	—
	500	—	0	0	1	1	1	1	3	4	6	8	—	—
	600	—	0	0	0	1	1	1	2	3	5	6	—	—
	700	—	0	0	0	1	1	1	1	3	4	5	—	—
	750	—	0	0	0	1	1	1	1	3	4	5	—	—
	900	—	0	0	0	0	1	1	1	2	3	4	—	—
	1000	—	0	0	0	0	1	1	1	2	3	4	—	—
THHN, THWN, THWN-2	8	—	—	—	—	—	—	—	—	—	—	—	—	—
	6	—	3	5	9	15	20	32	48	72	94	121	—	—
	4	—	1	3	6	9	12	20	30	45	58	75	—	—
	2	—	1	2	4	7	9	14	21	32	42	54	—	—
	1	—	1	1	3	5	7	10	16	24	31	40	—	—
	1/0	—	1	1	2	4	6	9	13	20	27	34	—	—
	2/0	—	1	1	1	3	5	7	11	17	22	28	—	—
	3/0	—	1	1	1	3	4	6	9	14	18	24	—	—
	4/0	—	0	1	1	2	3	5	8	11	15	19	—	—
	250	—	0	1	1	1	2	4	6	9	12	15	—	—
	300	—	0	1	1	1	1	3	5	8	10	13	—	—
	350	—	0	0	1	1	1	3	4	7	9	11	—	—
	400	—	0	0	1	1	1	2	4	6	8	10	—	—
	500	—	0	0	1	1	1	2	3	5	7	9	—	—
	600	—	0	0	0	1	1	1	3	4	5	7	—	—
	700	—	0	0	0	1	1	1	2	3	5	6	—	—
	750	—	0	0	0	1	1	1	2	3	4	6	—	—
	900	—	0	0	0	1	1	1	1	3	4	5	—	—
	1000	—	0	0	0	0	1	1	1	2	3	4	—	—
XHHW, XHHW-2	8	—	4	6	11	18	23	37	55	83	108	139	—	—
	6	—	3	5	8	13	17	27	41	62	80	103	—	—
	4	—	1	3	6	9	12	20	30	45	58	75	—	—
	2	—	1	2	4	7	9	14	21	32	42	54	—	—
	1	—	1	1	3	5	7	10	16	24	31	40	—	—
	1/0	—	1	1	2	4	6	9	13	20	27	34	—	—

Type	Conductor Size (AWG/ kcmil)	⅜ (12)	½ (16)	¾ (21)	1 (27)	1¼ (35)	1½ (41)	2 (53)	2½ (63)	3 (78)	3½ (91)	4 (103)	5 (129)	6 (155)
	2/0	—	1	1	1	3	5	7	11	17	22	29	—	—
	3/0	—	1	1	1	3	4	6	9	14	18	24	—	—
	4/0	—	0	1	1	2	3	5	8	12	15	20	—	—
	250	—	0	1	1	1	2	4	6	9	12	16	—	—
	300	—	0	1	1	1	1	3	5	8	10	13	—	—
	350	—	0	0	1	1	1	3	5	7	9	12	—	—
	400	—	0	0	1	1	1	3	4	6	8	11	—	—
	500	—	0	0	1	1	1	2	3	5	7	9	—	—
	600	—	0	0	0	1	1	1	3	4	5	7	—	—
	700	—	0	0	0	1	1	1	2	3	5	6	—	—
	750	—	0	0	0	1	1	1	2	3	4	6	—	—
	900	—	0	0	0	1	1	1	1	3	4	5	—	—
	1000	—	0	0	0	0	1	1	1	2	3	4	—	—

Definition: *Compact stranding* is the result of a manufacturing process where the stranded conductor is
compressed to the extent that the interstices (voids between strand wires) are virtually eliminated.

Table C.13 Maximum Number of Conductors or Fixture Wires in Type EB, PVC Conduit (Based on Chapter 9: Table 1, Table 4, and Table 5)

Type	Conductor Size (AWG/ kcmil)	Trade Size (Metric Designator)												
		⅜ (12)	½ (16)	¾ (21)	1 (27)	1¼ (35)	1½ (41)	2 (53)	2½ (63)	3 (78)	3½ (91)	4 (103)	5 (129)	6 (155)
CONDUCTORS														
RHH, RHW, RHW-2	14	—	—	—	—	—	—	53	—	119	155	197	303	430
	12	—	—	—	—	—	—	44	—	98	128	163	251	357
	10	—	—	—	—	—	—	35	—	79	104	132	203	288
	8	—	—	—	—	—	—	18	—	41	54	69	106	151
	6	—	—	—	—	—	—	15	—	33	43	55	85	121
	4	—	—	—	—	—	—	11	—	26	34	43	66	94
	3	—	—	—	—	—	—	10	—	23	30	38	58	83
	2	—	—	—	—	—	—	9	—	20	26	33	50	72
	1	—	—	—	—	—	—	6	—	13	17	21	33	47
	1/0	—	—	—	—	—	—	5	—	11	15	19	29	41
	2/0	—	—	—	—	—	—	4	—	10	13	16	25	36
	3/0	—	—	—	—	—	—	4	—	8	11	14	22	31
	4/0	—	—	—	—	—	—	3	—	7	9	12	18	26
	250	—	—	—	—	—	—	2	—	5	7	9	14	20
	300	—	—	—	—	—	—	1	—	5	6	8	12	17
	350	—	—	—	—	—	—	1	—	4	5	7	11	16
	400	—	—	—	—	—	—	1	—	4	5	6	10	14

Type	Conductor Size (AWG/ kcmil)	Trade Size (Metric Designator)												
		⅜ (12)	½ (16)	¾ (21)	1 (27)	1¼ (35)	1½ (41)	2 (53)	2½ (63)	3 (78)	3½ (91)	4 (103)	5 (129)	6 (155)
	500	—	—	—	—	—	—	1	—	3	4	5	9	12
	600	—	—	—	—	—	—	1	—	3	3	4	7	10
	700	—	—	—	—	—	—	1	—	2	3	4	6	9
	750	—	—	—	—	—	—	1	—	2	3	4	6	9
	800	—	—	—	—	—	—	1	—	2	3	4	6	8
	900	—	—	—	—	—	—	1	—	1	2	3	5	7
	1000	—	—	—	—	—	—	1	—	1	2	3	5	7
	1250	—	—	—	—	—	—	1	—	1	1	2	3	5
	1500	—	—	—	—	—	—	0	—	1	1	1	3	4
	1750	—	—	—	—	—	—	0	—	1	1	1	3	4
	2000	—	—	—	—	—	—	0	—	1	1	1	2	3
TW, THHW, THW, THW-2	14	—	—	—	—	—	—	111	—	250	327	415	638	907
	12	—	—	—	—	—	—	85	—	192	251	319	490	696
	10	—	—	—	—	—	—	63	—	143	187	238	365	519
	8	—	—	—	—	—	—	35	—	79	104	132	203	288
RHH*, RHW*, RHW-2*	14	—	—	—	—	—	—	74	—	166	217	276	424	603
	12	—	—	—	—	—	—	59	—	134	175	222	341	485
	10	—	—	—	—	—	—	46	—	104	136	173	266	378
	8	—	—	—	—	—	—	28	—	62	81	104	159	227
TW, THW, THHW, THW-2, RHH*, RHW*, RHW-2*	6	—	—	—	—	—	—	21	—	48	62	79	122	173
	4	—	—	—	—	—	—	16	—	36	46	59	91	129
	3	—	—	—	—	—	—	13	—	30	40	51	78	111
	2	—	—	—	—	—	—	11	—	26	34	43	66	94
	1	—	—	—	—	—	—	8	—	18	24	30	46	66
	1/0	—	—	—	—	—	—	7	—	15	20	26	40	56
	2/0	—	—	—	—	—	—	6	—	13	17	22	34	48
	3/0	—	—	—	—	—	—	5	—	11	14	18	28	40
	4/0	—	—	—	—	—	—	4	—	9	12	15	24	34
	250	—	—	—	—	—	—	3	—	7	10	12	19	27
	300	—	—	—	—	—	—	3	—	6	8	11	17	24
	350	—	—	—	—	—	—	2	—	6	7	9	15	21
	400	—	—	—	—	—	—	2	—	5	7	8	13	19
	500	—	—	—	—	—	—	1	—	4	5	7	11	16
	600	—	—	—	—	—	—	1	—	3	4	6	9	13
	700	—	—	—	—	—	—	1	—	3	4	5	8	11
	750	—	—	—	—	—	—	1	—	3	4	5	7	11
	800	—	—	—	—	—	—	1	—	3	3	4	7	10
	900	—	—	—	—	—	—	1	—	2	3	4	6	9
	1000	—	—	—	—	—	—	1	—	2	3	4	6	8
	1250	—	—	—	—	—	—	1	—	1	2	3	4	6
	1500	—	—	—	—	—	—	1	—	1	1	2	4	6

Type	Conductor Size (AWG/ kcmil)	Trade Size (Metric Designator)												
		⅜ (12)	½ (16)	¾ (21)	1 (27)	1¼ (35)	1½ (41)	2 (53)	2½ (63)	3 (78)	3½ (91)	4 (103)	5 (129)	6 (155)
	1750	—	—	—	—	—	—	1	—	1	1	2	3	5
	2000	—	—	—	—	—	—	0	—	1	1	1	3	4
THHN, THWN, THWN-2	14	—	—	—	—	—	—	159	—	359	468	595	915	1300
	12	—	—	—	—	—	—	116	—	262	342	434	667	948
	10	—	—	—	—	—	—	73	—	165	215	274	420	597
	8	—	—	—	—	—	—	42	—	95	124	158	242	344
	6	—	—	—	—	—	—	30	—	68	89	114	175	248
	4	—	—	—	—	—	—	19	—	42	55	70	107	153
	3	—	—	—	—	—	—	16	—	36	46	59	91	129
	2	—	—	—	—	—	—	13	—	30	39	50	76	109
	1	—	—	—	—	—	—	10	—	22	29	37	57	80
	1/0	—	—	—	—	—	—	8	—	18	24	31	48	68
	2/0	—	—	—	—	—	—	7	—	15	20	26	40	56
	3/0	—	—	—	—	—	—	5	—	13	17	21	33	47
	4/0	—	—	—	—	—	—	4	—	10	14	18	27	39
	250	—	—	—	—	—	—	4	—	8	11	14	22	31
	300	—	—	—	—	—	—	3	—	7	10	12	19	27
	350	—	—	—	—	—	—	3	—	6	8	11	17	24
	400	—	—	—	—	—	—	2	—	6	7	10	15	21
	500	—	—	—	—	—	—	1	—	5	6	8	12	18
	600	—	—	—	—	—	—	1	—	4	5	6	10	14
	700	—	—	—	—	—	—	1	—	3	4	6	9	12
	750	—	—	—	—	—	—	1	—	3	4	5	8	12
	800	—	—	—	—	—	—	1	—	3	4	5	8	11
	900	—	—	—	—	—	—	1	—	3	3	4	7	10
	1000	—	—	—	—	—	—	1	—	2	3	4	6	9
FEP, FEPB, PFA, PFAH, TFE	14	—	—	—	—	—	—	155	—	348	454	578	887	1261
	12	—	—	—	—	—	—	113	—	254	332	422	648	920
	10	—	—	—	—	—	—	81	—	182	238	302	465	660
	8	—	—	—	—	—	—	46	—	104	136	173	266	378
	6	—	—	—	—	—	—	33	—	74	97	123	189	269
	4	—	—	—	—	—	—	23	—	52	68	86	132	188
	3	—	—	—	—	—	—	19	—	43	56	72	110	157
	2	—	—	—	—	—	—	16	—	36	46	59	91	129
PFA, PFAH, TFE	1	—	—	—	—	—	—	11	—	25	32	41	63	90
PFA, PFAH, TFE, Z	1/0	—	—	—	—	—	—	9	—	20	27	34	53	75
	2/0	—	—	—	—	—	—	7	—	17	22	28	43	62
	3/0	—	—	—	—	—	—	6	—	14	18	23	36	51
	4/0	—	—	—	—	—	—	5	—	11	15	19	29	42
Z	14	—	—	—	—	—	—	186	—	419	547	696	1069	1519

Type	Conductor Size (AWG/ kcmil)	Trade Size (Metric Designator)												
		⅜ (12)	½ (16)	¾ (21)	1 (27)	1¼ (35)	1½ (41)	2 (53)	2½ (63)	3 (78)	3½ (91)	4 (103)	5 (129)	6 (155)
	12	—	—	—	—	—	—	132	—	297	388	494	759	1078
	10	—	—	—	—	—	—	81	—	182	238	302	465	660
	8	—	—	—	—	—	—	51	—	115	150	191	294	417
	6	—	—	—	—	—	—	36	—	81	105	134	206	293
	4	—	—	—	—	—	—	24	—	55	72	92	142	201
	3	—	—	—	—	—	—	18	—	40	53	67	104	147
	2	—	—	—	—	—	—	15	—	34	44	56	86	122
	1	—	—	—	—	—	—	12	—	27	36	45	70	99
XHHW, ZW, XHHW-2, XHH	14	—	—	—	—	—	—	111	—	250	327	415	638	907
	12	—	—	—	—	—	—	85	—	192	251	319	490	696
	10	—	—	—	—	—	—	63	—	143	187	238	365	519
	8	—	—	—	—	—	—	35	—	79	104	132	203	288
	6	—	—	—	—	—	—	26	—	59	77	98	150	213
	4	—	—	—	—	—	—	19	—	42	56	71	109	155
	3	—	—	—	—	—	—	16	—	36	47	60	92	131
	2	—	—	—	—	—	—	13	—	30	39	50	77	110
XHHW, XHHW-2, XHH	1	—	—	—	—	—	—	10	—	22	29	37	58	82
	1/0	—	—	—	—	—	—	8	—	19	25	31	48	69
	2/0	—	—	—	—	—	—	7	—	16	20	26	40	57
	3/0	—	—	—	—	—	—	6	—	13	17	22	33	47
	4/0	—	—	—	—	—	—	5	—	11	14	18	27	39
	250	—	—	—	—	—	—	4	—	9	11	15	22	32
	300	—	—	—	—	—	—	3	—	7	10	12	19	28
	350	—	—	—	—	—	—	3	—	6	8	11	17	24
	400	—	—	—	—	—	—	2	—	6	8	10	15	22
	500	—	—	—	—	—	—	1	—	5	6	8	12	18
	600	—	—	—	—	—	—	1	—	4	5	6	10	14
	700	—	—	—	—	—	—	1	—	3	4	6	9	12
	750	—	—	—	—	—	—	1	—	3	4	5	8	12
	800	—	—	—	—	—	—	1	—	3	4	5	8	11
	900	—	—	—	—	—	—	1	—	3	3	4	7	10
	1000	—	—	—	—	—	—	1	—	2	3	4	6	9
	1250	—	—	—	—	—	—	1	—	1	2	3	5	7
	1500	—	—	—	—	—	—	1	—	1	1	3	4	6
	1750	—	—	—	—	—	—	1	—	1	1	2	4	5
	2000	—	—	—	—	—	—	0	—	1	1	1	3	5
FIXTURE WIRES														
RFH-2, FFH-2, RFHH-2	18	—	—	—	—	—	—	107	—	240	313	398	612	869
	16	—	—	—	—	—	—	90	—	202	264	336	516	733
SF-2, SFF-2	18	—	—	—	—	—	—	134	—	303	395	502	772	1096
	16	—	—	—	—	—	—	111	—	250	327	415	638	907

Type	Conductor Size (AWG/ kcmil)	Trade Size (Metric Designator)												
		⅜ (12)	½ (16)	¾ (21)	1 (27)	1¼ (35)	1½ (41)	2 (53)	2½ (63)	3 (78)	3½ (91)	4 (103)	5 (129)	6 (155)
	14	—	—	—	—	—	—	90	—	202	264	336	516	733
SF-1, SFF-1	18	—	—	—	—	—	—	238	—	536	699	889	1366	1940
RFH-1, TF, TFF, XF, XFF	18	—	—	—	—	—	—	176	—	396	516	656	1009	1433
	16	—	—	—	—	—	—	142	—	319	417	530	814	1157
XF, XFF	14	—	—	—	—	—	—	111	—	250	327	415	638	907
TFN, TFFN	18	—	—	—	—	—	—	281	—	633	826	1050	1614	2293
	16	—	—	—	—	—	—	215	—	484	631	802	1233	1751
PF, PFF, PGF, PGFF, PAF, PTF, PTFF, PAFF	18	—	—	—	—	—	—	267	—	600	783	996	1530	2174
	16	—	—	—	—	—	—	206	—	464	606	770	1183	1681
	14	—	—	—	—	—	—	155	—	348	454	578	887	1261
ZF, ZFF, ZHF	18	—	—	—	—	—	—	344	—	774	1010	1284	1973	2802
	16	—	—	—	—	—	—	254	—	571	745	947	1455	2067
	14	—	—	—	—	—	—	186	—	419	547	696	1069	1519
KF-2, KFF-2	18	—	—	—	—	—	—	516	—	1161	1515	1926	2959	4204
	16	—	—	—	—	—	—	360	—	810	1057	1344	2064	2933
	14	—	—	—	—	—	—	242	—	544	710	903	1387	1970
	12	—	—	—	—	—	—	168	—	378	494	628	965	1371
	10	—	—	—	—	—	—	111	—	250	327	415	638	907
KF-1, KFF-1	18	—	—	—	—	—	—	596	—	1340	1748	2222	3414	4850
	16	—	—	—	—	—	—	419	—	941	1228	1562	2399	3408
	14	—	—	—	—	—	—	281	—	633	826	1050	1614	2293
	12	—	—	—	—	—	—	186	—	419	547	696	1069	1519
	10	—	—	—	—	—	—	122	—	274	358	455	699	993
XF, XFF	12	—	—	—	—	—	—	59	—	134	175	222	341	485
	10	—	—	—	—	—	—	46	—	104	136	173	266	378

Notes:

1. This table is for concentric stranded conductors only. For compact stranded conductors, Table C.12(A)
should be used.

2. Two-hour fire-rated RHH cable has ceramifiable insulation, which has much larger diameters than other RHH wires.
Consult manufacturer's conduit fill tables.

*Types RHH, RHW, and RHW-2 without outer covering.

Table C.13(A) Maximum Number of Conductors or Fixture Wires in Type EB, PVC Conduit (Based on Chapter 9: Table 1, Table 4, and Table 5A)

Type	Conductor Size (AWG/ kcmil)	Trade Size (Metric Designator)												
		⅜ (12)	½ (16)	¾ (21)	1 (27)	1¼ (35)	1½ (41)	2 (53)	2½ (63)	3 (78)	3½ (91)	4 (103)	5 (129)	6 (155)
COMPACT CONDUCTORS														
THW, THW-2, THHW	8	—	—	—	—	—	—	30	—	68	89	113	174	247
	6	—	—	—	—	—	—	23	—	52	69	87	134	191
	4	—	—	—	—	—	—	17	—	39	51	65	100	143
	2	—	—	—	—	—	—	13	—	29	38	48	74	105
	1	—	—	—	—	—	—	9	—	20	26	34	52	74
	1/0	—	—	—	—	—	—	8	—	17	23	29	45	64
	2/0	—	—	—	—	—	—	6	—	15	19	24	38	54
	3/0	—	—	—	—	—	—	5	—	12	16	21	32	46
	4/0	—	—	—	—	—	—	4	—	10	14	17	27	38
	250	—	—	—	—	—	—	3	—	8	11	14	21	30
	300	—	—	—	—	—	—	3	—	7	9	12	19	26
	350	—	—	—	—	—	—	3	—	6	8	11	17	24
	400	—	—	—	—	—	—	2	—	6	7	10	15	21
	500	—	—	—	—	—	—	1	—	5	6	8	12	18
	600	—	—	—	—	—	—	1	—	4	5	6	10	14
	700	—	—	—	—	—	—	1	—	3	4	6	9	13
	750	—	—	—	—	—	—	1	—	3	4	5	8	12
	900	—	—	—	—	—	—	1	—	3	4	5	7	10
	1000	—	—	—	—	—	—	1	—	2	3	4	7	9
THHN, THWN, THWN-2	8	—	—	—	—	—	—	—	—	—	—	—	—	—
	6	—	—	—	—	—	—	34	—	77	100	128	196	279
	4	—	—	—	—	—	—	21	—	47	62	79	121	172
	2	—	—	—	—	—	—	15	—	34	44	57	87	124
	1	—	—	—	—	—	—	11	—	25	33	42	65	93
	1/0	—	—	—	—	—	—	9	—	22	28	36	56	79
	2/0	—	—	—	—	—	—	8	—	18	23	30	46	65
	3/0	—	—	—	—	—	—	6	—	15	20	25	38	55
	4/0	—	—	—	—	—	—	5	—	12	16	20	32	45
	250	—	—	—	—	—	—	4	—	10	13	16	25	35
	300	—	—	—	—	—	—	4	—	8	11	14	22	31
	350	—	—	—	—	—	—	3	—	7	9	12	19	27
	400	—	—	—	—	—	—	3	—	6	8	11	17	24
	500	—	—	—	—	—	—	2	—	5	7	9	14	20
	600	—	—	—	—	—	—	1	—	4	6	7	11	16
	700	—	—	—	—	—	—	1	—	4	5	6	10	14
	750	—	—	—	—	—	—	1	—	4	5	6	9	14
	900	—	—	—	—	—	—	1	—	3	4	5	8	11
	1000	—	—	—	—	—	—	1	—	3	3	4	7	10
XHHW, XHHW-2	8	—	—	—	—	—	—	39	—	88	115	146	225	320
	6	—	—	—	—	—	—	29	—	65	85	109	167	238

Type	Conductor Size (AWG/ kcmil)	Trade Size (Metric Designator)												
		3/8 (12)	1/2 (16)	3/4 (21)	1 (27)	1 1/4 (35)	1 1/2 (41)	2 (53)	2 1/2 (63)	3 (78)	3 1/2 (91)	4 (103)	5 (129)	6 (155)
	4	—	—	—	—	—	—	21	—	47	62	79	121	172
	2	—	—	—	—	—	—	15	—	34	44	57	87	124
	1	—	—	—	—	—	—	11	—	25	33	42	65	93
	1/0	—	—	—	—	—	—	9	—	22	28	36	56	79
	2/0	—	—	—	—	—	—	8	—	18	24	30	47	67
	3/0	—	—	—	—	—	—	6	—	15	20	25	38	55
	4/0	—	—	—	—	—	—	5	—	12	16	21	32	46
	250	—	—	—	—	—	—	4	—	10	13	17	26	37
	300	—	—	—	—	—	—	4	—	8	11	14	22	31
	350	—	—	—	—	—	—	3	—	7	10	12	19	28
	400	—	—	—	—	—	—	3	—	7	9	11	17	25
	500	—	—	—	—	—	—	2	—	5	7	9	14	20
	600	—	—	—	—	—	—	1	—	4	6	7	11	16
	700	—	—	—	—	—	—	1	—	4	5	6	10	14
	750	—	—	—	—	—	—	1	—	3	5	6	9	13
	900	—	—	—	—	—	—	1	—	3	4	5	8	11
	1000	—	—	—	—	—	—	1	—	3	4	5	7	10

Definition: *Compact stranding* is the result of a manufacturing process where the stranded conductor is
compressed to the extent that the interstices (voids between strand wires) are virtually eliminated.

Table C.14 Number of Type MC Cables Permitted in Cable Tray (3C Multiconductor MC Cable Non-Jacketed Assembly)

(Based on fill in accordance with 392.22, Table 392.22(A), column 1, ampacity in accordance with 392.80)

-	-	Ventilated Tray Width [mm (in.)]											-
Conductor Insulation Type	Conductor Size (AWG/kcmil)	50 (2)	100 (4)	150 (6)	200 (8)	300 (12)	400 (16)	450 (18)	500 (20)	600 (24)	750 (30)	900 (36)	Cable Diameter
THHN													
	14	13	27	41	55	82	110	124	138	165	206	248	0.46
	12	10	20	31	41	62	83	93	104	124	160	192	0.53
	10	7	15	23	31	47	62	70	78	94	119	149	0.61
	8	6	12	18	25	37	50	56	63	75	96	116	0.68
	6	4	8	13	17	26	34	39	43	52	66	79	0.82
	4	2	5	8	11	17	23	26	29	35	45	55	0.99
	3	2	5	7	10	15	21	23	26	31	40	48	1.05
	2	2	4	6	9	13	18	20	22	27	34	41	1.13
	1	2	4	6	8	12	16	18	20	24	30	36	1.2
	1/0	1	3	5	7	11	14	16	18	22	28	34	1.25
	2/0	1	3	4	6	9	13	14	16	19	24	29	1.34
	3/0	1	2	3	5	7	10	11	13	15	20	24	1.49

-	-	Ventilated Tray Width [mm (in.)]											-
Conductor Insulation Type	Conductor Size (AWG/kcmil)	50 (2)	100 (4)	150 (6)	200 (8)	300 (12)	400 (16)	450 (18)	500 (20)	600 (24)	750 (30)	900 (36)	Cable Diameter
	4/0	1	2	3	5	7	10	11	12	15	19	22	1.57
	250	1	2	3	4	6	9	10	11	13	17	20	1.74
	300	1	2	3	4	6	8	9	10	12	16	19	1.86
	350	1	2	3	4	6	8	9	10	12	15	18	1.96
	400	0	1	2	3	5	7	8	9	11	14	17	2.11
	500	0	1	2	3	5	7	7	8	10	13	16	2.24
	600	0	1	2	3	4	6	7	8	9	12	15	2.38
	700	0	1	2	3	4	6	7	7	9	11	14	2.52
	750	0	1	2	2	4	5	6	7	8	11	13	2.67
	800	0	1	2	2	4	5	6	6	8	10	12	2.85
	900	0	1	1	2	3	5	5	6	7	10	12	2.99
	1000	0	1	1	2	3	4	5	6	7	9	11	3.25

Note: Single conductor diameters were obtained from Chapter 9, Table 5.

Table C.15 Number of Type MC Cables Permitted in Cable Tray (4C Multiconductor MC Cable Non-Jacketed Assembly) (Based on fill in accordance with 392.22, Table 392.22(A), column 1, ampacity in accordance with 392.80)

Conductor Insulation Type	Conductor Size (AWG/kcmil)	Ventilated Tray Width [mm (in.)]												Cable Diameter
		50 (2)	100 (4)	150 (6)	200 (8)	225 (9)	300 (12)	400 (16)	450 (18)	500 (20)	600 (24)	750 (30)	900 (36)	
THHN														
	14	10	23	37	47	55	73	94	110	120	146	183	219	0.494
	12	8	18	28	37	43	57	73	85	93	114	142	171	0.56
	10	6	14	21	27	32	42	54	63	69	84	105	127	0.65
	8	5	11	17	22	25	33	43	50	55	67	84	100	0.73
	6	3	7	12	15	17	23	30	35	38	46	58	69	0.88
	4	2	5	8	10	11	15	19	23	25	30	38	45	1.09
	3	2	4	7	9	10	13	17	20	22	27	33	40	1.155
	2	2	3	5	7	8	11	14	16	18	21	27	32	1.29
	1	1	3	5	6	7	10	12	15	16	19	24	29	1.355
	1/0	1	3	5	6	7	9	12	14	15	19	24	28	1.375
	2/0	1	2	3	4	5	7	9	10	11	14	17	21	1.608
	3/0	1	2	3	4	4	6	7	9	10	12	15	17	1.75
	4/0	1	2	3	4	4	6	8	9	10	12	15	18	1.97
	250	0	1	2	3	4	5	7	8	9	11	14	17	2.01
	300	0	1	2	3	3	5	7	7	8	10	13	15	2.255
	350	0	1	2	3	3	5	6	7	8	10	12	15	2.39
	400	0	1	2	3	3	4	6	7	8	9	12	14	2.46
	500	0	1	2	2	3	4	5	6	7	8	11	13	2.71
	600	0	1	2	2	3	4	5	6	6	8	10	12	2.92
	700	0	1	2	2	3	4	5	6	6	8	10	12	2.98
	750	0	1	1	2	2	3	4	5	5	7	8	10	3.34

Conductor Insulation Type	Conductor Size (AWG/kcmil)	Ventilated Tray Width [mm (in.)] 50 (2)	100 (4)	150 (6)	200 (8)	225 (9)	300 (12)	400 (16)	450 (18)	500 (20)	600 (24)	750 (30)	900 (36)	Cable Diameter
	800	0	1	1	2	2	3	4	4	5	6	8	9	3.71
	900	0	1	1	2	2	3	4	4	5	6	7	9	3.98
	1000	0	0	1	1	2	2	3	4	4	5	7	8	4.15

Table C.16 Number of Type TC Cables Permitted in Cable Tray (3C Multiconductor TC Cable Assembly)

(Based on fill in accordance with 392.22, Table 392.22(A), column 1, ampacity in accordance with 392.80)

Conductor Insulation Type	Conductor Size (AWG/kcmil)	Ventilated Tray Width [mm (in.)] 50 (2)	100 (4)	150 (6)	200 (8)	225 (9)	300 (12)	400 (16)	450 (18)	500 (20)	600 (24)	750 (30)	900 (36)	Cable Diameter
THHN														
	14	12	26	41	52	61	81	104	122	133	162	203	243	0.469
	12	9	20	32	41	47	63	81	95	104	126	158	189	0.532
	10	7	15	24	30	35	47	60	71	77	94	118	141	0.616
	8	5	12	19	24	29	38	49	57	62	76	95	114	0.685
	6	4	9	13	17	20	26	34	40	43	53	66	79	0.821
	4	4	8	13	16	19	26	33	38	42	51	64	77	0.834
	3	3	7	11	14	16	22	28	32	35	43	54	65	0.910
	2	3	6	9	12	14	18	23	27	30	36	45	55	0.990
	1	2	4	6	8	10	13	17	19	21	26	32	39	1.175
	1/0	2	4	6	8	9	12	15	18	20	24	30	36	1.220
	2/0	1	3	5	7	8	10	13	16	17	21	26	31	1.310
	3/0	1	3	4	6	7	9	12	13	15	18	22	27	1.410
	4/0	1	2	3	5	5	7	10	11	12	15	19	23	1.558
	250	1	2	3	4	5	6	9	10	11	13	17	20	1.720
	300	1	2	3	4	4	6	8	9	10	12	15	18	1.912
	350	1	2	3	4	4	6	8	9	10	12	15	18	1.953
	400	0	1	2	3	4	5	7	8	9	11	14	17	2.099
	500	0	1	2	3	4	5	7	8	8	10	13	16	2.239
	600	0	1	2	3	3	4	6	7	8	9	12	14	2.433
	700	0	1	2	3	3	4	6	6	7	9	11	13	2.661
	750	0	1	2	2	3	4	5	6	7	8	10	13	2.769
	800	0	1	2	2	3	4	5	6	6	8	10	12	2.988
	900	0	1	1	2	2	3	5	5	6	7	9	11	3.010
	1000	0	1	1	2	2	3	4	5	6	7	9	10	3.273

Table C.17 Number of Type TC Cables Permitted in Cable Tray (4C Multiconductor TC Cable Assembly)

(Based on fill in accordance with 392.22, Table 392.22(A), column 1, ampacity in accordance with 392.80)

Conductor Insulation Type	Conductor Size (AWG/kcmil)	Ventilated Tray Width [mm (in.)] 50 (2)	100 (4)	150 (6)	200 (8)	225 (9)	300 (12)	400 (16)	450 (18)	500 (20)	600 (24)	750 (30)	900 (36)	Cable Diameter
THHN														
	14	11	24	37	48	56	74	95	111	122	148	186	223	0.49
	12	8	18	28	37	43	57	73	85	93	114	142	171	0.56
	10	6	14	21	27	32	42	54	63	69	84	105	127	0.65
	8	5	11	17	22	25	33	43	50	55	67	84	100	0.73
	6	3	7	12	15	17	23	30	35	38	46	58	69	0.88
	4	3	6	10	12	15	19	25	29	32	39	48	58	0.96
	3	2	5	8	11	12	16	21	25	27	33	41	49	1.041
	2	2	4	7	9	10	14	18	21	23	28	34	41	1.137
	1	1	3	5	7	8	10	13	15	17	21	26	31	1.315
	1/0	1	3	5	6	7	10	12	14	16	19	24	29	1.365
	2/0	1	3	4	5	6	8	10	12	13	16	20	24	1.49
	3/0	1	2	3	4	5	7	9	10	11	14	17	21	1.598
	4/0	2	2	3	4	5	6	9	10	11	13	17	20	1.75
	250	1	2	3	4	4	6	8	9	10	12	15	18	1.91
	300	0	1	2	3	4	5	7	8	9	11	14	17	2.11
	350	0	1	2	3	4	5	7	8	9	11	13	16	2.16
	400	0	1	2	3	3	5	6	7	8	10	12	15	2.35
	500	0	1	2	3	3	4	6	7	7	9	11	14	2.52
	600	0	1	2	2	3	4	5	6	7	8	11	13	2.71
	700	0	1	2	2	3	4	5	6	6	8	10	12	2.91
	750	0	1	1	2	2	3	5	5	6	7	9	11	3.02
	800	0	1	1	2	2	3	4	5	6	7	9	10	3.33
	900	0	1	1	2	2	3	4	4	5	6	8	9	3.69
	1000	0	0	1	1	2	2	3	4	4	5	7	8	4.02

Table C.18 Number of Single Conductor Cables Permitted in Cable Tray
(Based on fill in accordance with 392.22, Table 392.22(B)(1), column 1, ampacity in accordance with 392.80)

Conductor Insulation Type	Conductor Size (AWG/kcmil)	Ventilated Tray Width [mm (in.)] 50 (2)	100 (4)	150 (6)	200 (8)	225 (9)	300 (12)	400 (16)	450 (18)	500 (20)	600 (24)	750 (30)	900 (36)	Cable Diameter
THHN														
	1/0	4	8	12	16	18	24	32	36	40	48	61	74	0.486
	2/0	3	7	11	14	16	22	29	33	37	44	56	67	0.532
	3/0	3	6	10	13	15	20	26	30	33	40	51	61	0.584
	4/0	3	6	9	12	14	18	24	27	30	36	46	56	0.642
	250	5	10	16	21	23	32	42	48	53	64	81	98	0.711
	300	4	9	13	18	20	27	37	41	46	55	70	84	0.766
	350	4	8	12	16	18	24	32	36	40	48	61	74	0.817
	400	3	7	10	14	16	21	29	32	36	43	55	66	0.864
	500	3	6	9	12	13	18	24	27	30	36	45	55	0.949
	600	2	4	7	9	10	14	19	22	24	29	37	44	1.051

Conductor Insulation Type	Conductor Size (AWG/kcmil)	Ventilated Tray Width [mm (in.)]												Cable Diameter
		50 (2)	100 (4)	150 (6)	200 (8)	225 (9)	300 (12)	400 (16)	450 (18)	500 (20)	600 (24)	750 (30)	900 (36)	
	700	2	4	6	8	9	12	17	19	21	25	32	39	1.122
	750	2	4	6	8	9	12	16	18	20	24	30	37	1.156
	800	1	3	5	7	8	11	15	17	19	23	29	35	1.188
	900	1	3	5	6	7	10	13	15	17	20	26	31	1.252
	1000	1	3	4	6	7	9	12	13	15	18	22	27	1.31

Table C.19 Number of Single Conductor Cables Permitted in Cable Tray
(Based on fill in accordance with 392.22, Table 392.22(B)(1), column 1, ampacity in accordance with 392.80)

Conductor Insulation Type	Conductor Size (AWG/kcmil)	Ventilated Tray Width [mm (in.)]												Cable Diameter
		50 (2)	100 (4)	150 (6)	200 (8)	225 (9)	300 (12)	400 (16)	450 (18)	500 (20)	600 (24)	750 (30)	900 (36)	
XHHW														
	1/0	4	8	12	16	18	24	32	36	40	49	62	74	0.482
	2/0	3	7	11	14	17	22	29	33	37	44	56	68	0.528
	3/0	3	6	10	13	15	20	27	30	33	40	51	62	0.58
	4/0	3	6	9	12	12	18	24	27	30	37	47	56	0.638
	250	5	10	16	21	24	32	43	49	54	65	83	98	0.705
	300	4	9	14	18	20	28	37	42	47	56	71	85	0.76
	350	4	8	12	16	18	24	33	37	41	49	62	75	0.811
	400	3	7	11	14	16	22	29	33	36	44	56	67	0.858
	500	3	6	9	12	13	18	24	27	30	36	46	55	0.943
	600	2	4	7	9	10	14	19	22	24	29	37	44	1.053
	700	2	4	6	8	9	12	17	19	21	25	32	39	1.124
	750	2	4	6	8	9	12	16	18	20	24	30	37	1.158
	800	1	3	5	7	8	11	15	17	19	23	29	35	1.19
	900	1	3	5	6	7	10	13	15	17	20	26	31	1.254
	1000	1	3	4	6	7	9	12	13	15	18	22	27	1.312

Table C.20 Number of Single Conductor Cables Permitted in Cable Tray
(Based on fill in accordance with 392.22, Table 392.22(B)(1), column 1, ampacity in accordance with 392.80)

Conductor Insulation Type	Conductor Size (AWG/kcmil)	Ventilated Tray Width [mm (in.)]												Cable Diameter
		50 (2)	100 (4)	150 (6)	200 (8)	225 (9)	300 (12)	400 (16)	450 (18)	500 (20)	600 (24)	750 (30)	900 (36)	
RHW														
	1/0	3	7	11	14	16	22	29	33	37	44	56	67	0.532
	2/0	3	6	10	13	15	20	27	30	34	40	51	62	0.578
	3/0	3	6	9	12	14	18	24	28	31	37	47	57	0.63
	4/0	2	5	8	11	13	17	22	25	28	34	43	52	0.688
	250	4	9	13	18	20	27	37	41	46	55	70	84	0.765
	300	4	8	12	16	17	24	32	36	40	48	61	73	0.82
	350	3	7	10	14	15	21	28	32	35	42	54	65	0.871

Conductor Insulation Type	Conductor Size (AWG/kcmil)	Ventilated Tray Width [mm (in.)] 50 (2)	100 (4)	150 (6)	200 (8)	225 (9)	300 (12)	400 (16)	450 (18)	500 (20)	600 (24)	750 (30)	900 (36)	Cable Diameter
	400	3	6	9	12	14	19	25	28	32	38	49	58	0.918
	500	2	5	8	10	12	16	21	24	26	32	41	49	1.003
	600	2	4	6	8	9	13	17	19	21	26	33	40	1.113
	700	1	3	5	7	8	11	15	17	19	23	29	35	1.184
	750	1	3	5	7	8	10	14	16	18	21	27	33	1.218
	800	1	3	5	6	7	10	13	15	17	20	26	31	1.25
	900	1	3	4	6	7	9	12	14	15	18	23	28	1.314
	1000	1	2	4	5	6	8	11	12	14	17	21	26	1.372

Additional Proposed Changes

File Name	Description	Approved
.1690396711003	NEC TIA 23-7 Log 1678	

Statement of Problem and Substantiation for Public Input

NOTE: This public input originates from Tentative Interim Amendment No. 23-7 (Log 1678) issued by the Standards Council on December 8, 2022 and per the NFPA Regs., needs to be reconsidered by the Code-Making Panel for the next edition of the Document.

Substantiation: There are cross-references in several Annex C table headers that do not align with the referenced sections in Article 392.

Emergency Nature: The standard contains an error or an omission that was overlooked during the regular revision process.

It has come to my attention that several of the tables added to the 2020 NEC and carried over to the 2023 NEC contain cross-references in the table headers that do not align with the intended section references in Article 392. This needs to be corrected in both editions to ensure that the information is technically accurate.

Submitter Information Verification

Submitter Full Name: CMP ON NEC-P08
Organization: NFPA
Street Address:
City:
State:
Zip:
Submittal Date: Wed Jul 26 14:22:14 EDT 2023
Committee: NEC-P08

Committee Statement

Resolution: FR-7791-NFPA 70-2024

Statement: Tables references corrected.

Tentative Interim Amendment

NFPA® 70®

National Electrical Code®

2023 Edition

Reference: Table C.18, Table C.19 and Table C.20
TIA 23-7
(SC 22-12-7 / TIA Log #1678)

Pursuant to Section 5 of the NFPA *Regulations Governing the Development of NFPA Standards*, the National Fire Protection Association has issued the following Tentative Interim Amendment to NFPA 70®, *National Electrical Code®*, 2023 edition. The TIA was processed by the NEC Code-Making Panel 8, and the NEC Correlating Committee, and was issued by the Standards Council on December 8, 2022, with an effective date of December 28, 2022.

*1. Revise Table Headers **only** for Table C.18, Table, C.19 and Table C.20 to read as follows:*

Table C.18 Number of Single Conductor Cables Permitted in Cable Tray
(Based on fill in accordance with 392.22, Table 392.22~~(A)~~(B)(1), column 1, ampacity in accordance with 392.80)

Table C.19 Number of Single Conductor Cables Permitted in Cable Tray
(Based on fill in accordance with 392.22, Table 392.22~~(A)~~(B)(1), column 1, ampacity in accordance with 392.80)

Table C.20 Number of Single Conductor Cables Permitted in Cable Tray
(Based on fill in accordance with 392.22, Table 392.22~~(A)~~(B)(1), column 1, ampacity in accordance with 392.80)

Issue Date: December 8, 2022

Effective Date: December 28, 2022

(Note: For further information on NFPA Codes and Standards, please see www.nfpa.org/docinfo)

Public Input No. 2879-NFPA 70-2023 [New Part after I.]

380.2 Listing Requirements.

Multioutlet assemblies and associated fittings shall be listed.

Statement of Problem and Substantiation for Public Input

Multioutlet assemblies have become more and more complex products over the years. Today's multioutlet assemblies can be motor operated or of modular floor mounted designs often including telephone equipment and communication circuit protectors making the need for the NEC to require listing a necessity. The Eighth Issue of the Outline of Investigation for Multioutlet Assemblies, UL 111, dated January 9, 2023, addresses the critical construction, performance, marking and installation instructions, provides guidance for online instructions and requires compliance with The Standard for Audio/Video, Information and Communication Technology Equipment – Part 1: Safety Requirements, UL 62368-1 for telephone equipment and communication circuit protectors that can be included in Multioutlet Assemblies. UL 111 is currently being proposed to be a first edition ANSI/UL standard. As multioutlet assemblies have become more complex over the years a listing requirement in the NEC will greatly assist AHJs when performing inspections.

Submitter Information Verification

Submitter Full Name: David Gerstetter
Organization: Ul Solutions
Affiliation: UL Solutions
Street Address:
City:
State:
Zip:

Submittal Date: Fri Aug 25 20:38:17 EDT 2023
Committee: NEC-P08

Committee Statement

Resolution: FR-7508-NFPA 70-2024

Statement: Due to increased complexities in multioutlet assemblies a listing requirement is necessary to ensure these products meet the applicable product safety standard.

Public Input No. 115-NFPA 70-2023 [Sections Part III., 342.100, 342.120]

~~**Sections Part III., 342.100, 342.120**~~

~~**Part III.** Construction Specifications~~

~~**342.100** Construction.~~

~~IMC shall be made of one of the following:~~

(1) ~~Steel, with protective coatings~~

(2) ~~Stainless steel~~

~~**342.120** Marking.~~

~~Each length shall be clearly and durably marked at least every 1.5 m (5 ft) with the letters IMC. Each length shall be marked as required in the first sentence of 110.21(A) .~~

Statement of Problem and Substantiation for Public Input

Part III can be deleted in its entirety since these raceways are required to be listed and must meet product standards in order to achieve that listing.

Related Public Inputs for This Document

Related Input	Relationship
Public Input No. 114-NFPA 70-2023 [Sections Part III., 340.104, 340.108, 340.112, 340.116]	Removal of construction criteria for listed wiring methods
Public Input No. 113-NFPA 70-2023 [Sections Part III., 337.104, 337.108, 337.112, 337.114, 337...]	Removal of construction criteria for listed wiring methods
Public Input No. 112-NFPA 70-2023 [Sections Part III., 336.100, 336.104, 336.116, 336.120, 336...]	Removal of construction criteria for listed wiring methods
Public Input No. 111-NFPA 70-2023 [Sections Part III., 332.104, 332.108, 332.112, 332.116]	Removal of construction criteria for listed wiring methods
Public Input No. 110-NFPA 70-2023 [Sections Part III., 330.104, 330.108, 330.112, 330.116, 330...]	Removal of construction criteria for listed wiring methods
Public Input No. 109-NFPA 70-2023 [Sections Part III., 324.100, 324.101, 324.112, 324.120]	Removal of construction criteria for listed wiring methods
Public Input No. 108-NFPA 70-2023 [Sections Part III., 322.100, 322.104, 322.112, 322.120]	Removal of construction criteria for listed wiring methods
Public Input No. 107-NFPA 70-2023 [Sections Part III., 338.100, 338.120]	Removal of construction criteria for listed wiring methods
Public Input No. 106-NFPA 70-2023 [Sections Part III., 320.100, 320.104, 320.108, 320.120]	Removal of construction criteria for listed wiring

	methods
Public Input No. 105-NFPA 70-2023 [Sections Part III., 334.100, 334.104, 334.108, 334.112, 334...]	Removal of construction criteria for listed wiring methods
Public Input No. 116-NFPA 70-2023 [Sections Part III., 344.100, 344.120]	
Public Input No. 117-NFPA 70-2023 [Sections Part III., 350.120]	
Public Input No. 118-NFPA 70-2023 [Sections Part III., 352.100, 352.120]	
Public Input No. 119-NFPA 70-2023 [Sections Part III., 353.100, 353.120]	
Public Input No. 120-NFPA 70-2023 [Sections Part III., 354.100, 354.120]	
Public Input No. 121-NFPA 70-2023 [Sections Part III., 355.100, 355.120]	
Public Input No. 122-NFPA 70-2023 [Sections Part III., 356.100, 356.120]	
Public Input No. 123-NFPA 70-2023 [Sections Part III., 358.100, 358.120]	

Submitter Information Verification

Submitter Full Name:	Russ Leblanc
Organization:	Leblanc Consulting Services
Street Address:	
City:	
State:	
Zip:	
Submittal Date:	Wed Jan 11 14:11:15 EST 2023
Committee:	NEC-P08

Committee Statement

Resolution: Generally, material and equipment used throughout this document are listed and labeled. Removal of Sections X.100 and X.120 would remove any information of construction in Part III. As standards become multi-national, construction requirements within the NEC are reasons for national differences within the standard. Removal of the requirements in the NEC would allow for Standard Owner’s to define minimum criteria for safety without NFPA influence. The Article does not define which Standard is expected to be the basis of the listing, therefore the Article lists the minimum criteria in order for the conduit to be listed.

Public Input No. 116-NFPA 70-2023 [Sections Part III., 344.100, 344.120]

~~**Sections Part III., 344.100, 344.120**~~

~~**Part III.** Construction Specifications~~

~~**344.100** Construction.~~

~~RMC shall be made of one of the following:~~

(1) ~~Steel with protective coatings~~

(2) ~~Aluminum~~

(3) ~~Red brass~~

(4) ~~Stainless steel~~

~~**344.120** Marking.~~

~~Each length shall be clearly and durably identified in every 3 m (10 ft) as required in the first sentence of 110.21(A) . Nonferrous conduit of corrosion-resistant material shall have suitable markings.~~

Statement of Problem and Substantiation for Public Input

Part III can be deleted in its entirety since these raceways are required to be listed and must meet product standards in order to achieve that listing.

Related Public Inputs for This Document

Related Input	Relationship
Public Input No. 115-NFPA 70-2023 [Sections Part III., 342.100, 342.120]	Removal of construction criteria for listed wiring methods
Public Input No. 114-NFPA 70-2023 [Sections Part III., 340.104, 340.108, 340.112, 340.116]	Removal of construction criteria for listed wiring methods
Public Input No. 113-NFPA 70-2023 [Sections Part III., 337.104, 337.108, 337.112, 337.114, 337...]	Removal of construction criteria for listed wiring methods
Public Input No. 112-NFPA 70-2023 [Sections Part III., 336.100, 336.104, 336.116, 336.120, 336...]	Removal of construction criteria for listed wiring methods
Public Input No. 111-NFPA 70-2023 [Sections Part III., 332.104, 332.108, 332.112, 332.116]	Removal of construction criteria for listed wiring methods
Public Input No. 110-NFPA 70-2023 [Sections Part III., 330.104, 330.108, 330.112, 330.116, 330...]	Removal of construction criteria for listed wiring methods
Public Input No. 109-NFPA 70-2023 [Sections Part III., 324.100, 324.101, 324.112, 324.120]	Removal of construction criteria for listed wiring methods

Public Input No. 108-NFPA 70-2023 [Sections Part III., 322.100, 322.104, 322.112, 322.120]	Removal of construction criteria for listed wiring methods
Public Input No. 107-NFPA 70-2023 [Sections Part III., 338.100, 338.120]	Removal of construction criteria for listed wiring methods
Public Input No. 106-NFPA 70-2023 [Sections Part III., 320.100, 320.104, 320.108, 320.120]	Removal of construction criteria for listed wiring methods
Public Input No. 105-NFPA 70-2023 [Sections Part III., 334.100, 334.104, 334.108, 334.112, 334...]	Removal of construction criteria for listed wiring methods
Public Input No. 117-NFPA 70-2023 [Sections Part III., 350.120]	
Public Input No. 118-NFPA 70-2023 [Sections Part III., 352.100, 352.120]	
Public Input No. 119-NFPA 70-2023 [Sections Part III., 353.100, 353.120]	
Public Input No. 120-NFPA 70-2023 [Sections Part III., 354.100, 354.120]	
Public Input No. 121-NFPA 70-2023 [Sections Part III., 355.100, 355.120]	
Public Input No. 122-NFPA 70-2023 [Sections Part III., 356.100, 356.120]	
Public Input No. 123-NFPA 70-2023 [Sections Part III., 358.100, 358.120]	

Submitter Information Verification

Submitter Full Name:	Russ Leblanc
Organization:	Leblanc Consulting Services
Street Address:	
City:	
State:	
Zip:	
Submittal Date:	Wed Jan 11 14:15:44 EST 2023
Committee:	NEC-P08

Committee Statement

Resolution: Generally, material and equipment used throughout this document are listed and labeled. Removal of Sections X.100 and X.120 would remove any information of construction in Part III. As standards become multi-national, construction requirements within the NEC are reasons for national differences within the standard. Removal of the requirements in the NEC would allow for Standard Owner's to define minimum criteria for safety without NFPA influence. The Article does not define which Standard is expected to be the basis of the listing, therefore the Article lists the minimum criteria in order for the conduit to be listed.

Public Input No. 117-NFPA 70-2023 [Sections Part III., 350.120]

~~**Sections Part III., 350.120**~~

~~**Part III.** Construction Specifications~~

~~**350.120** Marking.~~

~~LFMC shall be marked according to 110.21 . The trade size and other information required by the listing shall also be marked on the conduit. Conduit suitable for direct burial shall be so marked.~~

Statement of Problem and Substantiation for Public Input

Part III can be deleted in its entirety since these raceways are required to be listed and must meet product standards in order to achieve that listing.

Related Public Inputs for This Document

Related Input	Relationship
Public Input No. 116-NFPA 70-2023 [Sections Part III., 344.100, 344.120]	Removal of construction criteria for listed wiring methods
Public Input No. 115-NFPA 70-2023 [Sections Part III., 342.100, 342.120]	Removal of construction criteria for listed wiring methods
Public Input No. 114-NFPA 70-2023 [Sections Part III., 340.104, 340.108, 340.112, 340.116]	Removal of construction criteria for listed wiring methods
Public Input No. 113-NFPA 70-2023 [Sections Part III., 337.104, 337.108, 337.112, 337.114, 337...]	Removal of construction criteria for listed wiring methods
Public Input No. 112-NFPA 70-2023 [Sections Part III., 336.100, 336.104, 336.116, 336.120, 336...]	Removal of construction criteria for listed wiring methods
Public Input No. 111-NFPA 70-2023 [Sections Part III., 332.104, 332.108, 332.112, 332.116]	Removal of construction criteria for listed wiring methods
Public Input No. 110-NFPA 70-2023 [Sections Part III., 330.104, 330.108, 330.112, 330.116, 330...]	Removal of construction criteria for listed wiring methods
Public Input No. 109-NFPA 70-2023 [Sections Part III., 324.100, 324.101, 324.112, 324.120]	Removal of construction criteria for listed wiring methods
Public Input No. 108-NFPA 70-2023 [Sections Part III., 322.100, 322.104, 322.112, 322.120]	Removal of construction criteria for listed wiring methods
Public Input No. 107-NFPA 70-2023 [Sections Part III., 338.100, 338.120]	Removal of construction criteria for listed wiring methods
Public Input No. 106-NFPA 70-2023 [Sections Part III., 320.100, 320.104, 320.108, 320.120]	Removal of construction criteria for listed wiring

	methods
[Public Input No. 105-NFPA 70-2023 [Sections Part III., 334.100, 334.104, 334.108, 334.112, 334...]]	Removal of construction criteria for listed wiring methods
[Public Input No. 118-NFPA 70-2023 [Sections Part III., 352.100, 352.120]]	
[Public Input No. 119-NFPA 70-2023 [Sections Part III., 353.100, 353.120]]	
[Public Input No. 120-NFPA 70-2023 [Sections Part III., 354.100, 354.120]]	
[Public Input No. 121-NFPA 70-2023 [Sections Part III., 355.100, 355.120]]	
[Public Input No. 122-NFPA 70-2023 [Sections Part III., 356.100, 356.120]]	
[Public Input No. 123-NFPA 70-2023 [Sections Part III., 358.100, 358.120]]	

Submitter Information Verification

Submitter Full Name:	Russ Leblanc
Organization:	Leblanc Consulting Services
Street Address:	
City:	
State:	
Zip:	
Submittal Date:	Wed Jan 11 14:20:20 EST 2023
Committee:	NEC-P08

Committee Statement

Resolution: Generally, material and equipment used throughout this document are listed and labeled. Removal of Section X.120 would remove any information of construction in Part III. As standards become multi-national, construction requirements within the NEC are reasons for national differences within the standard. Removal of the requirements in the NEC would allow for Standard Owner’s to define minimum criteria for safety without NFPA influence. The Article does not define which Standard is expected to be the basis of the listing, therefore the Article lists the minimum criteria in order for the conduit to be listed.

Public Input No. 118-NFPA 70-2023 [Sections Part III., 352.100, 352.120]

~~**Sections Part III., 352.100, 352.120**~~

~~**Part III.** Construction Specifications~~

~~**352.100** Construction.~~

~~PVC conduit shall be made of rigid (nonplasticized) polyvinyl chloride (PVC). PVC conduit and fittings shall be composed of suitable nonmetallic material that is resistant to moisture and chemical atmospheres. For use aboveground, it shall also be flame retardant, resistant to impact and crushing, resistant to distortion from heat under conditions likely to be encountered in service, and resistant to low temperature and sunlight effects. For use underground, the material shall be acceptably resistant to moisture and corrosive agents and shall be of sufficient strength to withstand abuse, such as by impact and crushing, in handling and during installation. Where intended for direct burial, without encasement in concrete, the material shall also be capable of withstanding continued loading that is likely to be encountered after installation.~~

~~**352.120** Marking.~~

~~Each length of PVC conduit shall be clearly and durably marked at least every 3 m (10 ft) as required in the first sentence of 110.21(A) . The type of material shall also be included in the marking unless it is visually identifiable. For conduit recognized for use aboveground, these markings shall be permanent. For conduit limited to underground use only, these markings shall be sufficiently durable to remain legible until the material is installed. Conduit shall be permitted to be surface marked to indicate special characteristics of the material.~~

~~Informational Note: Examples of these markings include but are not limited to “limited smoke” and “sunlight resistant.”~~

Statement of Problem and Substantiation for Public Input

Part III can be deleted in its entirety since these raceways are required to be listed and must meet product standards in order to achieve that listing.

Related Public Inputs for This Document

Related Input	Relationship
Public Input No. 117-NFPA 70-2023 [Sections Part III., 350.120]	Removal of construction criteria for listed wiring methods
Public Input No. 116-NFPA 70-2023 [Sections Part III., 344.100, 344.120]	Removal of construction criteria for listed wiring methods
Public Input No. 115-NFPA 70-2023 [Sections Part III., 342.100, 342.120]	Removal of construction criteria for listed wiring methods
Public Input No. 114-NFPA 70-2023 [Sections Part III., 340.104, 340.108, 340.112, 340.116]	Removal of construction criteria for listed wiring methods
Public Input No. 113-NFPA 70-2023 [Sections Part III., 337.104, 337.108, 337.112, 337.114, 337...]	Removal of construction criteria for listed wiring methods
Public Input No. 112-NFPA 70-2023 [Sections Part III., 336.100, 336.104, 336.116, 336.120, 336...]	Removal of construction criteria for listed wiring

	methods
Public Input No. 111-NFPA 70-2023 [Sections Part III., 332.104, 332.108, 332.112, 332.116]	Removal of construction criteria for listed wiring methods
Public Input No. 110-NFPA 70-2023 [Sections Part III., 330.104, 330.108, 330.112, 330.116, 330...]	Removal of construction criteria for listed wiring methods
Public Input No. 109-NFPA 70-2023 [Sections Part III., 324.100, 324.101, 324.112, 324.120]	Removal of construction criteria for listed wiring methods
Public Input No. 108-NFPA 70-2023 [Sections Part III., 322.100, 322.104, 322.112, 322.120]	Removal of construction criteria for listed wiring methods
Public Input No. 107-NFPA 70-2023 [Sections Part III., 338.100, 338.120]	Removal of construction criteria for listed wiring methods
Public Input No. 106-NFPA 70-2023 [Sections Part III., 320.100, 320.104, 320.108, 320.120]	Removal of construction criteria for listed wiring methods
Public Input No. 105-NFPA 70-2023 [Sections Part III., 334.100, 334.104, 334.108, 334.112, 334...]	Removal of construction criteria for listed wiring methods
Public Input No. 119-NFPA 70-2023 [Sections Part III., 353.100, 353.120]	
Public Input No. 120-NFPA 70-2023 [Sections Part III., 354.100, 354.120]	
Public Input No. 121-NFPA 70-2023 [Sections Part III., 355.100, 355.120]	
Public Input No. 122-NFPA 70-2023 [Sections Part III., 356.100, 356.120]	
Public Input No. 123-NFPA 70-2023 [Sections Part III., 358.100, 358.120]	

Submitter Information Verification

Submitter Full Name:	Russ Leblanc
Organization:	Leblanc Consulting Services
Street Address:	
City:	
State:	
Zip:	
Submittal Date:	Wed Jan 11 14:24:11 EST 2023
Committee:	NEC-P08

Committee Statement

Resolution: Generally, material and equipment used throughout this document are listed and labeled. Removal of Sections X.100 and X.120 would remove any information of construction in Part III. As standards become multi-national, construction requirements within the NEC are reasons for national differences within the standard. Removal of the requirements in the NEC would allow for Standard Owner's to define minimum criteria for safety without NFPA influence. The Article does not define which Standard is expected to be the basis of the listing, therefore the Article lists the minimum criteria in order for the conduit to be listed.

Public Input No. 119-NFPA 70-2023 [Sections Part III., 353.100, 353.120]

~~**Sections Part III., 353.100, 353.120**~~

~~**Part III.** Construction Specifications~~

~~**353.100** Construction.~~

~~HDPE conduit shall be composed of high density polyethylene that is resistant to moisture and chemical atmospheres. The material shall be resistant to moisture and corrosive agents and shall be of sufficient strength to withstand abuse, such as by impact and crushing, in handling and during installation. Where intended for direct burial, without encasement in concrete, the material shall also be capable of withstanding continued loading that is likely to be encountered after installation.~~

~~**353.120** Marking.~~

~~Each length of HDPE shall be clearly and durably marked at least every 3 m (10 ft) as required in 110.21 . The type of material shall also be included in the marking.~~

Statement of Problem and Substantiation for Public Input

Part III can be deleted in its entirety since these raceways are required to be listed and must meet product standards in order to achieve that listing.

Related Public Inputs for This Document

Related Input	Relationship
Public Input No. 118-NFPA 70-2023 [Sections Part III., 352.100, 352.120]	Removal of construction specifications for listed wiring methods
Public Input No. 117-NFPA 70-2023 [Sections Part III., 350.120]	Removal of construction specifications for listed wiring methods
Public Input No. 116-NFPA 70-2023 [Sections Part III., 344.100, 344.120]	Removal of construction specifications for listed wiring methods
Public Input No. 115-NFPA 70-2023 [Sections Part III., 342.100, 342.120]	Removal of construction specifications for listed wiring methods
Public Input No. 114-NFPA 70-2023 [Sections Part III., 340.104, 340.108, 340.112, 340.116]	Removal of construction specifications for listed wiring methods
Public Input No. 113-NFPA 70-2023 [Sections Part III., 337.104, 337.108, 337.112, 337.114, 337...]	Removal of construction specifications for listed wiring methods
Public Input No. 112-NFPA 70-2023 [Sections Part III., 336.100, 336.104, 336.116, 336.120, 336...]	Removal of construction specifications for listed wiring methods
Public Input No. 111-NFPA 70-2023 [Sections Part III., 332.104, 332.108, 332.112, 332.116]	Removal of construction specifications for listed wiring methods
Public Input No. 110-NFPA 70-2023 [Sections Part III., 330.104, 330.108, 330.112, 330.116, 330...]	Removal of construction specifications for listed wiring

	methods
Public Input No. 109-NFPA 70-2023 [Sections Part III., 324.100, 324.101, 324.112, 324.120]	Removal of construction specifications for listed wiring methods
Public Input No. 108-NFPA 70-2023 [Sections Part III., 322.100, 322.104, 322.112, 322.120]	Removal of construction specifications for listed wiring methods
Public Input No. 107-NFPA 70-2023 [Sections Part III., 338.100, 338.120]	Removal of construction specifications for listed wiring methods
Public Input No. 106-NFPA 70-2023 [Sections Part III., 320.100, 320.104, 320.108, 320.120]	Removal of construction specifications for listed wiring methods
Public Input No. 105-NFPA 70-2023 [Sections Part III., 334.100, 334.104, 334.108, 334.112, 334...]	Removal of construction specifications for listed wiring methods
Public Input No. 120-NFPA 70-2023 [Sections Part III., 354.100, 354.120]	
Public Input No. 121-NFPA 70-2023 [Sections Part III., 355.100, 355.120]	
Public Input No. 122-NFPA 70-2023 [Sections Part III., 356.100, 356.120]	
Public Input No. 123-NFPA 70-2023 [Sections Part III., 358.100, 358.120]	

Submitter Information Verification

Submitter Full Name:	Russ Leblanc
Organization:	Leblanc Consulting Services
Street Address:	
City:	
State:	
Zip:	
Submittal Date:	Wed Jan 11 14:29:48 EST 2023
Committee:	NEC-P08

Committee Statement

Resolution: Generally, material and equipment used throughout this document are listed and labeled. Removal of Sections X.100 and X.120 would remove any information of construction in Part III. As standards become multi-national, construction requirements within the NEC are reasons for national differences within the standard. Removal of the requirements in the NEC would allow for Standard Owner's to define minimum criteria for safety without NFPA influence. The Article does not define which Standard is expected to be the basis of the listing, therefore the Article lists the minimum criteria in order for the conduit to be listed.

Public Input No. 120-NFPA 70-2023 [Sections Part III., 354.100, 354.120]

~~**Sections Part III., 354.100, 354.120**~~

~~**Part III.** Construction Specifications~~

~~**354.100** Construction.~~

~~**(A)** General.~~

~~NUCC is an assembly that is provided in continuous lengths shipped in a coil, reel, or carton.~~

~~**(B)** Nonmetallic Underground Conduit.~~

~~The nonmetallic underground conduit shall be listed and composed of a material that is resistant to moisture and corrosive agents. It shall also be capable of being supplied on reels without damage or distortion and shall be of sufficient strength to withstand abuse, such as impact or crushing, in handling and during installation without damage to conduit or conductors.~~

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

~~Conductors and cables used in NUCC shall be listed and shall comply with 310.10(C) . Conductors of different systems shall be installed in accordance with 300.3(C) .~~

~~**(D)** Conductor Fill.~~

~~The maximum number of conductors or cables in NUCC shall not exceed that permitted by the percentage fill in Table 1, Chapter 9.~~

~~**354.120** Marking.~~

~~NUCC shall be clearly and durably marked at least every 3.05 m (10 ft) as required by 110.21 . The type of conduit material shall also be included in the marking.~~

~~Identification of conductors or cables used in the assembly shall be provided on a tag attached to each end of the assembly or to the side of a reel. Enclosed conductors or cables shall be marked in accordance with 310.8 .~~

Statement of Problem and Substantiation for Public Input

Part III can be deleted in its entirety since these raceways are required to be listed and must meet product standards in order to achieve that listing.

Related Public Inputs for This Document

Related Input	Relationship
Public Input No. 119-NFPA 70-2023 [Sections Part III., 353.100, 353.120]	Removal of construction specifications for listed wiring methods
Public Input No. 118-NFPA 70-2023 [Sections Part III., 352.100, 352.120]	Removal of construction specifications for listed wiring methods
Public Input No. 117-NFPA 70-2023 [Sections Part III., 350.120]	Removal of construction specifications for listed wiring methods
Public Input No. 116-NFPA 70-2023 [Sections Part III., 344.100, 344.120]	Removal of construction specifications for listed wiring methods

Public Input No. 115-NFPA 70-2023 [Sections Part III., 342.100, 342.120]	Removal of construction specifications for listed wiring methods
Public Input No. 114-NFPA 70-2023 [Sections Part III., 340.104, 340.108, 340.112, 340.116]	Removal of construction specifications for listed wiring methods
Public Input No. 113-NFPA 70-2023 [Sections Part III., 337.104, 337.108, 337.112, 337.114, 337...]	Removal of construction specifications for listed wiring methods
Public Input No. 112-NFPA 70-2023 [Sections Part III., 336.100, 336.104, 336.116, 336.120, 336...]	Removal of construction specifications for listed wiring methods
Public Input No. 111-NFPA 70-2023 [Sections Part III., 332.104, 332.108, 332.112, 332.116]	Removal of construction specifications for listed wiring methods
Public Input No. 110-NFPA 70-2023 [Sections Part III., 330.104, 330.108, 330.112, 330.116, 330...]	Removal of construction specifications for listed wiring methods
Public Input No. 109-NFPA 70-2023 [Sections Part III., 324.100, 324.101, 324.112, 324.120]	Removal of construction specifications for listed wiring methods
Public Input No. 108-NFPA 70-2023 [Sections Part III., 322.100, 322.104, 322.112, 322.120]	Removal of construction specifications for listed wiring methods
Public Input No. 107-NFPA 70-2023 [Sections Part III., 338.100, 338.120]	Removal of construction specifications for listed wiring methods
Public Input No. 106-NFPA 70-2023 [Sections Part III., 320.100, 320.104, 320.108, 320.120]	Removal of construction specifications for listed wiring methods
Public Input No. 105-NFPA 70-2023 [Sections Part III., 334.100, 334.104, 334.108, 334.112, 334...]	Removal of construction specifications for listed wiring methods
Public Input No. 121-NFPA 70-2023 [Sections Part III., 355.100, 355.120]	
Public Input No. 122-NFPA 70-2023 [Sections Part III., 356.100, 356.120]	
Public Input No. 123-NFPA 70-2023 [Sections Part III., 358.100, 358.120]	

Submitter Information Verification

Submitter Full Name:	Russ Leblanc
Organization:	Leblanc Consulting Services
Street Address:	
City:	
State:	
Zip:	
Submittal Date:	Wed Jan 11 14:33:49 EST 2023
Committee:	NEC-P08

Committee Statement

Resolution: Generally, material and equipment used throughout this document are listed and labeled. Removal of Sections X.100 and X.120 would remove any information of construction in Part III. As standards become multi-national, construction requirements within the NEC are reasons for national differences within the standard. Removal of the requirements in the NEC would allow for Standard Owner's to define minimum criteria for safety without NFPA influence. The Article does not define which Standard is expected to be the basis of the listing, therefore the Article lists the minimum criteria in order for the conduit to be listed.

Public Input No. 121-NFPA 70-2023 [Sections Part III., 355.100, 355.120]

~~**Sections Part III., 355.100, 355.120**~~

~~**Part III.** Construction Specifications~~

~~**355.100** Construction.~~

~~RTRC and fittings shall be composed of suitable nonmetallic material that is resistant to moisture and chemical atmospheres. For use aboveground, it shall also be flame retardant, resistant to impact and crushing, resistant to distortion from heat under conditions likely to be encountered in service, and resistant to low temperature and sunlight effects. For use underground, the material shall be acceptably resistant to moisture and corrosive agents and shall be of sufficient strength to withstand abuse, such as by impact and crushing, in handling and during installation. Where intended for direct burial, without encasement in concrete, the material shall also be capable of withstanding continued loading that is likely to be encountered after installation.~~

~~**355.120** Marking.~~

~~Each length of RTRC shall be clearly and durably marked at least every 3 m (10 ft) as required in the first sentence of 110.21(A) . The type of material shall also be included in the marking unless it is visually identifiable. For conduit recognized for use aboveground, these markings shall be permanent. For conduit limited to underground use only, these markings shall be sufficiently durable to remain legible until the material is installed. Conduit shall be permitted to be surface marked to indicate special characteristics of the material.~~

> ~~Informational Note: Examples of these markings include but are not limited to “limited smoke” and “sunlight resistant.”~~

Statement of Problem and Substantiation for Public Input

Part III can be deleted in its entirety since these raceways are required to be listed and must meet product standards in order to achieve that listing.

Related Public Inputs for This Document

Related Input	Relationship
Public Input No. 120-NFPA 70-2023 [Sections Part III., 354.100, 354.120]	Removal of construction specifications for listed wiring methods
Public Input No. 119-NFPA 70-2023 [Sections Part III., 353.100, 353.120]	Removal of construction specifications for listed wiring methods
Public Input No. 118-NFPA 70-2023 [Sections Part III., 352.100, 352.120]	Removal of construction specifications for listed wiring methods
Public Input No. 117-NFPA 70-2023 [Sections Part III., 350.120]	Removal of construction specifications for listed wiring methods
Public Input No. 116-NFPA 70-2023 [Sections Part III., 344.100, 344.120]	Removal of construction specifications for listed wiring methods
Public Input No. 115-NFPA 70-2023 [Sections Part III., 342.100, 342.120]	Removal of construction specifications for listed wiring methods

Public Input No. 114-NFPA 70-2023 [Sections Part III., 340.104, 340.108, 340.112, 340.116]	Removal of construction specifications for listed wiring methods
Public Input No. 113-NFPA 70-2023 [Sections Part III., 337.104, 337.108, 337.112, 337.114, 337...]	Removal of construction specifications for listed wiring methods
Public Input No. 112-NFPA 70-2023 [Sections Part III., 336.100, 336.104, 336.116, 336.120, 336...]	Removal of construction specifications for listed wiring methods
Public Input No. 111-NFPA 70-2023 [Sections Part III., 332.104, 332.108, 332.112, 332.116]	Removal of construction specifications for listed wiring methods
Public Input No. 110-NFPA 70-2023 [Sections Part III., 330.104, 330.108, 330.112, 330.116, 330...]	Removal of construction specifications for listed wiring methods
Public Input No. 109-NFPA 70-2023 [Sections Part III., 324.100, 324.101, 324.112, 324.120]	Removal of construction specifications for listed wiring methods
Public Input No. 108-NFPA 70-2023 [Sections Part III., 322.100, 322.104, 322.112, 322.120]	Removal of construction specifications for listed wiring methods
Public Input No. 107-NFPA 70-2023 [Sections Part III., 338.100, 338.120]	Removal of construction specifications for listed wiring methods
Public Input No. 106-NFPA 70-2023 [Sections Part III., 320.100, 320.104, 320.108, 320.120]	Removal of construction specifications for listed wiring methods
Public Input No. 105-NFPA 70-2023 [Sections Part III., 334.100, 334.104, 334.108, 334.112, 334...]	Removal of construction specifications for listed wiring methods
Public Input No. 122-NFPA 70-2023 [Sections Part III., 356.100, 356.120]	
Public Input No. 123-NFPA 70-2023 [Sections Part III., 358.100, 358.120]	

Submitter Information Verification

Submitter Full Name: Russ Leblanc
Organization: Leblanc Consulting Services
Street Address:
City:
State:
Zip:
Submittal Date: Wed Jan 11 14:38:16 EST 2023
Committee: NEC-P08

Committee Statement

Resolution: Generally, material and equipment used throughout this document are listed and labeled. Removal of Sections X.100 and X.120 would remove any information of construction in Part III. As standards become multi-national, construction requirements within the NEC are reasons for national differences within the standard. Removal of the requirements in the NEC would allow for Standard Owner’s to define minimum criteria for safety without NFPA influence. The Article does not define which Standard is expected to be the basis of the listing, therefore the Article lists the minimum criteria in order for the conduit to be listed.

Public Input No. 122-NFPA 70-2023 [Sections Part III., 356.100, 356.120]

~~**Sections Part III., 356.100, 356.120**~~

~~**Part III.** Construction Specifications~~

~~**356.100** Construction.~~

~~LFNC-B as a prewired manufactured assembly shall be provided in continuous lengths capable of being shipped in a coil, reel, or carton without damage.~~

~~**356.120** Marking.~~

~~LFNC shall be marked at least every 600 mm (2 ft) in accordance with 110.21 . The marking shall include a type designation in accordance with the definition of *Conduit, Liquidtight Flexible Nonmetallic (LFNC)* in Article 100 and the trade size. Conduit that is intended for outdoor use or direct burial shall be marked.~~

~~The type, size, and quantity of conductors used in prewired manufactured assemblies shall be identified by means of a printed tag or label attached to each end of the manufactured assembly and either the carton, coil, or reel. The enclosed conductors shall be marked in accordance with 310.8 .~~

Statement of Problem and Substantiation for Public Input

Part III can be deleted in its entirety since these raceways are required to be listed and must meet product standards in order to achieve that listing.

Related Public Inputs for This Document

Related Input	Relationship
Public Input No. 121-NFPA 70-2023 [Sections Part III., 355.100, 355.120]	Removal of construction specifications for listed wiring methods
Public Input No. 120-NFPA 70-2023 [Sections Part III., 354.100, 354.120]	Removal of construction specifications for listed wiring methods
Public Input No. 119-NFPA 70-2023 [Sections Part III., 353.100, 353.120]	Removal of construction specifications for listed wiring methods
Public Input No. 118-NFPA 70-2023 [Sections Part III., 352.100, 352.120]	Removal of construction specifications for listed wiring methods
Public Input No. 117-NFPA 70-2023 [Sections Part III., 350.120]	Removal of construction specifications for listed wiring methods
Public Input No. 116-NFPA 70-2023 [Sections Part III., 344.100, 344.120]	Removal of construction specifications for listed wiring methods
Public Input No. 115-NFPA 70-2023 [Sections Part III., 342.100, 342.120]	Removal of construction specifications for listed wiring methods
Public Input No. 114-NFPA 70-2023 [Sections Part III., 340.104, 340.108, 340.112, 340.116]	Removal of construction specifications for listed wiring methods

Public Input No. 113-NFPA 70-2023 [Sections Part III., 337.104, 337.108, 337.112, 337.114, 337...]	Removal of construction specifications for listed wiring methods
Public Input No. 112-NFPA 70-2023 [Sections Part III., 336.100, 336.104, 336.116, 336.120, 336...]	Removal of construction specifications for listed wiring methods
Public Input No. 111-NFPA 70-2023 [Sections Part III., 332.104, 332.108, 332.112, 332.116]	Removal of construction specifications for listed wiring methods
Public Input No. 110-NFPA 70-2023 [Sections Part III., 330.104, 330.108, 330.112, 330.116, 330...]	Removal of construction specifications for listed wiring methods
Public Input No. 109-NFPA 70-2023 [Sections Part III., 324.100, 324.101, 324.112, 324.120]	Removal of construction specifications for listed wiring methods
Public Input No. 107-NFPA 70-2023 [Sections Part III., 338.100, 338.120]	Removal of construction specifications for listed wiring methods
Public Input No. 108-NFPA 70-2023 [Sections Part III., 322.100, 322.104, 322.112, 322.120]	Removal of construction specifications for listed wiring methods
Public Input No. 106-NFPA 70-2023 [Sections Part III., 320.100, 320.104, 320.108, 320.120]	Removal of construction specifications for listed wiring methods
Public Input No. 105-NFPA 70-2023 [Sections Part III., 334.100, 334.104, 334.108, 334.112, 334...]	Removal of construction specifications for listed wiring methods
Public Input No. 123-NFPA 70-2023 [Sections Part III., 358.100, 358.120]	

Submitter Information Verification

Submitter Full Name: Russ Leblanc

Organization: Leblanc Consulting Services

Street Address:

City:

State:

Zip:

Submittal Date: Wed Jan 11 14:42:54 EST 2023

Committee: NEC-P08

Committee Statement

Resolution: Generally, material and equipment used throughout this document are listed and labeled. Removal of Sections X.100 and X.120 would remove any information of construction in Part III. As standards become multi-national, construction requirements within the NEC are reasons for national differences within the standard. Removal of the requirements in the NEC would allow for Standard Owner's to define minimum criteria for safety without NFPA influence. The Article does not define which Standard is expected to be the basis of the listing, therefore the Article lists the minimum criteria in order for the conduit to be listed.

Public Input No. 123-NFPA 70-2023 [Sections Part III., 358.100, 358.120]

~~**Sections Part III., 358.100, 358.120**~~

~~**Part III.** Construction Specifications~~

~~**358.100** Construction.~~

~~EMT shall be made of one of the following:~~

(1) ~~Steel with protective coatings~~

(2) ~~Aluminum~~

(3) ~~Stainless steel~~

~~**358.120** Marking.~~

~~EMT shall be clearly and durably marked at least every 3 m (10 ft) as required in the first sentence of 110.21(A) .~~

Statement of Problem and Substantiation for Public Input

Part III can be deleted in its entirety since these raceways are required to be listed and must meet product standards in order to achieve that listing.

Related Public Inputs for This Document

Related Input	Relationship
Public Input No. 105-NFPA 70-2023 [Sections Part III., 334.100, 334.104, 334.108, 334.112, 334...]	Removal of construction specifications for listed wiring methods
Public Input No. 106-NFPA 70-2023 [Sections Part III., 320.100, 320.104, 320.108, 320.120]	Removal of construction specifications for listed wiring methods
Public Input No. 107-NFPA 70-2023 [Sections Part III., 338.100, 338.120]	Removal of construction specifications for listed wiring methods
Public Input No. 108-NFPA 70-2023 [Sections Part III., 322.100, 322.104, 322.112, 322.120]	Removal of construction specifications for listed wiring methods
Public Input No. 109-NFPA 70-2023 [Sections Part III., 324.100, 324.101, 324.112, 324.120]	Removal of construction specifications for listed wiring methods
Public Input No. 110-NFPA 70-2023 [Sections Part III., 330.104, 330.108, 330.112, 330.116, 330...]	Removal of construction specifications for listed wiring methods
Public Input No. 111-NFPA 70-2023 [Sections Part III., 332.104, 332.108, 332.112, 332.116]	Removal of construction specifications for listed wiring methods
Public Input No. 112-NFPA 70-2023 [Sections Part III., 336.100, 336.104, 336.116, 336.120, 336...]	Removal of construction specifications for listed wiring methods

Public Input No. 113-NFPA 70-2023 [Sections Part III., 337.104, 337.108, 337.112, 337.114, 337...]	Removal of construction specifications for listed wiring methods
Public Input No. 114-NFPA 70-2023 [Sections Part III., 340.104, 340.108, 340.112, 340.116]	Removal of construction specifications for listed wiring methods
Public Input No. 115-NFPA 70-2023 [Sections Part III., 342.100, 342.120]	Removal of construction specifications for listed wiring methods
Public Input No. 116-NFPA 70-2023 [Sections Part III., 344.100, 344.120]	Removal of construction specifications for listed wiring methods
Public Input No. 117-NFPA 70-2023 [Sections Part III., 350.120]	Removal of construction specifications for listed wiring methods
Public Input No. 118-NFPA 70-2023 [Sections Part III., 352.100, 352.120]	Removal of construction specifications for listed wiring methods
Public Input No. 119-NFPA 70-2023 [Sections Part III., 353.100, 353.120]	Removal of construction specifications for listed wiring methods
Public Input No. 120-NFPA 70-2023 [Sections Part III., 354.100, 354.120]	Removal of construction specifications for listed wiring methods
Public Input No. 121-NFPA 70-2023 [Sections Part III., 355.100, 355.120]	Removal of construction specifications for listed wiring methods
Public Input No. 122-NFPA 70-2023 [Sections Part III., 356.100, 356.120]	Removal of construction specifications for listed wiring methods
Public Input No. 124-NFPA 70-2023 [Sections Part III., 360.120]	

Submitter Information Verification

Submitter Full Name:	Russ Leblanc
Organization:	Leblanc Consulting Services
Street Address:	
City:	
State:	
Zip:	
Submittal Date:	Wed Jan 11 14:47:27 EST 2023
Committee:	NEC-P08

Committee Statement

Resolution: Generally, material and equipment used throughout this document are listed and labeled. Removal of Sections X.100 and X.120 would remove any information of construction in Part III. As standards become multi-national, construction requirements within the NEC are reasons for national differences within the standard. Removal of the requirements in the NEC would allow for Standard Owner's to define minimum criteria for safety without NFPA influence. The Article does not define which Standard is expected to be the basis of the listing, therefore the Article lists the minimum criteria in order for the conduit to be listed.

Public Input No. 124-NFPA 70-2023 [Sections Part III., 360.120]

~~**Sections Part III., 360.120**~~

~~**Part III.** Construction Specifications~~

~~**360.120** Marking.~~

~~FMT shall be marked according to 110.21 .~~

Statement of Problem and Substantiation for Public Input

Part III can be deleted in its entirety since these raceways are required to be listed and must meet product standards in order to achieve that listing.

Related Public Inputs for This Document

Related Input	Relationship
Public Input No. 123-NFPA 70-2023 [Sections Part III., 358.100, 358.120]	Removal of construction specifications for listed wiring methods
Public Input No. 125-NFPA 70-2023 [Sections Part III., 362.100, 362.120]	

Submitter Information Verification

Submitter Full Name: Russ Leblanc
Organization: Leblanc Consulting Services
Street Address:
City:
State:
Zip:
Submittal Date: Wed Jan 11 14:56:49 EST 2023
Committee: NEC-P08

Committee Statement

Resolution: Generally, material and equipment used throughout this document are listed and labeled. Removal of Section X.120 would remove any information of construction in Part III. As standards become multi-national, construction requirements within the NEC are reasons for national differences within the standard. Removal of the requirements in the NEC would allow for Standard Owner's to define minimum criteria for safety without NFPA influence. The Article does not define which Standard is expected to be the basis of the listing, therefore the Article lists the minimum criteria in order for the conduit to be listed.

Public Input No. 125-NFPA 70-2023 [Sections Part III., 362.100, 362.120]

~~**Sections Part III., 362.100, 362.120**~~

~~**Part III.** Construction Specifications~~

~~**362.100** Construction.~~

~~ENT shall be made of material that does not exceed the ignitibility, flammability, smoke generation, and toxicity characteristics of rigid (nonplasticized) polyvinyl chloride.~~

~~ENT, as a prewired manufactured assembly, shall be provided in continuous lengths capable of being shipped in a coil, reel, or carton without damage.~~

~~**362.120** Marking.~~

~~ENT shall be clearly and durably marked at least every 3 m (10 ft) as required in the first sentence of 110.21(A) . The type of material shall also be included in the marking. Marking for limited smoke shall be permitted on the tubing that has limited smoke-producing characteristics.~~

~~The type, size, and quantity of conductors used in prewired manufactured assemblies shall be identified by means of a printed tag or label attached to each end of the manufactured assembly and either the carton, coil, or reel. The enclosed conductors shall be marked in accordance with 310.8 .~~

Statement of Problem and Substantiation for Public Input

Part III can be deleted in its entirety since these raceways are required to be listed and must meet product standards in order to achieve that listing.

Related Public Inputs for This Document

Related Input	Relationship
Public Input No. 124-NFPA 70-2023 [Sections Part III., 360.120]	Removal of construction specifications for listed wiring methods
Public Input No. 126-NFPA 70-2023 [Sections Part III., 369.100, 369.110, 369.120]	

Submitter Information Verification

Submitter Full Name:	Russ Leblanc
Organization:	Leblanc Consulting Services
Street Address:	
City:	
State:	
Zip:	
Submittal Date:	Wed Jan 11 14:58:36 EST 2023
Committee:	NEC-P08

Committee Statement

Resolution: Generally, material and equipment used throughout this document are listed and labeled. Removal of Sections X.100 and X.120 would remove any information of construction in Part III. As standards become multi-national, construction requirements within the NEC are reasons for national differences within the standard. Removal of the requirements in the NEC would allow for Standard Owner’s to define minimum criteria for safety without NFPA influence. The Article does not define which Standard is expected to be the basis of the listing, therefore the Article lists the minimum criteria in order for the conduit to be listed.

Public Input No. 126-NFPA 70-2023 [Sections Part III., 369.100, 369.110, 369.120]

~~**Sections Part III., 369.100, 369.110, 369.120**~~

~~**Part III.** Construction Specifications~~

~~**369.100** Construction.~~

~~The IBP conductor shall be aluminum or copper. The bus pipe shall be permitted to be solid or hollow.~~

~~**369.110** Barriers.~~

~~Fire barriers shall be provided where fire walls, floors, or ceilings are penetrated.~~

> ~~Informational Note: See 300.21 for information concerning the spread of fire or products of combustion.~~

~~**369.120** Marking.~~

~~All IBP shall be marked to indicate the following information:~~

(1) ~~The maximum rated voltage phase-to-phase or phase-to-ground~~

(2) ~~The maximum rated ampacity~~

(3) ~~The manufacturer's name, trademark, or other distinctive marking by which the organization responsible for the product can be readily identified~~

(4) ~~The equivalent AWG size or circular mil area of the conductor~~

(5) ~~The maximum rated conductor temperature~~

(6) ~~The rated peak withstand current rating in rms symmetrical amperes or kA~~

(7) ~~Enclosure type designation, if other than Type 1~~

(8) ~~Rated short-time withstand current and duration if greater than 2 seconds~~

Statement of Problem and Substantiation for Public Input

Part III can be deleted in its entirety since these wiring methods are required to be listed and must meet product standards in order to achieve that listing.

Related Public Inputs for This Document

Related Input	Relationship
Public Input No. 125-NFPA 70-2023 [Sections Part III., 362.100, 362.120]	Removal of construction specifications for listed wiring methods
Public Input No. 127-NFPA 70-2023 [Sections Part III., 374.100]	

Submitter Information Verification

Submitter Full Name: Russ Leblanc

Organization: Leblanc Consulting Services

Street Address:

City:
State:
Zip:
Submittal Date: Wed Jan 11 15:00:50 EST 2023
Committee: NEC-P08

Committee Statement

Resolution: The content in Sections Part **III** 369.100, 369.110, 369.120 is relevant as supplemental material to the product certification standard

Public Input No. 127-NFPA 70-2023 [Sections Part III., 374.100]

~~**374.100** General.~~

~~Cellular metal floor raceways shall be constructed so that adequate electrical and mechanical continuity of the complete system will be secured. They shall provide a complete enclosure for the conductors. The interior surfaces shall be free from burrs and sharp edges, and surfaces over which conductors are drawn shall be smooth. Suitable bushings or fittings having smooth rounded edges shall be provided where conductors pass.~~

~~Sections~~
Part III

~~., 374.100~~

~~**Part III.** Construction Specifications~~

can be deleted in its entirety since these wiring methods are required to be listed and must meet product standards in order to achieve that listing.

Statement of Problem and Substantiation for Public Input

Part III can be deleted in its entirety since these wiring methods are required to be listed and must meet product standards in order to achieve that listing.

Related Public Inputs for This Document

Related Input	Relationship
Public Input No. 126-NFPA 70-2023 [Sections Part III., 369.100, 369.110, 369.120]	Removal of construction specifications for listed wiring methods
Public Input No. 128-NFPA 70-2023 [Sections Part III., 378.120]	

Submitter Information Verification

Submitter Full Name: Russ Leblanc
Organization: Leblanc Consulting Services
Street Address:
City:
State:
Zip:
Submittal Date: Wed Jan 11 15:03:07 EST 2023
Committee: NEC-P08

Committee Statement

Resolution: FR-7858-NFPA 70-2024

Statement: The construction requirements located in Part III are simplified to eliminate redundancy and align with other sections such as 376.100. Section 374.6 requires cellular metal floor raceways and associated fittings to be listed and the construction requirements previously located in Part III are covered in the associated product standard, UL 209 - Cellular Metal Floor Raceways and Fittings.

Public Input No. 128-NFPA 70-2023 [Sections Part III., 378.120]

~~**Sections Part III., 378.120**~~

~~**Part III.** Construction Specifications~~

~~**378.120** Marking.~~

~~Nonmetallic wireways shall be marked so that the manufacturer's name or trademark and interior cross-sectional area in square inches shall be visible after installation. Marking for limited smoke shall be permitted on the nonmetallic wireways that have limited smoke-producing characteristics.~~

Statement of Problem and Substantiation for Public Input

Part III can be deleted in its entirety since these wiring methods are required to be listed and must meet product standards in order to achieve that listing.

Related Public Inputs for This Document

Related Input	Relationship
Public Input No. 127-NFPA 70-2023 [Sections Part III., 374.100]	Removal of construction specifications for listed wiring methods
Public Input No. 129-NFPA 70-2023 [Sections Part III., 384.100, 384.120]	

Submitter Information Verification

Submitter Full Name: Russ Leblanc
Organization: Leblanc Consulting Services
Street Address:
City:
State:
Zip:
Submittal Date: Wed Jan 11 15:05:07 EST 2023
Committee: NEC-P08

Committee Statement

Resolution: Generally, material and equipment used throughout this document are listed and labeled. Removal of Sections X.100 and X.120 would remove any information of construction in Part III. As standards become multi-national, construction requirements within the NEC are reasons for national differences within the standard. Removal of the requirements in the NEC would allow for Standard Owner's to define minimum criteria for safety without NFPA influence. The Article does not define which Standard is expected to be the basis of the listing, therefore the Article lists the minimum criteria in order for the conduit to be listed.

Public Input No. 129-NFPA 70-2023 [Sections Part III., 384.100, 384.120]

~~**Sections Part III., 384.100, 384.120**~~

~~**Part III.** Construction Specifications~~

~~**384.100** Construction.~~

~~Strut-type channel raceways and their accessories shall be of a construction that distinguishes them from other raceways. Raceways and their elbows, couplings, and other fittings shall be designed such that the sections can be electrically and mechanically coupled together and installed without subjecting the wires to abrasion. They shall comply with 384.100(A) , (B), and (C).~~

~~**(A)** Material.~~

~~Raceways and accessories shall be formed of steel, stainless steel, or aluminum.~~

~~**(B)** Corrosion Protection.~~

~~Steel raceways and accessories shall be protected against corrosion by galvanizing or by an organic coating.~~

~~Informational Note: Enamel and PVC coatings are examples of organic coatings that provide corrosion protection.~~

~~**(C)** Cover.~~

~~Covers of strut-type channel raceways shall be either metal or nonmetallic.~~

~~**384.120** Marking.~~

~~Each length of strut-type channel raceway shall be clearly and durably identified as required in the first sentence of 110.21(A) .~~

Statement of Problem and Substantiation for Public Input

Part III can be deleted in its entirety since these wiring methods are required to be listed and must meet product standards in order to achieve that listing.

Related Public Inputs for This Document

Related Input	Relationship
Public Input No. 128-NFPA 70-2023 [Sections Part III., 378.120]	Removal of construction specifications for listed wiring methods
Public Input No. 130-NFPA 70-2023 [Sections Part III., 386.100, 386.120]	

Submitter Information Verification

Submitter Full Name: Russ Leblanc
Organization: Leblanc Consulting Services
Street Address:
City:
State:
Zip:
Submittal Date: Wed Jan 11 15:07:10 EST 2023

Committee: NEC-P08

Committee Statement

Resolution: Generally, material and equipment used throughout this document are listed and labeled. Removal of Sections X.100 and X.120 would remove any information of construction in Part III. As standards become multi-national, construction requirements within the NEC are reasons for national differences within the standard. Removal of the requirements in the NEC would allow for Standard Owner's to define minimum criteria for safety without NFPA influence. The Article does not define which Standard is expected to be the basis of the listing, therefore the Article lists the minimum criteria in order for the conduit to be listed.

Public Input No. 130-NFPA 70-2023 [Sections Part III., 386.100, 386.120]

~~**Sections Part III., 386.100, 386.120**~~

~~**Part III.** Construction Specifications~~

~~**386.100** Construction.~~

~~Surface metal raceways shall be of such construction as will distinguish them from other raceways. Surface metal raceways and their elbows, couplings, and similar fittings shall be designed so that the sections can be electrically and mechanically coupled together and installed without subjecting the wires to abrasion.~~

~~Where covers and accessories of nonmetallic materials are used on surface metal raceways, they shall be identified for such use.~~

~~**386.120** Marking.~~

~~Each length of surface metal raceway shall be clearly and durably identified as required in the first sentence of 110.21(A) .~~

Statement of Problem and Substantiation for Public Input

Part III can be deleted in its entirety since these wiring methods are required to be listed and must meet product standards in order to achieve that listing.

Related Public Inputs for This Document

Related Input	Relationship
Public Input No. 129-NFPA 70-2023 [Sections Part III., 384.100, 384.120]	Removal of construction specifications for listed wiring methods
Public Input No. 131-NFPA 70-2023 [Sections Part III., 388.100, 388.120]	

Submitter Information Verification

Submitter Full Name: Russ Leblanc
Organization: Leblanc Consulting Services
Street Address:
City:
State:
Zip:

Submittal Date: Wed Jan 11 15:08:29 EST 2023
Committee: NEC-P08

Committee Statement

Resolution: Generally, material and equipment used throughout this document are listed and labeled. Removal of Sections X.100 and X.120 would remove any information of construction in Part III. As standards become multi-national, construction requirements within the NEC are reasons for national differences within the standard. Removal of the requirements in the NEC would allow for Standard Owner’s to define minimum criteria for safety without NFPA influence. The Article does not define which Standard is expected to be the basis of the listing, therefore the Article lists the minimum criteria in order for the conduit to be listed.

Public Input No. 131-NFPA 70-2023 [Sections Part III., 388.100, 388.120]

~~**Sections Part III., 388.100, 388.120**~~

~~**Part III.** Construction Specifications~~

~~**388.100** Construction.~~

~~Surface nonmetallic raceways shall be of such construction as will distinguish them from other raceways. Surface nonmetallic raceways and their elbows, couplings, and similar fittings shall be designed so that the sections can be mechanically coupled together and installed without subjecting the wires to abrasion.~~

~~Surface nonmetallic raceways and fittings are made of suitable nonmetallic material that is resistant to moisture and chemical atmospheres. It shall also be flame retardant, resistant to impact and crushing, resistant to distortion from heat under conditions likely to be encountered in service, and resistant to low-temperature effects.~~

~~**388.120** Marking.~~

~~Surface nonmetallic raceways that have limited smoke-producing characteristics shall be permitted to be so identified. Each length of surface nonmetallic raceway shall be clearly and durably identified as required in the first sentence of 110.21(A) .~~

Statement of Problem and Substantiation for Public Input

Part III can be deleted in its entirety since these wiring methods are required to be listed and must meet product standards in order to achieve that listing.

Related Public Inputs for This Document

Related Input	Relationship
Public Input No. 130-NFPA 70-2023 [Sections Part III., 386.100, 386.120]	Removal of construction specifications for listed wiring methods
Public Input No. 132-NFPA 70-2023 [Sections Part VII., 410.80, 410.82, 410.84]	

Submitter Information Verification

Submitter Full Name: Russ Leblanc
Organization: Leblanc Consulting Services
Street Address:
City:
State:
Zip:

Submittal Date: Wed Jan 11 15:09:42 EST 2023
Committee: NEC-P08

Committee Statement

Resolution: Generally, material and equipment used throughout this document are listed and labeled. Removal of Sections X.100 and X.120 would remove any information of construction in Part III. As standards become multi-national, construction requirements within the NEC are reasons for national differences within the standard. Removal of the requirements in the NEC would allow for Standard Owner’s to define minimum criteria for safety without NFPA influence. The Article does not define which Standard is expected to be the basis of the listing, therefore the Article lists the minimum criteria in order for the conduit to be listed.

Public Input No. 778-NFPA 70-2023 [New Section after Table]

Note 7

Note 7 should include wireways.

Additional Proposed Changes

File Name	Description	Approved
Ch9_note_7.docx	example calculation where .8 should be allowed to be rounded up.	

Statement of Problem and Substantiation for Public Input

There is way more unused space in a wireway that is only allowed 20% fill. If a conduit that can be filled to 40% or less can be rounded up, teh conductor fill for a gutter or wireway should be allowed to as well.

Submitter Information Verification

Submitter Full Name: Chad Privratsky

Organization: IBEW 280

Street Address:

City:

State:

Zip:

Submittal Date: Mon May 08 20:43:45 EDT 2023

Committee: NEC-P08

Committee Statement

Resolution: Table 1 addresses fill for conduit and tubing, not wireways. Wireway fill is addressed in Sections 376.22 and 378.22.

Public Input No. 2572-NFPA 70-2023 [Section No. Table]

Table 1

Table 1 Percent of Cross Section of Conduit and Tubing for Conductors and Cables

Number of Conductors and/or Cables	Cross-Sectional Area (%)
1	53
2	31
Over 2	40

Informational Note No. 1: Table 1 is based on common conditions of proper cabling and alignment of conductors where the length of the pull and the number of bends are within reasonable limits. It should be recognized that, for certain conditions, a larger size conduit or a lesser conduit fill should be considered.

Informational Note No. 2: When pulling three conductors or cables into a raceway, if the ratio of the raceway (inside diameter) to the conductor or cable (outside diameter) is between 2.8 and 3.2, jamming can occur. While jamming can occur when pulling four or more conductors or cables into a raceway, the probability is very low.

Notes to Tables

(1) See Informative Annex C for the maximum number of conductors and fixture wires, all of the same size (total cross-sectional area including insulation) permitted in trade sizes of the applicable conduit or tubing.

(2) Table 1 applies only to complete conduit or tubing systems and is not intended to apply to sections of conduit or tubing used to protect exposed wiring and cable from physical damage.

(3) Equipment grounding or bonding conductors, where installed, shall be included when calculating conduit or tubing fill. The actual dimensions of the equipment grounding or bonding conductor (insulated or bare) shall be used in the calculation.

(4) Where conduit or tubing nipples, not including connectors, having a maximum length not to exceed 600 mm (24 in.) are installed between boxes, cabinets, and similar enclosures, the nipples shall be permitted to be filled to 60 percent of their total cross-sectional area, and 310.15(C)(1) adjustment factors need not apply to this condition.

(5) For conductors not included in Chapter 9, such as multiconductor cables and optical fiber cables, the actual dimensions shall be used.

(6) For combinations of conductors of different sizes, use actual dimensions or Table 5 and Table 5A for dimensions of conductors and Table 4 for the applicable conduit or tubing dimensions.

(7) When calculating the maximum number of conductors or cables permitted in a conduit or tubing, all of the same size (total cross-sectional area including insulation), the next higher whole number shall be used to determine the maximum number of conductors permitted when the calculation results in a decimal greater than or equal to 0.8. When calculating the size for conduit or tubing permitted for a single conductor <u>or cable</u> , one conductor <u>or cable</u> shall be permitted when the calculation results in a decimal greater than or equal to 0.8.

(8) Where bare conductors are permitted by other sections of this *Code*, the dimensions for bare conductors in Table 8 shall be permitted.

(9) A multiconductor cable, optical fiber cable, or flexible cord of two or more conductors shall be treated as a single conductor for calculating percentage conduit or tubing fill area. For cables that have elliptical cross sections, the cross-sectional area calculation shall be based on using the major diameter of the ellipse as a circle diameter. Assemblies of single insulated conductors without an overall covering shall not be considered a cable when determining conduit or tubing fill area. The conduit or tubing fill for the assemblies shall be calculated based upon the individual conductors.

(10) The values for approximate conductor diameter and area shown in Table 5 are based on worst-case scenario and indicate round concentric-lay-stranded conductors. Solid and round concentric-lay-stranded conductor values are grouped together for the purpose of Table 5. Round compact-stranded conductor values are shown in Table 5A. If the actual values of the conductor diameter and area are known, they shall be permitted to be used.

Statement of Problem and Substantiation for Public Input

The methodology of Note 7 applies equally well to conductors or cables, and the first sentence does cover both conductors and cables. Without explanation, cables are omitted from the second sentence of Note 7. If this omission is unintentional, this PI corrects the oversight. If this omission is intentional, an Informational Note explaining why one cable is treated differently from one conductor would be much appreciated.

Submitter Information Verification

Submitter Full Name: Wayne Whitney
Organization: [Not Specified]
Street Address:
City:
State:
Zip:
Submittal Date: Tue Aug 22 13:43:58 EDT 2023
Committee: NEC-P08

Committee Statement

Resolution: FR-7763-NFPA 70-2024

Statement: Informational Note 1 changed term ‘conduit’ to ‘raceway’ to be more inclusive as EMT is not a conduit, but it is a raceway.

Table Note 7 added the term ‘cable’ to clarify that it applies to both conductors and cables.

Table Note 8 now clarifies when bare conductors are installed, Table 8 is applicable to determine the conductor dimension.

Public Input No. 758-NFPA 70-2023 [Section No. Table]

Table 1

Table 1 Percent of Cross Section of Conduit and Tubing for Conductors and Cables

Number of Conductors and/or Cables	Cross-Sectional Area (%)
1	53
2	31
Over 2	40

Informational Note No. 1: Table 1 is based on common conditions of proper cabling and alignment of conductors where the length of the pull and the number of bends are within reasonable limits. It should be recognized that, for certain conditions, a larger size ~~conduit~~ raceway or a lesser ~~conduit~~ raceway fill should be considered.

Informational Note No. 2: When pulling three conductors or cables into a raceway, if the ratio of the raceway (inside diameter) to the conductor or cable (outside diameter) is between 2.8 and 3.2, jamming can occur. While jamming can occur when pulling four or more conductors or cables into a raceway, the probability is very low.

Notes to Tables

(1) See Informative Annex C for the maximum number of conductors and fixture wires, all of the same size (total cross-sectional area including insulation) permitted in trade sizes of the applicable conduit or tubing.

(2) Table 1 applies only to complete conduit or tubing systems and is not intended to apply to sections of conduit or tubing used to protect exposed wiring and cable from physical damage.

(3) Equipment grounding or bonding conductors, where installed, shall be included when calculating conduit or tubing fill. The actual dimensions of the equipment grounding or bonding conductor (insulated or bare) shall be used in the calculation.

(4) Where conduit or tubing nipples, not including connectors, having a maximum length not to exceed 600 mm (24 in.) are installed between boxes, cabinets, and similar enclosures, the nipples shall be permitted to be filled to 60 percent of their total cross-sectional area, and 310.15(C)(1) adjustment factors need not apply to this condition.

(5) For conductors not included in Chapter 9, such as multiconductor cables and optical fiber cables, the actual dimensions shall be used.

(6) For combinations of conductors of different sizes, use actual dimensions or Table 5 and Table 5A for dimensions of conductors and Table 4 for the applicable conduit or tubing dimensions.

(7) When calculating the maximum number of conductors or cables permitted in a conduit or tubing, all of the same size (total cross-sectional area including insulation), the next higher whole number shall be used to determine the maximum number of conductors permitted when the calculation results in a decimal greater than or equal to 0.8. When calculating the size for conduit or tubing permitted for a single conductor, one conductor shall be permitted when the calculation results in a decimal greater than or equal to 0.8.

(8) Where bare conductors are ~~permitted by other sections of this *Code*~~ installed , the dimensions for bare conductors in Table 8 shall be permitted.

(9) A multiconductor cable, optical fiber cable, or flexible cord of two or more conductors shall be treated as a single conductor for calculating percentage conduit or tubing fill area. For cables that have elliptical cross sections, the cross-sectional area calculation shall be based on using the major diameter of the ellipse as a circle diameter. Assemblies of single insulated conductors without an overall covering shall not be considered a cable when determining conduit or tubing fill area. The conduit or tubing fill for the assemblies shall be calculated based upon the individual conductors.

(10) The values for approximate conductor diameter and area shown in Table 5 are based on worst-case scenario and indicate round concentric-lay-stranded conductors. Solid and round concentric-lay-stranded conductor values are grouped together for the purpose of Table 5. Round compact-stranded conductor values are shown in Table 5A. If the actual values of the conductor diameter and area are known, they shall be permitted to be used.

Statement of Problem and Substantiation for Public Input

The change to Informational Note 1 should be viewed as editorial only, as it substitutes the word "conduit" for "raceway" for accuracy. All conduits are raceways, but not all raceways are conduits. Electrical Metallic Tubing is the most obvious example.
Table Note 8 should be revised because, as written, an insulated conductor can be calculated using the bare dimensions in some instances. For example, a grounded conductor in a raceway mast for an overhead service is permitted to be bare (see 230.41 Ex) but is often insulated regardless. When this is occurs the raceway fill should be based on the actual installation, that being an insulated grounded conductor.

Submitter Information Verification

Submitter Full Name:	Ryan Jackson
Organization:	Self-employed
Affiliation:	Steel Tube Institute
Street Address:	
City:	
State:	
Zip:	
Submittal Date:	Mon May 01 15:02:29 EDT 2023
Committee:	NEC-P08

Committee Statement

Resolution: FR-7763-NFPA 70-2024

Statement: Informational Note 1 changed term ‘conduit’ to ‘raceway’ to be more inclusive as EMT is not a conduit, but it is a raceway.

Table Note 7 added the term ‘cable’ to clarify that it applies to both conductors and cables.

Table Note 8 now clarifies when bare conductors are installed, Table 8 is applicable to determine the conductor dimension.

Public Input No. 1875-NFPA 70-2023 [Section No. Table]

Table 4 Article 342

	-			Article 342 — Intermediate Metal Conduit (IMC)									
Metric Designator	Trade Size	-		Over 2 Wires 40%		-		60%		-	1 Wire 53%		-	2
			-	mm²	in.²	-		mm²	in.²	-	mm²	in.²	-	mm
12	⅜	-		—	—	-		—	—	-	—	—	-	—
16	½	-		89	0.137	-		133	0.205	-	117	0.181	-	69
21	¾	-		151	0.235	-		226	0.352	-	200	0.311	-	117
27	1	-		248	0.384	-		372	0.575	-	329	0.508	-	192
35	1¼	-		425	0.659	-		638	0.988	-	564	0.873	-	330
41	1½	-		573	0.890	-		859	1.335	-	759	1.179	-	444
53	2	-		937	1.452	-		1405	2.178	-	1241	1.924	-	726
63	2½	-		1323	2.054	-		1985	3.081	-	1753	2.722	-	102[illegible]
78	3	-		2046	3.169	-		3069	4.753	-	2711	4.199	-	158[illegible]
91	3½	-		2729	4.234	-		4093	6.351	-	3616	5.610	-	211[illegible]
103	4	-		3490	5.452	-		5235	8.179	-	4624	7.224	-	270[illegible]
129	5	-		5455	8.528	-		8183	12.792	-	7229	11.30	-	422[illegible]
155	6	-		7878	12.304	-		11817	18.456	-	10439	16.302	-	610[illegible]
205	8		TBD	TBD		TBD	TBD		TBD	TBD	TBD	TBD	TBD	TBD

Statement of Problem and Substantiation for Public Input

This is a companion PI for the addition of 8" conduits for MV cables routed underground.
Note to CMP: Terraview is messed up and shows the proposed changes incorrectly. The "TBD" indicated will have to be determined later if the product standard is developed for 8" conduit.

Related Public Inputs for This Document

Related Input	Relationship
Public Input No. 429-NFPA 70-2023 [Section No. 352.20(B)]	8" conduit
Public Input No. 430-NFPA 70-2023 [Section No. 353.20(B)]	8" conduit
Public Input No. 1856-NFPA 70-2023 [Section No. 342.20(B)]	8" conduit
Public Input No. 1857-NFPA 70-2023 [Section No. 344.20(B)]	8" conduit
Public Input No. 1859-NFPA 70-2023 [Section No. 355.20(B)]	8" conduit
Public Input No. 1862-NFPA 70-2023 [Section No. 300.1(C)]	8" conduit
Public Input No. 1876-NFPA 70-2023 [Section No. Table]	
Public Input No. 1877-NFPA 70-2023 [Section No. Table]	

Submitter Information Verification

Submitter Full Name: Paul Guidry
Organization: Fluor Enterprises, Inc.
Affiliation: Associated Builders and Contractors
Street Address:
City:
State:
Zip:
Submittal Date: Sun Aug 06 18:34:39 EDT 2023
Committee: NEC-P08

Committee Statement

Resolution: Insufficient data was provided to add 8 inch conduit to the tables.

Public Input No. 1876-NFPA 70-2023 [Section No. Table]

Table 4 Article 344

-				Article 344 — Rigid Metal Conduit (RMC)										
Metric Designator	Trade Size	-		Over 2 Wires 40%		-		60%		-	1 Wire 53%		-	2
			-	mm^2	in.^{2}	-		mm^2	in.^{2}	-	mm^2	in.^{2}	-	mm
12	⅜	-		—	—	-		—	—	-	—	—	-	—
16	½	-		81	0.125	-		122	0.188	-	108	0.166	-	63
21	¾	-		141	0.220	-		212	0.329	-	187	0.291	-	109
27	1	-		229	0.355	-		344	0.532	-	303	0.470	-	177
35	1¼	-		394	0.610	-		591	0.916	-	522	0.809	-	305
41	1½	-		533	0.829	-		800	1.243	-	707	1.098	-	413
53	2	-		879	1.363	-		1319	2.045	-	1165	1.806	-	681
63	2½	-		1255	1.946	-		1882	2.919	-	1663	2.579	-	972
78	3	-		1936	3.000	-		2904	4.499	-	2565	3.974	-	1500
91	3½	-		2584	4.004	-		3877	6.006	-	3424	5.305	-	2003
103	4	-		3326	5.153	-		4990	7.729	-	4408	6.828	-	2578
129	5	-		5220	8.085	-		7830	12.127	-	6916	10.713	-	4045
155	6	-		7528	11.663	-		11292	17.495	-	9975	15.454	-	5834
205	8		TBD	TBD		TBD	TBD		TBD	TBD	TBD	TBD	TBD	TBD

Statement of Problem and Substantiation for Public Input

This is a companion PI for the addition of 8" conduits for MV cables routed underground.
Note to CMP: Terraview is messed up and shows the proposed changes incorrectly. The "TBD" indicated will have to be determined later if the product standard is developed for 8" conduit.

Related Public Inputs for This Document

Related Input	Relationship
Public Input No. 1875-NFPA 70-2023 [Chapter 9, conduit fill table]	8" conduits

Submitter Information Verification

Submitter Full Name: Paul Guidry
Organization: Fluor Enterprises, Inc.
Affiliation: Associated Builders and Contractors
Street Address:
City:

State:

Zip:

Submittal Date: Sun Aug 06 18:43:54 EDT 2023

Committee: NEC-P08

Committee Statement

Resolution: Insufficient data was provided to add 8 inch conduit to the tables.

Public Input No. 1878-NFPA 70-2023 [Section No. Table]

Table 4 Article 352 Schedule 80

-			Article 352 — Rigid PVC Conduit (PVC), Schedule 8										
Metric Designator	Trade Size	-	Over 2 Wires 40%		-	60%		-	1 Wire 53%		-	2	
		-	mm2	in.2	-	mm2	in.2	-	mm2	in.2	-	mm	
12	⅜	-	—	—	-	—	—	-	—	—	-	—	
16	½	-	56	0.087	-	85	0.130	-	75	0.115	-	44	
21	¾	-	105	0.164	-	158	0.246	-	139	0.217	-	82	
27	1	-	178	0.275	-	267	0.413	-	236	0.365	-	138	
35	1¼	-	320	0.495	-	480	0.742	-	424	0.656	-	248	
41	1½	-	442	0.684	-	663	1.027	-	585	0.907	-	342	
53	2	-	742	1.150	-	1113	1.725	-	983	1.523	-	575	
63	2½	-	1064	1.647	-	1596	2.471	-	1410	2.183	-	825	
78	3	-	1660	2.577	-	2491	3.865	-	2200	3.414	-	1287	
91	3½	-	2243	3.475	-	3365	5.213	-	2972	4.605	-	1738	
103	4	-	2907	4.503	-	4361	6.755	-	3852	5.967	-	2253	
129	5	-	4607	7.142	-	6911	10.713	-	6105	9.463	-	3571	
155	6	-	6605	10.239	-	9908	15.359	-	8752	13.567	-	5119	
205	8	TBD	TBD		TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD	

Statement of Problem and Substantiation for Public Input

This is a companion PI for the addition of 8" conduits for MV cables routed underground.
Note to CMP: Terraview is messed up and shows the proposed changes incorrectly. The "TBD" indicated will have to be determined later if the product standard is developed for 8" conduit.

Related Public Inputs for This Document

Related Input	Relationship
Public Input No. 1877-NFPA 70-2023 [Section No. Table]	

Submitter Information Verification

Submitter Full Name: Paul Guidry
Organization: Fluor Enterprises, Inc.
Affiliation: Associated Builders and Contractors
Street Address:
City:

State:

Zip:

Submittal Date: Sun Aug 06 18:49:49 EDT 2023

Committee: NEC-P08

Committee Statement

Resolution: Insufficient data was provided to add 8 inch conduit to the tables.

Public Input No. 1877-NFPA 70-2023 [Section No. Table]

Table 4 Articles 352 and 353 Schedule 40

	-	Articles 352 and 353 — Rigid PVC Conduit (PVC), Schedule 40, and HD											
Metric Designator	Trade Size	-		Over 2 Wires 40%		-	60%		-	1 Wire 53%		-	2
			-	mm²	in.²	-	mm²	in.²	-	mm²	in.²	-	mm
12	⅜	-		—	—	-	—	—	-	—	—	-	—
16	½	-		74	0.114	-	110	0.171	-	97	0.151	-	57
21	¾	-		131	0.203	-	196	0.305	-	173	0.269	-	101
27	1	-		214	0.333	-	321	0.499	-	284	0.441	-	166
35	1¼	-		374	0.581	-	561	0.872	-	495	0.770	-	290
41	1½	-		513	0.794	-	769	1.191	-	679	1.052	-	397
53	2	-		849	1.316	-	1274	1.975	-	1126	1.744	-	658
63	2½	-		1212	1.878	-	1817	2.817	-	1605	2.488	-	939
78	3	-		1877	2.907	-	2816	4.361	-	2487	3.852	-	145
91	3½	-		2511	3.895	-	3766	5.842	-	3327	5.161	-	194
103	4	-		3237	5.022	-	4855	7.532	-	4288	6.654	-	250
129	5	-		5099	7.904	-	7649	11.856	-	6756	10.473	-	395
155	6	-		7373	11.427	-	11060	17.140	-	9770	15.141	-	571
205	8		TBD	TBD		TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD

Statement of Problem and Substantiation for Public Input

This is a companion PI for the addition of 8" conduits for MV cables routed underground.
Note to CMP: Terraview is messed up and shows the proposed changes incorrectly. The "TBD" indicated will have to be determined later if the product standard is developed for 8" conduit.

Related Public Inputs for This Document

Related Input	Relationship
Public Input No. 1875-NFPA 70-2023 [Section No. Table]	8" conduit

Submitter Information Verification

Submitter Full Name: Paul Guidry
Organization: Fluor Enterprises, Inc.
Affiliation: Associated Builders and Contractors
Street Address:
City:

State:

Zip:

Submittal Date: Sun Aug 06 18:47:39 EDT 2023

Committee: NEC-P08

Committee Statement

Resolution: Insufficient data was provided to add 8 inch conduit to the tables.