Public Comment No. 1813-NFPA 70-2021 [Global Input]

Flexible Bus Systems. An assembly of flexible insulated bus, with a system of associated fittings used to secure, support and terminate the bus.

Informational Note: Flexible bus systems are engineered systems for a specific site location and are ordinarily assembled at the point of installation from the components furnished or specified by the manufacturer.

Flexible Insulated Bus. A flexible rectangular conductor with an overall insulation.

Additional Proposed Changes

File Name	Description	Approved
PC_for_Definition_Relocation_Draft_3.docx	100 Definition text in Word file	

Statement of Problem and Substantiation for Public Comment

The definitions in the new Article 371 created in the first draft under FR 7621 are being relocated to Article 100 in accordance with 2.2.2 of the NEC Style Manual. There are no technical changes to the definitions in this public comment, only relocation of the definition and any associated informational note.

Related Item

• PI 3616

Submitter Information Verification

Submitter Full Name: Ward Judson
Organization: nVent Electric
Street Address:
City:
State:
Zip:
Submittal Date: Tue Aug 17 22:32:11 EDT 2021
Committee: NEC-P08

Committee Statement

Committee Action: Rejected but see related SR
Resolution: SR-8122-NFPA 70-2021
Statement: The definitions have been relocated to Article 100 per the NEC Style Manual and removed from Article 371.

PC for Definition Relocation

PC Text -- Article 371

371.2 Definition.

~~The definitions in this section shall apply within this article and throughout the Code.~~

~~**Flexible Bus Systems.** An assembly of flexible insulated bus, with a system of associated fittings used to secure, support and terminate the bus.~~

> ~~Informational Note: Flexible bus systems are engineered systems for a specific site location and are ordinarily assembled at the point of installation from the components furnished or specified by the manufacturer.~~

~~**Flexible Insulated Bus.** A flexible rectangular conductor with an overall insulation.~~

PC Text --- Article 100

Flexible Bus Systems. An assembly of flexible insulated bus, with a system of associated fittings used to secure, support and terminate the bus.

> Informational Note: Flexible bus systems are engineered systems for a specific site location and are ordinarily assembled at the point of installation from the components furnished or specified by the manufacturer.

Flexible Insulated Bus. A flexible rectangular conductor with an overall insulation.

Substantiation:

The definitions in the new Article 371 created in the first draft under FR 7621 are being relocated to Article 100 in accordance with 2.2.2 of the NEC Style Manual. There are no technical changes to the definitions in this public comment, only relocation of the definition and any associated informational note.

Public Comment No. 831-NFPA 70-2021 [Global Input]

The Correlating Committee advises that article scope statements and location of articles are the responsibility of the Correlating Committee and the Correlating Committee accepts the panel action. The Correlating Committee requests further consideration be given to relocating the Information Note currently located within the scope section to the definition for IBP.
The Correlating Committee directs the panel to move the definitions to Article 100.
The Correlating Committee directs the panel to reconsider the use of the term "unqualified person" in NEC 369.12 with regard to the accessibility of those persons.
The Correlating Committee directs the panel to review the "Note" in NEC 369.11 0 and confirm if this is an "Informational Note."
The Correlating Committee directs the panel to review and remove "size" after AWG and "area" to support consistency.

Additional Proposed Changes

File Name	Description	Approved
8_CN_337_Global.pdf	70_CN337	

Statement of Problem and Substantiation for Public Comment

The following CC Note No. 337 appeared in the First Draft Report on First Revision No. 7620.

The Correlating Committee advises that article scope statements and location of articles are the responsibility of the Correlating Committee and the Correlating Committee accepts the panel action.
The Correlating Committee requests further consideration be given to relocating the Information Note currently located within the scope section to the definition for IBP.
The Correlating Committee directs the panel to move the definitions to Article 100.
The Correlating Committee directs the panel to reconsider the use of the term "unqualified person" in NEC 369.12 with regard to the accessibility of those persons.
The Correlating Committee directs the panel to review the "Note" in NEC 369.11 0 and confirm if this is an "Informational Note."
The Correlating Committee directs the panel to review and remove "size" after AWG and "area" to support consistency.

Related Item

• First Revision No. 7620

Submitter Information Verification

Submitter Full Name: CC on NEC-AAC
Organization: NEC Correlating Committee
Street Address:
City:
State:
Zip:
Submittal Date: Wed Aug 04 13:23:39 EDT 2021
Committee: NEC-P08

Committee Statement

Committee Action: Rejected but see related SR

Resolution: SR-8151-NFPA 70-2021

Statement: The term “Systems” or “systems” is added throughout the Article 369, along with minor editorial changes to on text structure to address the word addition, in order to clarify that Insulated Bus Pipe (IBP), also known as Tubular Covered Conductor (TCC), IBP/TCC should be treated as a system rather than a standalone product. The term "unqualified" is removed from 369.12 (4) and the terms “size” and “area” are removed from 369.120(4).

Insulated Bus Pipe (IBP)/Tubular Covered Conductors (TCC) and Systems are not permitted to be reconditioned. Therefore, the panel has relocated , retitled and reconsidered the First Revision text to move the text from the 369.8 to 362.2 , retitled the section and simplified the text to simply state "shall not be reconditioned" rather than shall not be permitted to be" per direction from the correlating committee.

Section 369.14 is revised per 110.3(B) the general rule for the installation, testing, and manufacturing instructions for electrical equipment. Section 4.1.1 of the 2020 NEC Style Manual states that the general requirements contained in Chapters 1 through 4 shall not be repeated in other articles of the code.

The word “connections” is added to the title of the section since connections and terminations, which may be one in the same, are being addressed in this rule. Informational Note No. 3 contains a requirement which is not permitted by the NEC Style Manual, so it is relocated to be a new second sentence in 369.20. Additionally the term “made-up” has been removed to improve code language.

for all but the request to add the term “phase-to-phase” in 369.10 (5) on account it being unnecessary since throughout the code nominal voltages are considered to be phase-to phase without the additional text.

clarifying that the "Note" in NEC 369.110 is indeed an "Informational Note." and is consistent with other existing Articles within the code, e.g. the informational note found in Section 368.10.

section 369.14 was revised per 110.3(B) the general rule for the installation, testing, and manufacturing instructions for electrical equipment. Section 4.1.1 of the 2020 NEC Style Manual states that the general requirements contained in Chapters 1 through 4 shall not be repeated in other articles of the code.

Second Revision TG6-5 8151 which added the word “connections” to the title of the section since connections and terminations, which may be one in the same, are being addressed in this rule. Also Informational Note No. 3 which contained a requirement which is not permitted by the NEC Style Manual, was relocated to be a new second sentence in 369.20. Lastly, the term “made-up” was removed to improve code language.

Correlating Committee Note No. 337-NFPA 70-2021 [Global Input]

Submitter Information Verification

Committee: NEC-P08
Submittal Date: Thu May 06 16:36:49 EDT 2021

Committee Statement

Committee Statement: The Correlating Committee advises that article scope statements and location of articles are the responsibility of the Correlating Committee and the Correlating Committee accepts the panel action. The Correlating Committee requests further consideration be given to relocating the Information Note currently located within the scope section to the definition for IBP.

The Correlating Committee directs the panel to move the definitions to Article 100.

The Correlating Committee directs the panel to reconsider the use of the term “unqualified person” in NEC 369.12 with regard to the accessibility of those persons.

The Correlating Committee directs the panel to review the “Note” in NEC 369.110 and confirm if this is an “Informational Note.”

The Correlating Committee directs the panel to review and remove “size” after AWG and “area” to support consistency.

First Revision No. 7620-NFPA 70-2020 [Global Input]

Ballot Results

This item has passed ballot

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

Affirmative All

Ayer, Lawrence S.
Gallo, Ernest J.
Hickman, Palmer L.
Holub, Richard A.
Hunter, Dean C.
Johnston, Michael J.
Kendall, David H.
Kovacik, John R.
Manche, Alan
McDaniel, Roger D.
Porter, Christine T.
Williams, David A.

Public Comment No. 832-NFPA 70-2021 [Global Input]

The Correlating Committee advises that article scope statements and location of articles are the responsibility of the Correlating Committee and the Correlating Committee accepts the scope as established by the panel.
The Correlating Committee directs the panel to move the definitions in Section 371.2 to Article 100.

Additional Proposed Changes

File Name	Description	Approved
8_CN_338_Global.pdf	70_CN338	

Statement of Problem and Substantiation for Public Comment

The following CC Note No. 338 appeared in the First Draft Report on First Revision No. 7621.

The Correlating Committee advises that article scope statements and location of articles are the responsibility of the Correlating Committee and the Correlating Committee accepts the scope as established by the panel.
The Correlating Committee directs the panel to move the definitions in Section 371.2 to Article 100.

Related Item

• First Revision No. 7621

Submitter Information Verification

Submitter Full Name: CC on NEC-AAC
Organization: NEC Correlating Committee
Street Address:
City:
State:
Zip:
Submittal Date: Wed Aug 04 13:26:42 EDT 2021
Committee: NEC-P08

Committee Statement

Committee Action: Rejected but see related SR
Resolution: SR-8122-NFPA 70-2021
Statement: The definitions have been relocated to Article 100 per the NEC Style Manual and removed from Article 371.

Correlating Committee Note No. 338-NFPA 70-2021 [Global Input]

Submitter Information Verification

Committee: NEC-P08
Submittal Date: Thu May 06 16:50:38 EDT 2021

Committee Statement

Committee Statement: The Correlating Committee advises that article scope statements and location of articles are the responsibility of the Correlating Committee and the Correlating Committee accepts the scope as established by the panel.

The Correlating Committee directs the panel to move the definitions in Section 371.2 to Article 100.

First Revision No. 7621-NFPA 70-2020 [Global Input]

Ballot Results

This item has passed ballot

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

Affirmative All

Ayer, Lawrence S.
Gallo, Ernest J.
Hickman, Palmer L.
Holub, Richard A.
Hunter, Dean C.
Johnston, Michael J.
Kendall, David H.
Kovacik, John R.
Manche, Alan
McDaniel, Roger D.
Porter, Christine T.
Williams, David A.

Public Comment No. 837-NFPA 70-2021 [Global Input]

The Correlating Committee directs the Chair of CMP-8 to assign a task group to review all the definitions under their purview for compliance with the NEC Style Manual and to review definitions identified by the Correlating Committee that may contain correlation issues. The attachment includes a list of those definitions identified that need to be reviewed.

Additional Proposed Changes

File Name	Description	Approved
8_CN_357_Global.pdf	70_CN357	

Statement of Problem and Substantiation for Public Comment

The following CC Note No. 357 appeared in the First Draft Report on First Revision No. 7501.

The Correlating Committee directs the Chair of CMP-8 to assign a task group to review all the definitions under their purview for compliance with the NEC Style Manual and to review definitions identified by the Correlating Committee that may contain correlation issues. The attachment includes a list of those definitions identified that need to be reviewed.

Related Item

• First Revision No. 7501

Submitter Information Verification

Submitter Full Name: CC on NEC-AAC
Organization: NEC Correlating Committee
Street Address:
City:
State:
Zip:
Submittal Date: Wed Aug 04 13:39:02 EDT 2021
Committee: NEC-P08

Committee Statement

Committee Action: Rejected but see related SR
Resolution: SR-8148-NFPA 70-2021
Statement: The Informational Note within the definition of a “Raceway” was deleted since all raceway definitions have been relocated to Article 100.

Correlating Committee Note No. 357-NFPA 70-2021 [Global Input]

Supplemental Information

File Name	Description	Approved
NEC_P08_Definitions_TG_Attachment_CN357.docx		

Submitter Information Verification

Committee: NEC-P08
Submittal Date: Thu May 06 22:39:40 EDT 2021

Committee Statement

Committee Statement: The Correlating Committee directs the Chair of CMP-8 to assign a task group to review all the definitions under their purview for compliance with the NEC Style Manual and to review definitions identified by the Correlating Committee that may contain correlation issues. The attachment includes a list of those definitions identified that need to be reviewed.

First Revision No. 7501-NFPA 70-2020 [Global Input]

Ballot Results

This item has passed ballot

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

Affirmative All

Ayer, Lawrence S.
Gallo, Ernest J.
Hickman, Palmer L.
Holub, Richard A.
Hunter, Dean C.
Johnston, Michael J.
Kendall, David H.
Kovacik, John R.
Manche, Alan
McDaniel, Roger D.
Porter, Christine T.
Williams, David A.

Correlating Committee Definitions Task Group
CMP-8 - Definitions

CMP-8 Definitions	Correlating Committee Comments
	The Correlating Committee directs the Chair of CMP-8 to assign a task group to review all the definitions under their purview for compliance with the NEC Style Manual and to review definitions identified by the Correlating Committee that may contain correlation issues. The attachment includes a list of those definitions identified that need to be reviewed.
Raceway. An enclosed channel designed expressly for holding wires, cables, or busbars, with additional functions as permitted in this Code. (CMP-8) Informational Note: A raceway is identified within specific article definitions.	Within the Article Definition? Remove Informational Note
	All definitions will be relocated to Article 100

Public Comment No. 14-NFPA 70-2021 [Definition: Conduit, Liquidtight Flexible Nonmetallic (LFNC...]

Conduit, Liquidtight Flexible Nonmetallic (LFNC). (Liquidtight 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 ~~Type~~ LFNC-A

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

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

(CMP-8)

Informational Note: FNMC is an alternative designation for LFNC.

Statement of Problem and Substantiation for Public Comment

Editorial. "Type" is no longer used to describe the acronym LFNC and can be removed.

Related Item

• FR 7501

Submitter Information Verification

Submitter Full Name: David Kendall
Organization: ABB Inc.
Street Address:
City:
State:
Zip:
Submittal Date: Tue Jun 29 12:37:52 EDT 2021
Committee: NEC-P08

Committee Statement

Committee Action: Rejected but see related SR

Resolution: SR-8161-NFPA 70-2021

Statement: “Type” has been removed from the new definitions found in Article 100 for conduit and tubings. This editorial deletion of “Type” within the definition of Liquidtight Flexible Nonmetallic Conduit (LFNC) correlates with the other definitions and clarifies the acronym for usability.

Public Comment No. 13-NFPA 70-2021 [Definition: Raceway.]

Raceway.

An enclosed channel designed expressly for holding wires, cables, or busbars, with additional functions as permitted in this *Code*. (CMP-8)

~~Informational Note: A raceway is identified within specific article definitions.~~

Statement of Problem and Substantiation for Public Comment

The Correlating Committee directed CMP-8 to review the definition of a Raceway and the Informational Note directing the user to the individual raceways articles for identification. The Informational Note is deleted since all definitions have been relocated to Article 100.

Related Item

• FR 9140, FR 7501, and FR 8640

Submitter Information Verification

Submitter Full Name: David Kendall
Organization: ABB Inc.
Street Address:
City:
State:
Zip:
Submittal Date: Tue Jun 29 12:26:37 EDT 2021
Committee: NEC-P08

Committee Statement

Committee Action: Rejected but see related SR
Resolution: SR-8148-NFPA 70-2021
Statement: The Informational Note within the definition of a “Raceway” was deleted since all raceway definitions have been relocated to Article 100.

Public Comment No. 131-NFPA 70-2021 [New Definition after Definition: Flat Conductor Cable, Type...]

TITLE OF NEW CONTENT

Flexible Bus Systems

An assembly of flexible insulated bus, with a system of associated fittings used to secure, support, and terminate the bus.

Informational Note: Flexible Bus Systems are engineered systems for a specific site location and are ordinarily assembled at the point of installation from components furnished or specified by the manufacturer. (CMP-8)

Flexible Insulated Bus

A flexible rectangular conductor with an overall insulation. (CMP-8)

Statement of Problem and Substantiation for Public Comment

The definitions of Flexible Bus Systems and Flexible Insulated Bus are being relocated to Article 100 from new Article 371 per the 2020 NEC Style Manual.

Related Item

• FR-7621

Submitter Information Verification

Submitter Full Name: David Kendall
Organization: ABB Inc.
Street Address:
City:
State:
Zip:
Submittal Date: Tue Jul 06 10:48:36 EDT 2021
Committee: NEC-P08

Committee Statement

Committee Action: Rejected but see related SR
Resolution: SR-8122-NFPA 70-2021
Statement: The definitions have been relocated to Article 100 per the NEC Style Manual and removed from Article 371.

Public Comment No. 129-NFPA 70-2021 [New Definition after Definition: Instrumentation Tray Cable...]

TITLE OF NEW CONTENT

Insulated Bus Pipe (IBP)

A cylindrical solid or hollow conductor with solid insulation system, having conductive grading layers and a grounding layer imbedded in the insulation, and provided with an overall covering of insulating or metallic material. (CMP-8)

Insulated Bus Pipe (IBP) Systems

An assembly that includes bus pipe, connectors, fittings, mounting structures, and accessories. (CMP-8)

Statement of Problem and Substantiation for Public Comment

The definitions of Insulated Bus Pipe (IBP) and Insulated Bus Pipe (IBP) Systems are being relocated to Article 100 from new Article 369 per the 2020 NEC Style Manual.

Related Item

• FR 7620

Submitter Information Verification

Submitter Full Name: David Kendall
Organization: ABB Inc.
Street Address:
City:
State:
Zip:
Submittal Date: Tue Jul 06 10:30:32 EDT 2021
Committee: NEC-P08

Committee Statement

Committee Action: Rejected but see related SR

Resolution: SR-8151-NFPA 70-2021

Statement: The term “Systems” or “systems” is added throughout the Article 369, along with minor editorial changes to on text structure to address the word addition, in order to clarify that Insulated Bus Pipe (IBP), also known as Tubular Covered Conductor (TCC), IBP/TCC should be treated as a system rather than a standalone product. The term "unqualified" is removed from 369.12 (4) and the terms “size” and “area” are removed from 369.120(4).

Insulated Bus Pipe (IBP)/Tubular Covered Conductors (TCC) and Systems are not permitted to be reconditioned. Therefore, the panel has relocated , retitled and reconsidered the First Revision text to move the text from the 369.8 to 362.2 , retitled the section and simplified the text to simply state "shall not be reconditioned" rather than shall not be permitted to be" per direction from the correlating committee.

Section 369.14 is revised per 110.3(B) the general rule for the installation, testing, and manufacturing instructions for electrical equipment. Section 4.1.1 of the 2020 NEC Style Manual states that the general requirements contained in Chapters 1 through 4 shall not be repeated in other articles of the code.

The word “connections” is added to the title of the section since connections and terminations, which may be one in the same, are being addressed in this rule. Informational Note No. 3 contains a requirement which is not permitted by the NEC Style Manual, so it is relocated to be a new second sentence in 369.20. Additionally the term “made-up” has been removed to improve code language.

for all but the request to add the term “phase-to-phase” in 369.10 (5) on account it being unnecessary since throughout the code nominal voltages are considered to be phase-to phase without the additional text.

clarifying that the "Note" in NEC 369.110 is indeed an "Informational Note." and is consistent with other existing Articles within the code, e.g. the informational note found in Section 368.10.

section 369.14 was revised per 110.3(B) the general rule for the installation, testing, and manufacturing instructions for electrical equipment. Section 4.1.1 of the 2020 NEC Style Manual states that the general requirements contained in Chapters 1 through 4 shall not be repeated in other articles of the code.

Second Revision TG6-5 8151 which added the word “connections” to the title of the section since connections and terminations, which may be one in the same, are being addressed in this rule. Also Informational Note No. 3 which contained a requirement which is not permitted by the NEC Style Manual, was relocated to be a new second sentence in 369.20. Lastly, the term “made-up” was removed to improve code language.

Public Comment No. 77-NFPA 70-2021 [Article 342]

Article 342 Intermediate Metal Conduit ~~: Type~~ (IMC)

Part I. General

342.1 Scope.

This article covers the use, installation, and construction specifications for intermediate metal conduit (IMC) and associated fittings.

342.6 Listing Requirements.

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

Part II. Installation

342.10 Uses Permitted.

(A) All Atmospheric Conditions and Occupancies.

Use of IMC shall be permitted under all atmospheric conditions and occupancies.

(B) Corrosion Environments.

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.

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.

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:

(1) Stainless steel fittings

(2) Stainless steel boxes and enclosures

(3) Steel (galvanized, painted, powder or PVC coated, and so forth) boxes and enclosures when not subject to severe corrosive influences

(4) Stainless steel, nonmetallic, or approved accessories

342.20 Size.

(A) Minimum.

IMC smaller than metric designator 16 (trade size ½) shall not be used.

(B) Maximum.

IMC larger than metric designator 103 (trade size 4) shall not be used.

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.

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 number of cables shall not exceed the allowable percentage fill specified in Table 1, Chapter 9.

342.24 Bends.

(A) How Made.

Bends of IMC shall be so made that the conduit will not be damaged and the internal diameter of the conduit will not be effectively reduced. The radius of the curve of any field bend to the centerline of the conduit shall not be less than indicated in Table 2, Chapter 9.

(B) Number in One Run.

The total degrees of bends in a conduit run shall not exceed 360 degrees between pull points.

342.28 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 taper of 1 in 16 (¾ in. taper per foot) shall be used.

Informational Note: See ANSI/ASME B1.20.1-2013, *Standard for Pipe Threads, General Purpose (Inch)*.

342.30 Securing and Supporting.

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).

(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) 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 344.30(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.

342.42 Couplings and Connectors.

(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. Threadless couplings and connectors shall not be used on threaded conduit ends unless listed for the purpose.

(B) Running Threads.

Running threads shall not be used on conduit for connection at couplings.

342.46 Bushings.

Where a conduit enters a box, fitting, or other enclosure, a bushing shall be provided to protect the wires from abrasion unless the box, fitting, or enclosure is designed to provide such protection.

Informational Note: See 300.4(G) for the protection of conductors 4 AWG and larger at bushings.

342.56 Splices and Taps.

Splices and taps shall be made in accordance with 300.15.

342.60 Grounding.

IMC shall be permitted as an equipment grounding conductor.

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 Comment

Editorial. “Type” has been removed from the new definitions for the individual conduits and tubings. This editorial deletion correlates with the definitions and clarifies the acronym for usability.

Please Note: This editorial revision only impacts the title of the article. Wonderful Terra required all of the Sections within the Article to be highlighted to make this simple change.

Related Item

• FR 7501

Submitter Information Verification

Submitter Full Name: David Kendall
Organization: ABB Inc.
Street Address:
City:
State:
Zip:
Submittal Date: Thu Jul 01 15:32:27 EDT 2021
Committee: NEC-P08

Committee Statement

Committee Action: Rejected but see related SR
Resolution: SR-8108-NFPA 70-2021
Statement: “Type” has been removed from the new definitions found in Article 100 for conduit and tubings. This editorial deletion correlates with the definition and clarifies the acronym for usability.

Public Comment No. 1209-NFPA 70-2021 [Section No. 342.20(B)]

(B) Maximum.

IMC larger than metric designator ~~103~~ 155 (trade size 4 6) shall not be used.

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 Comment

Add trade sizes 5 & 6 to Article 342 for IMC to correlate to articles 344 RMC and 358 EMT. During the first draft CMP 8 made a change that allows for trade size 6 EMT. Trade size 6 was already allowed in Rigid metal conduit and Rigid non-metallic PVC & Fiberglass conduits. IMC offers equal or superior physical protection to all of the other conduits already allowed to be used up to trade size 6 and there is absolutely no reason to leave it as the sole rigid conduit/tubing method metallic or non-metallic limited to a smaller trade size. UL 1242 is currently open for harmonization with Canada and the proposal for trade sizes 5 & 6 will be submitted to the SDP. I am submitting companion comments to make changes tot he tables in chapter 9. The companion comment is 1210

Related Public Comments for This Document

Related Comment	Relationship
Public Comment No. 1210-NFPA 70-2021 [Section No. Table]	Table Changes
Public Comment No. 2205-NFPA 70-2021 [Section No. C.8]	

Related Item

• FR-7593 • Public Input 2426

Submitter Information Verification

Submitter Full Name: Raymond Horner
Organization: Atkore
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City:
State:
Zip:
Submittal Date: Tue Aug 10 15:56:08 EDT 2021
Committee: NEC-P08

Committee Statement

Committee Action: Accepted

Resolution: SR-8144-NFPA 70-2021

Statement: The panel accepted changes to include trade sizes 5 and 6 IMC to Article 342 to keep consistency in the rigid metal raceway articles.

The panel found that due to the changes made in the first draft by FR7583 and the fact that the products are manufactured similarly that the addition of the new trade

sizes are not considered new material.

Public Comment No. 78-NFPA 70-2021 [Article 344]

Article 344 Rigid Metal ~~Conduit: Type~~ Conduit (RMC)

Part I. General

344.1 Scope.

This article covers the use, installation, and construction specifications for rigid metal conduit (RMC) and associated fittings.

344.6 Listing Requirements.

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

Part II. Installation

344.10 Uses Permitted.

(A) Atmospheric Conditions and Occupancies.

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

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

(2) Aluminum RMC.

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, Stainless Steel, and Red Brass RMC, Elbows, Couplings, and Fittings.

Galvanized 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.

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:

(1) Stainless steel fittings

(2) Stainless steel boxes and enclosures

(3) Steel (galvanized, painted, powder or PVC coated, and so forth) boxes and enclosures when not subject to severe corrosive influences

(4) Stainless steel, nonmetallic, or approved accessories

344.20 Size.

(A) Minimum.

RMC smaller than metric designator 16 (trade size ½) shall not be used.

Exception: Metric designator 12 (trade size ⅜) shall be permitted for enclosing the leads of motors as permitted in 430.245(B).

(B) Maximum.

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

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.

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 number of cables shall not exceed the allowable percentage fill specified in Table 1, Chapter 9.

344.24 Bends.

(A) How Made.

Bends of RMC shall be so made that the conduit will not be damaged and so that the internal diameter of the conduit will not be effectively reduced. The radius of the curve of any field bend to the centerline of the conduit shall not be less than indicated in Table 2, Chapter 9

(B) Number in One Run.

The total degrees of bends in a conduit run shall not exceed 360 degrees between pull points.

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.

344.30 Securing and Supporting.

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).

(A) Securely Fastened.

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

(1) RMC 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) Fastening 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).

(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 RMC shall be permitted to be fished.

(B) Supports.

RMC 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 344.30(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 RMC 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 344.30(B) Supports for Rigid Metal Conduit

Conduit Size		Maximum Distance Between Rigid Metal Conduit Supports	
Metric Designator	Trade Size	m	ft
16–21	½–¾	3.0	10
27	1	3.7	12
35–41	1¼–1½	4.3	14
53–63	2–2½	4.9	16
78 and larger	3 and larger	6.1	20

344.42 Couplings and Connectors.

(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. Threadless couplings and connectors shall not be used on threaded conduit ends unless listed for the purpose.

(B) Running Threads.

Running threads shall not be used on conduit for connection at couplings.

344.46 Bushings.

Where a conduit enters a box, fitting, or other enclosure, a bushing shall be provided to protect the wires from abrasion unless the box, fitting, or enclosure is designed to provide such protection.

Informational Note: See 300.4(G) for the protection of conductors sizes 4 AWG and larger at bushings.

344.56 Splices and Taps.

Splices and taps shall be made in accordance with 300.15.

344.60 Grounding.

RMC shall be permitted as an equipment grounding conductor.

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 Comment

Editorial. “Type” has been removed from the new definitions for the individual conduits and tubings. This editorial deletion correlates with the definitions and clarifies the acronym for usability.

Please Note: This editorial revision only impacts the title of the article. Wonderful Terra required all of the Sections within the Article to be highlighted to make this simple change.

Related Item

• FR 7501

Submitter Information Verification

Submitter Full Name: David Kendall
Organization: ABB Inc.
Street Address:
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Submittal Date: Thu Jul 01 15:35:59 EDT 2021
Committee: NEC-P08

Committee Statement

Committee Action:	Rejected but see related SR
Resolution:	SR-8108-NFPA 70-2021
Statement:	“Type” has been removed from the new definitions found in Article 100 for conduit and tubings. This editorial deletion correlates with the definition and clarifies the acronym for usability.

Public Comment No. 79-NFPA 70-2021 [Article 348]

Article 348 Flexible Metal Conduit ~~: Type~~ (FMC)

Part I. General

348.1 Scope.

This article covers the use, installation, and construction specifications for flexible metal conduit (FMC) and associated fittings.

348.6 Listing Requirements.

FMC and associated fittings shall be listed.

348.8 Reconditioning.

FMC shall not be reconditioned.

Part II. Installation

348.10 Uses Permitted.

FMC shall be permitted to be used in exposed and concealed locations.

348.12 Uses Not Permitted.

FMC shall not be used in the following:

(1) In wet locations

(2) In hoistways, other than as permitted in 620.21(A)(1)

(3) In storage battery rooms

(4) In any hazardous (classified) location except as permitted by other articles in this *Code*

(5) Where exposed to materials having a deteriorating effect on the installed conductors, such as oil or gasoline

(6) Underground or embedded in poured concrete or aggregate

(7) Where subject to physical damage

348.20 Size.

(A) Minimum.

FMC less than metric designator 16 (trade size ½) shall not be used unless permitted in 348.20(A)(1) through (A)(5) for metric designator 12 (trade size ⅜).

(1) For enclosing the leads of motors as permitted in 430.245(B)

(2) In lengths not in excess of 1.8 m (6 ft) for any of the following uses:

(3) For utilization equipment

(4) As part of a listed assembly

(5) For tap connections to luminaires as permitted in 410.117(C)

(6) For manufactured wiring systems as permitted in 604.100(A)

(7) In hoistways as permitted in 620.21(A)(1)

(8) As part of a listed assembly to connect wired luminaire sections as permitted in 410.137(C)

(B) Maximum.

FMC larger than metric designator 103 (trade size 4) shall not be used.

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.

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 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.

348.24 Bends.

(A) How Made.

Bends in conduit shall be made so that the conduit is not damaged and the internal diameter of the conduit is not effectively reduced. Bends shall be permitted to be made manually without auxiliary equipment. The radius of the curve to the centerline of any bend shall not be less than shown in Table 2, Chapter 9 using the column “Other Bends.”

(B) Number in One Run.

The total degrees of bends in a conduit run shall not exceed 360 degrees between pull points.

348.28 Trimming.

All cut ends shall be trimmed or otherwise finished to remove rough edges, except where fittings that thread into the convolutions are used.

348.30 Securing and Supporting.

FMC shall be securely fastened in place and supported in accordance with 348.30(A) and (B).

(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.

(B) Supports.

Horizontal runs of FMC supported by openings through framing members at intervals not greater than 1.4 m (4½ ft) and securely fastened within 300 mm (12 in.) of termination points shall be permitted.

348.42 Couplings and Connectors.

Angle connectors shall not be concealed.

348.56 Splices and Taps.

Splices and taps shall be made in accordance with 300.15.

348.60 Grounding and Bonding.

(A) Fixed Installation.

FMC shall be permitted to be used as an equipment grounding conductor when installed in accordance with 250.118(A)(5) where flexibility is not required after installation.

(B) Flexible Installation.

An equipment grounding conductor 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.

(C) Equipment Grounding Conductors.

Where required or installed, equipment grounding conductors shall be installed in accordance with 250.134.

(D) Equipment Bonding Jumpers.

Where required or installed, equipment bonding jumpers shall be installed in accordance with 250.102.

Statement of Problem and Substantiation for Public Comment

Editorial. “Type” has been removed from the new definitions for the individual conduits and tubings. This editorial deletion correlates with the definitions and clarifies the acronym for usability.

Please Note: This editorial revision only impacts the title of the article. Wonderful Terra required all of

the Sections within the Article to be highlighted to make this simple change.

Related Item

• FR 7501

Submitter Information Verification

Submitter Full Name: David Kendall
Organization: ABB Inc.
Street Address:
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Submittal Date: Thu Jul 01 15:38:08 EDT 2021
Committee: NEC-P08

Committee Statement

Committee Action: Rejected but see related SR
Resolution: SR-8108-NFPA 70-2021
Statement: “Type” has been removed from the new definitions found in Article 100 for conduit and tubings. This editorial deletion correlates with the definition and clarifies the acronym for usability.

Public Comment No. 1063-NFPA 70-2021 [Section No. 348.8]

~~**348.8** Reconditioning.~~

~~FMC shall not be reconditioned.~~

Statement of Problem and Substantiation for Public Comment

Proposing to delete this proposed new section concerning reconditioning of this wiring method. No apparent substantiation was given for this rule, which would add more text and length to the NEC. Is there an example of any reputable firm "reconditioning" flexible metal conduit and selling it to a qualified contractor for installation? Having this rule present for this and other wiring methods (but not others) might create room to argue that one can "recondition" types AC and NMB cable, PVC or EMT conduit since it's prohibited for only some of the wiring methods but not others.

Note that while this would prohibit "reconditioning" it doesn't prohibit re-use. cleaning up an old wiring method before re-use may be prohibited, but re-use without any cleaning would be okay. Whether re-use is allowed is judged by 110.2, approval of equipment. It would seem this same section (110.2) is the best way to address the concerns about "reconditioning" of wiring methods.

If we need a rule prohibiting "reconditioning" of wiring methods, maybe we should put in in article 300 instead of having to keep up with adding a prohibition on any new wiring method that is made. Or maybe it should be inserted into the "used prohibited" sections of the wiring methods.

Related Item

- Public Input No. 2330-NFPA 70-2020 [New Section after 348.6]
- First Revision No. 7552-NFPA 70-2020 [New Section after 348.6]

Submitter Information Verification

Submitter Full Name: Josh Weaver
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Submittal Date: Sat Aug 07 12:06:07 EDT 2021
Committee: NEC-P08

Committee Statement

Committee Action: Rejected

Resolution: 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).

Public Comment No. 80-NFPA 70-2021 [Article 350]

Article 350 Liquidtight Flexible Metal Conduit ~~: Type~~ (LFMC)

Part I. General

350.1 Scope.

This article covers the use, installation, and construction specifications for liquidtight flexible metal conduit (LFMC) and associated fittings.

350.6 Listing Requirements.

LFMC and associated fittings shall be listed.

350.8 Reconditioning.

LFMC shall not be reconditioned.

Part II. Installation

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.

350.12 Uses Not Permitted.

LFMC shall not be used where subject to physical damage.

350.20 Size.

(A) Minimum.

LFMC smaller than metric designator 16 (trade size ½) shall not be used.

Exception: LFMC of metric designator 12 (trade size ⅜) shall be permitted as covered in 348.20(A).

(B) Maximum.

The maximum size of LFMC shall be metric designator 103 (trade size 4).

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.

350.22 Number of Conductors or Cables.

(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 number of cables shall not exceed the allowable percentage fill specified in Table 1, Chapter 9.

(B) Metric Designator 12 (Trade Size ⅜).

The number of conductors shall not exceed that permitted in Table 348.22, “Fittings Outside Conduit” columns.

350.24 Bends.

(A) How Made.

Bends in conduit shall be so made that the conduit will not be damaged and the internal diameter of the conduit will not be effectively reduced. Bends shall be permitted to be made manually without auxiliary equipment. The radius of the curve to the centerline of any bend shall not be less than required in Table 2, Chapter 9 using the column “Other Bends.”

(B) Number in One Run.

The total degrees of bends in a conduit run shall not exceed 360 degrees between pull points.

350.28 Trimming.

All cut ends of conduit shall be trimmed inside and outside to remove rough edges.

350.30 Securing and Supporting.

LFMC shall be securely fastened in place and supported in accordance with 350.30(A) and (B).

(A) Securely Fastened.

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). 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.

(B) Supports.

Horizontal runs of LFMC supported by openings through framing members at intervals not greater than 1.4 m (4½ ft) and securely fastened within 300 mm (12 in.) of termination points shall be permitted.

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.

350.56 Splices and Taps.

Splices and taps shall be made in accordance with 300.15.

350.60 Grounding and Bonding.

(A) Fixed Installation.

LFMC shall be permitted to be used as an equipment grounding conductor when installed in accordance with 250.118(A)(6) where flexibility is not required after installation.

(B) Flexible Installation.

An equipment grounding conductor 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.

(C) Equipment Grounding Conductor.

Where required or installed, equipment grounding conductors shall be installed in accordance with 250.134.

(D) Equipment Bonding Jumpers.

Where required or installed, equipment bonding jumpers shall be installed in accordance with 250.102.

Informational Note: See 501.30(B), 502.30(B), 503.30(B), 505.25(B), and 506.25(B) for types of equipment grounding conductors.

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 Comment

Editorial. “Type” has been removed from the new definitions for the individual conduits and tubings. This editorial deletion correlates with the definitions and clarifies the acronym for usability.

Please Note: This editorial revision only impacts the title of the article. Wonderful Terra required all of the Sections within the Article to be highlighted to make this simple change.

Related Item

• FR 7501

Submitter Information Verification

Submitter Full Name: David Kendall
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Submittal Date: Thu Jul 01 15:39:45 EDT 2021
Committee: NEC-P08

Committee Statement

Committee Action: Rejected but see related SR
Resolution: SR-8108-NFPA 70-2021

Statement:	“Type” has been removed from the new definitions found in Article 100 for conduit and tubings. This editorial deletion correlates with the definition and clarifies the acronym for usability.

Public Comment No. 1064-NFPA 70-2021 [Section No. 350.8]

~~**350.8** Reconditioning.~~

~~LFMC shall not be reconditioned.~~

Statement of Problem and Substantiation for Public Comment

Proposing to delete this proposed new section concerning reconditioning of this wiring method. No apparent substantiation was given for this rule, which would add more text and length to the NEC. Is there an example of any reputable firm "reconditioning" flexible metal conduit and selling it to a qualified contractor for installation? Having this rule present for this and other wiring methods (but not others) might create room to argue that one can "recondition" types AC and NMB cable, PVC or EMT conduit since it's prohibited for only some of the wiring methods but not others.

Note that while this would prohibit "reconditioning" it doesn't prohibit re-use. cleaning up an old wiring method before re-use may be prohibited, but re-use without any cleaning would be okay. Whether re-use is allowed is judged by 110.2, approval of equipment. It would seem this same section (110.2) is the best way to address the concerns about "reconditioning" of wiring methods.

If we need a rule prohibiting "reconditioning" of wiring methods, maybe we should put in in article 300 instead of having to keep up with adding a prohibition on any new wiring method that is made. Or maybe it should be inserted into the "used prohibited" sections of the wiring methods.

Related Item

- First Revision No. 7552-NFPA 70-2020 [New Section after 348.6]
- Public Input No. 2330-NFPA 70-2020 [New Section after 348.6]

Submitter Information Verification

Submitter Full Name: Josh Weaver
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Submittal Date: Sat Aug 07 12:17:43 EDT 2021
Committee: NEC-P08

Committee Statement

Committee Action: Rejected

Resolution: 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).

Public Comment No. 81-NFPA 70-2021 [Article 352]

Article 352 Rigid Polyvinyl Chloride Conduit ~~: Type~~ (PVC)

Part I. General

352.1 Scope.

This article covers the use, installation, and construction specifications for rigid polyvinyl chloride conduit (PVC) and associated fittings.

352.6 Listing Requirements.

PVC conduit, factory elbows, and associated fittings shall be listed.

Part II. Installation

352.10 Uses Permitted.

The use of PVC conduit shall be permitted in accordance with 352.10(A) through (I).

Informational Note: Extreme cold may cause some nonmetallic conduits to become brittle and, therefore, more susceptible to damage from physical contact.

(A) Concealed.

PVC conduit shall be permitted in walls, floors, and ceilings.

(B) Encased in Concrete.

PVC conduit shall be permitted to be encased in concrete.

(C) Corrosive Influences.

PVC conduit shall be permitted in locations subject to severe corrosive influences as covered in 300.6 and where subject to chemicals for which the materials are specifically approved.

(D) Cinders.

PVC conduit shall be permitted in cinder fill.

(E) Wet Locations.

PVC conduit shall be permitted in portions of dairies, laundries, canneries, or other wet locations, and in locations where walls are frequently washed, the entire conduit system, including boxes and fittings used therewith, shall be installed and equipped so as to prevent water from entering the conduit. All supports, bolts, straps, screws, and so forth, shall be of corrosion-resistant materials or be protected against corrosion by approved corrosion-resistant materials.

(F) Dry and Damp Locations.

PVC conduit shall be permitted for use in dry and damp locations not prohibited by 352.12.

(G) Exposed.

PVC conduit shall be permitted for exposed work.

(H) Underground Installations.

For underground installations, PVC shall be permitted for direct burial and underground encased in concrete. See 300.5 and 305.15.

(I) Support of Conduit Bodies.

PVC conduit shall be permitted to support nonmetallic conduit bodies not larger than the largest 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).

(J) Insulation Temperature Limitations.

Conductors or cables rated at a temperature higher than the listed temperature rating of PVC conduit shall be permitted to be installed in PVC conduit, provided the conductors or cables are not operated at a temperature higher than the listed temperature rating of the PVC conduit.

(K) Physical Damage.

Where subject to physical damage, Type Schedule 80 PVC conduit, Type Schedule 80 PVC elbows, and listed fittings for PVC conduit shall be used.

Informational Note: All listed PVC conduit fittings are suitable for connection to both Schedule 40 and Schedule 80 PVC conduit.

352.12 Uses Not Permitted.

PVC conduit shall not be used under the conditions specified in 352.12(A) through (E).

(A) Hazardous (Classified) Locations.

In any hazardous (classified) location, except as permitted by other articles of this *Code*.

(B) Support of Luminaires.

For the support of luminaires or other equipment not described in 352.10(I).

(C) Physical Damage.

Where subject to physical damage, except as permitted in 352.10(K).

(D) Ambient Temperatures.

Where subject to ambient temperatures in excess of 50°C (122°F) unless listed otherwise.

(E) Theaters and Similar Locations.

In theaters and similar locations, except as provided in 518.4 and 520.5.

352.20 Size.

(A) Minimum.

PVC conduit smaller than metric designator 16 (trade size ½) shall not be used.

(B) Maximum.

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

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

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 number of cables shall not exceed the allowable percentage fill specified in Table 1, Chapter 9.

352.24 Bends.

(A) How Made.

Bends shall be so made that the conduit will not be damaged and the internal diameter of the conduit will not be effectively reduced. Field bends shall be made only with identified bending equipment. The radius of the curve to the centerline of such bends shall not be less than shown in Table 2, Chapter 9.

(B) Number in One Run.

The total degrees of bends in a conduit run shall not exceed 360 degrees between pull points.

352.28 Trimming.

All cut ends shall be trimmed inside and outside to remove rough edges.

352.30 Securing and Supporting.

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).

(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.

(B) Supports.

PVC conduit shall be supported as required in Table 352.30(B). Conduit listed for support at spacings other than as shown in Table 352.30(B) shall be permitted to be installed in accordance with the listing. Horizontal runs of PVC conduit supported by openings through framing members at intervals not exceeding those in Table 352.30(B) and securely fastened within 900 mm (3 ft) of termination points shall be permitted.

Table 352.30(B) Support of Rigid Polyvinyl Chloride Conduit (PVC)

Conduit Size		Maximum Spacing Between Supports	
Metric Designator	Trade Size	mm or m	ft
16–27	½–1	900 mm	3
35–53	1¼–2	1.5 m	5
63–78	2½–3	1.8 m	6
91–129	3½–5	2.1 m	7
155	6	2.5 m	8

352.44 Expansion Fittings.

(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 (¼ 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	120	4.87
25	1.52	25	1.01	125	5.07
30	1.83	30	1.22	130	5.27
35	2.13	35	1.42	135	5.48
40	2.43	40	1.62	140	5.68
45	2.74	45	1.83	145	5.88
50	3.04	50	2.03	150	6.08
55	3.35	55	2.23	155	6.29
60	3.65	60	2.43	160	6.49
65	3.95	65	2.64	165	6.69
70	4.26	70	2.84	170	6.90
75	4.56	75	3.04	175	7.10
80	4.87	80	3.24	180	7.30
85	5.17	85	3.45	185	7.50
90	5.48	90	3.65	190	7.71
95	5.78	95	3.85	195	7.91
100	6.08	100	4.06	200	8.11

(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).

352.46 Bushings.

Where a conduit enters a box, fitting, or other enclosure, a bushing or adapter shall be provided to protect the wire from abrasion unless the box, fitting, or enclosure design provides equivalent protection.

Informational Note: See 300.4(G) for the protection of conductors 4 AWG and larger at bushings.

352.48 Joints.

All joints between lengths of conduit, and between conduit and couplings, fittings, and boxes, shall be made by an approved method.

352.56 Splices and Taps.

Splices and taps shall be made in accordance with 300.15.

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.

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 Comment

Editorial. “Type” has been removed from the new definitions for the individual conduits and tubings. This editorial deletion correlates with the definitions and clarifies the acronym for usability.

Please Note: This editorial revision only impacts the title of the article. Wonderful Terra required all of the Sections within the Article to be highlighted to make this simple change.

Related Item

• FR 7501

Submitter Information Verification

Submitter Full Name: David Kendall
Organization: ABB Inc.
Street Address:
City:
State:
Zip:

Submittal Date: Thu Jul 01 15:41:55 EDT 2021
Committee: NEC-P08

Committee Statement

Committee Action: Rejected but see related SR
Resolution: SR-8108-NFPA 70-2021
Statement: “Type” has been removed from the new definitions found in Article 100 for conduit and tubings. This editorial deletion correlates with the definition and clarifies the acronym for usability.

Public Comment No. 833-NFPA 70-2021 [Section No. 352.1]

352.1 Scope.

This article covers the use, installation, and construction specifications for rigid polyvinyl chloride conduit (PVC) and associated fittings.

Additional Proposed Changes

File Name	Description	Approved
8_CN_339.pdf	70_CN339	

Statement of Problem and Substantiation for Public Comment

The following CC Note No. 339 appeared in the First Draft Report on First Revision No. 7559.

The Correlating Committee advises that article scope statements and location of articles are the responsibility of the Correlating Committee and the Correlating Committee accepts the deletion of the Informational Note.

Related Item

• First Revision No. 7559

Submitter Information Verification

Submitter Full Name: CC on NEC-AAC
Organization: NEC Correlating Committee
Street Address:
City:
State:
Zip:
Submittal Date: Wed Aug 04 13:29:36 EDT 2021
Committee: NEC-P08

Committee Statement

Committee Action: Rejected
Resolution: No further action is required by the panel.

Correlating Committee Note No. 339-NFPA 70-2021 [Section No. 352.1]

Submitter Information Verification

Committee: NEC-P08
Submittal Date: Thu May 06 16:55:12 EDT 2021

Committee Statement

Committee Statement: The Correlating Committee advises that article scope statements and location of articles are the responsibility of the Correlating Committee and the Correlating Committee accepts the deletion of the Informational Note.

First Revision No. 7559-NFPA 70-2020 [Section No. 352.1]

Ballot Results

This item has passed ballot

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

Affirmative All

Ayer, Lawrence S.
Gallo, Ernest J.
Hickman, Palmer L.
Holub, Richard A.
Hunter, Dean C.
Johnston, Michael J.
Kendall, David H.
Kovacik, John R.
Manche, Alan
McDaniel, Roger D.
Porter, Christine T.
Williams, David A.

Public Comment No. 1065-NFPA 70-2021 [Section No. 352.44(B)]

~~(B) Earth Movement.~~

~~Expansion~~

Informational Note: 300.5(J) may necessitate the installation of 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) .~~

and entering an enclosure, regardless of length of the conduit section.

Statement of Problem and Substantiation for Public Comment

I am proposing turning this into an informational note rather than a rule. The public input related to this proposed new rule sought to create a requirement, followed by an exception for where the AHJ deems in not needed. However, the current text of the proposed new rule basically says use expansion fittings where required. This seems of little use. Such a thing should already be known to a qualified person. Thus, it's not really a new rule, but a reminder to a qualified person, that other rules in the code (such as 300.5J) may require additional expansion fittings. Information that is more along the lines of an informational guideline might be better placed in the form of an informational note.

Related Item

• First Revision No. 7571-NFPA 70-2020 [Section No. 352.44]

• Public Input No. 1107-NFPA 70-2020 [Section No. 352.44]

Submitter Information Verification

Submitter Full Name: Josh Weaver
Organization: [Not Specified]
Street Address:
City:
State:
Zip:
Submittal Date: Sat Aug 07 12:26:02 EDT 2021
Committee: NEC-P08

Committee Statement

Committee Action: Rejected

Resolution: 352.44(B) requires expansion fitting to be used to address earth settling or movement. The Public Comment removes this new requirement to require an expansion fitting.

Public Comment No. 1357-NFPA 70-2021 [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 Comment

This revision seeks to use the defined term "equipment grounding conductor."

Related Item

• FR 7572

Submitter Information Verification

Submitter Full Name: Ryan Jackson
Organization: Ryan Jackson
Street Address:
City:
State:
Zip:
Submittal Date: Thu Aug 12 12:20:37 EDT 2021
Committee: NEC-P08

Committee Statement

Committee Action: Rejected

Resolution: The Public Comment proposed change assumes all grounding conductors are Equipment Grounding Conductors, whereas a grounding conductor, whether an EGC, a GEC, or an equipotential bonding conductor is still needed for PVC conduit.

Public Comment No. 82-NFPA 70-2021 [Article 353]

Article 353 High Density Polyethylene Conduit ~~: Type~~ (HDPE Conduit)

Part I. General

353.1 Scope.

This article covers the use, installation, and construction specifications for high density polyethylene (HDPE) conduit and associated fittings.

353.6 Listing Requirements.

HDPE conduit and associated fittings shall be listed.

Part II. Installation

353.10 Uses Permitted.

The use of HDPE conduit shall be permitted under the following conditions:

(1) In discrete lengths or in continuous lengths from a reel

(2) In locations subject to severe corrosive influences as covered in 300.6 and where subject to chemicals for which the conduit is listed

(3) In cinder fill

(4) In direct burial installations in earth or concrete

Informational Note to (4): Refer to 300.5 and 305.15 for underground installations.

(5) Above ground, except as prohibited in 353.12, where encased in not less than 50 mm (2 in.) of concrete.

(6) Conductors or cables rated at a temperature higher than the listed temperature rating of HDPE conduit shall be permitted to be installed in HDPE conduit, provided the conductors or cables are not operated at a temperature higher than the listed temperature rating of the HDPE conduit.

353.12 Uses Not Permitted.

HDPE conduit shall not be used under the following conditions:

(1) Where exposed

(2) Within a building

(3) In any hazardous (classified) location, except as permitted by other articles in this *Code*

(4) Where subject to ambient temperatures in excess of 50°C (122°F) unless listed otherwise

353.20 Size.

(A) Minimum.

HDPE conduit smaller than metric designator 16 (trade size ½) shall not be used.

(B) Maximum.

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

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

353.22 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 number of cables shall not exceed the allowable percentage fill specified in Table 1, Chapter 9.

353.24 Bends.

(A) How Made.

Bends shall be so made that the conduit will not be damaged and the internal diameter of the conduit will not be effectively reduced. Bends shall be permitted to be made manually without auxiliary equipment, and the radius of the curve to the centerline of such bends shall not be less than shown in Table 354.24(A). For conduits of metric designators 129 and 155 (trade sizes 5 and 6), the allowable radii of bends shall be in accordance with specifications provided by the manufacturer.

(B) Number in One Run.

The total degrees of bends in a conduit run shall not exceed 360 degrees between pull points.

353.28 Trimming.

All cut ends shall be trimmed inside and outside to remove rough edges.

353.46 Bushings.

Where a conduit enters a box, fitting, or other enclosure, a bushing or adapter shall be provided to protect the wire from abrasion unless the box, fitting, or enclosure design provides equivalent protection.

> Informational Note: See 300.4(G) for the protection of conductors 4 AWG and larger at bushings.

353.48 Joints.

All joints between lengths of conduit, fittings, and boxes shall be made using either electrofusion or mechanical fittings.

353.56 Splices and Taps.

Splices and taps shall be made in accordance with 300.15.

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.

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 Comment

Editorial. “Type” has been removed from the new definitions for the individual conduits and tubings. This editorial deletion correlates with the definitions and clarifies the acronym for usability.

Please Note: This editorial revision only impacts the title of the article. Wonderful Terra required all of the Sections within the Article to be highlighted to make this simple change.

Related Item

• FR 7501

Submitter Information Verification

Submitter Full Name: David Kendall
Organization: ABB Inc.
Street Address:
City:
State:
Zip:
Submittal Date: Thu Jul 01 15:47:06 EDT 2021
Committee: NEC-P08

Committee Statement

Committee Action: Rejected but see related SR
Resolution: SR-8108-NFPA 70-2021
Statement: “Type” has been removed from the new definitions found in Article 100 for conduit and tubings. This editorial deletion correlates with the definition and clarifies the acronym for usability.

Public Comment No. 834-NFPA 70-2021 [Section No. 353.1]

353.1 Scope.

This article covers the use, installation, and construction specifications for high density polyethylene (HDPE) conduit and associated fittings.

Additional Proposed Changes

File Name	Description	Approved
8_CN_340.pdf	70_CN340	

Statement of Problem and Substantiation for Public Comment

The following CC Note No. 340 appeared in the First Draft Report on First Revision No. 7517.

The Correlating Committee advises that article scope statements and location of articles are the responsibility of the Correlating Committee and the Correlating Committee accepts the deletion of the Informational Note.

Related Item

• First Revision No. 7517

Submitter Information Verification

Submitter Full Name: CC on NEC-AAC
Organization: NEC Correlating Committee
Street Address:
City:
State:
Zip:
Submittal Date: Wed Aug 04 13:32:54 EDT 2021
Committee: NEC-P08

Committee Statement

Committee Action: Rejected
Resolution: No further action was required by the panel.

Correlating Committee Note No. 340-NFPA 70-2021 [Section No. 353.1]

Submitter Information Verification

Committee: NEC-P08
Submittal Date: Thu May 06 16:56:25 EDT 2021

Committee Statement

Committee Statement: The Correlating Committee advises that article scope statements and location of articles are the responsibility of the Correlating Committee and the Correlating Committee accepts the deletion of the Informational Note.

First Revision No. 7517-NFPA 70-2020 [Section No. 353.1]

Ballot Results

This item has passed ballot

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

Affirmative All

Ayer, Lawrence S.
Gallo, Ernest J.
Hickman, Palmer L.
Holub, Richard A.
Hunter, Dean C.
Johnston, Michael J.
Kendall, David H.
Kovacik, John R.
Manche, Alan
McDaniel, Roger D.
Porter, Christine T.
Williams, David A.

Public Comment No. 1066-NFPA 70-2021 [Section No. 353.48]

353.48 Joints.

All joints between lengths of conduit, fittings, and boxes shall be made using either ~~electrofusion or mechanical fittings~~ identified fittings. Heat fusion, or direct connections without the use of a fitting shall not be allowed .

Statement of Problem and Substantiation for Public Comment

It seems it would be more appropriate to require Identified fittings rather than to require certain means. If we require only certain means, then there will be the issue of updating the NEC every time there is a new identified and/or listed means that should be allowed by the NEC but isn't. There's 2 part epoxy type adhesives that are identified for use with fittings for HDPE conduit and that have been proven in use by the utilities and have been approved by the AHJ. No reason to prohibit this was presented in the public input. Rather, the public input sought to prohibit heat fusion and butt splicing and didn't seek to require only electrofusion or mechanical fittings. As a result, I suggest we either resort to the 2020 language, or change to allow identified fittings.

See example of 2 part epoxy joint compound:
https://www.polywater.com/electrical/joining_pvc_and_hdpe_duct/

Related Item

- Public Input No. 1276-NFPA 70-2020 [Section No. 353.48]
- First Revision No. 7537-NFPA 70-2020 [Section No. 353.48]

Submitter Information Verification

Submitter Full Name: Josh Weaver
Organization: [Not Specified]
Street Address:
City:
State:
Zip:
Submittal Date: Sat Aug 07 12:46:02 EDT 2021
Committee: NEC-P08

Committee Statement

Committee Action: Rejected but see related SR
Resolution: SR-8133-NFPA 70-2021
Statement: UL 651A is performance based, if the CMP creates a laundry list of permitted joints, it may inadvertently omit a joining method that could meet the performance requirements of the standard. By prohibiting heat and butt fusion, that seems to meet the intent of the original PI as well as the intent of the current PC's.

Public Comment No. 1415-NFPA 70-2021 [Section No. 353.48]

353.48 Joints.

All joints between lengths of conduit, and between conduit and couplings, fittings, and boxes, shall be made by an approved method.

Informational Note: HDPE conduit can be joined using either chemical fusion, electrofusion, or mechanical fittings.

Additional Proposed Changes

File Name	Description	Approved
PolyWaterLetterV3.pdf	Letter with explanation of Chemical Fusion and how it is utilized in the HDPE Industry.	
PolyWaterTest.pdf	Test Date for the reliability of Chemical Fusion, much like PVC Cement, designed for the jointing of HDPE Conduit to not only other HDPE Conduits but also where necessary for a smooth field transition.	

Statement of Problem and Substantiation for Public Comment

Greetings Code Making Panel Members -

The current proposed wording of section 353.48 leaves out a very common and industry proven method of "chemical" fusion (or ChemicalFusion) of two raceway methods together that has proven to be as reliable as mechanical method and more readily available and economically viable to the electrical industry. Not including this proven chemical process, similar to the pvc cement's chemical bonding process, of joining HDPE Conduit and associated transition fittings together, only serves to increases the cost of construction needlessly but also reduces the reliability and longevity of the underground connection.

I have a companion PC 562 that seeks to add the term "Chemical Fusion" or "ChemicalFusion" to the list of acceptable jointing procedures. If that proposal is not accepted this PC seeks to revert the language back to the 2020 NEC to allow the "approved" method to be utilized since the chemical fusion method is commonly used and products are on the market that have been tested (see attached) that support their use in the field.

Please see the attached, associated documents to collectively review the analysis of this tested method as well as technical data to substantiate the viability of such a chemical fusion method.

Related Public Comments for This Document

Related Comment	Relationship
Public Comment No. 562-NFPA 70-2021 [Section No. 353.48]	Desired Public Comment to address this issue
Public Comment No. 562-NFPA 70-2021 [Section No. 353.48]	

Related Item

• 1276 • FR7537

Submitter Information Verification

Submitter Full Name: Paul Abernathy
Organization: Electrical Code Academy, Inc.
Street Address:
City:
State:
Zip:
Submittal Date: Thu Aug 12 16:15:14 EDT 2021
Committee: NEC-P08

Committee Statement

Committee Action: Rejected but see related SR
Resolution: SR-8133-NFPA 70-2021
Statement: UL 651A is performance based, if the CMP creates a laundry list of permitted joints, it may inadvertently omit a joining method that could meet the performance requirements of the standard. By prohibiting heat and butt fusion, that seems to meet the intent of the original PI as well as the intent of the current PC's.

Condux International
P.O. Box 247 • 145 Kingswood Road
Mankato, MN 56002-0247 USA
Phone: 800-553-2077 or Fax: 507-387-1442

www.condux.com

Date May, 25 2005

Purpose

Testing BonDuit Conduit Adhesive use HDPE conduit and PVC coupling.

Test Procedure

Two one-foot pieces of HDPE conduit were joined together with a Schedule 40 PVC coupling using BonDuit® Conduit Adhesive. The BonDuit® Conduit Adhesive was applied using the instruction contained in the kit. The conduit and coupling were sanded using an 80-grit sanding cloth and cleaned with a TR™ Solvent Wipe provided in the kit. The BonDuit® Adhesive was applied in a zigzag pattern onto the conduit, the depth of the coupling. The coupling was twisted on and any excess BonDuit® Adhesive was smoothed. The pieces were cured, then tested as described on the tables below.

24 hour Cure							
Conduit	**Pull-Out, Tension Force, lbs**						
Size	**1**	**2**	**3**	**4**	**5**	**6**	**Ave**
4 inch	6000	4900	4900	5100	6600	4500	5333 lb
2 inch	2000	2200	2100	1800	n/a	n/a	2025 lb
1 1/2 inch	1200	1600	1000	1300	1200	1100	1233 lb
1 inch	665	790	740	690	720	740	724 lb

1 hour Cure					
Conduit	**Pull-Out, Tension Force, lbs**				
Size	**1**	**2**	**3**	**4**	**Ave**
2 inch	2000	1800	1800	1900	1875 lb
1 inch	700	790	750	740	745 lb

Conduit Size	**Published Pull-Out Tension Force, lbs**
4 inch	4870 lb
2 inch	1820 lb
1 ½ inch	910 lb
1 inch	460 lb

ELECTRICAL CODE ACADEMY, INC.

3913 EDWARD DRIVE, MCKINNEY, TX 75071

Dear ***Code Making Panel 8 Members:***

My name is Paul Abernathy, CEO of Electrical Code Academy, Inc. and program administrator for the ***Certified Master Electrical Code Professional®*** Program, as well as also being a fellow *Code Making Panel* member serving on *CMP 5* and *CMP 17*.

Firstly, I would like to commend you all on the continued outstanding work you're doing on CMP 8. As we all know, the efforts we make, and sometimes sacrifice collectively together within the code development community, will always be focused on the safety of our fellow electrical brothers and sisters and of course the world at large.

Secondly, I think with constant code development (change) we, the electrical community, sometimes demand additional clarity that is born out of common industry practice. With that brings me to the change proposed in section 353.48 regarding the joints within High Density Polyethylene Conduit (HDPE). I whole heartedly applaud the removal of "Heat Fusion" as a joining method for HDPE. As stated in the CMP FR-7501 panel statement, the heat fusion process indeed produces a "lip or bead" that can potentially damage the insulation of conductors as they are installed. With regards to the electrofusion connection option, they are costly and sadly will result in unlikely utilization in the field that results in less reliable mechanical connection usage. With that said, I would like to submit something for your consideration in the public comment stage as a possible CMP 8 second draft revision, and is why I am reaching out.

There are very limited options for a listed non-mechanical transition fittings for PVC to HDPE. In fact, in my opinion, there are less reliable and less secure friction fitting without an enhanced "chemical fusion bond" whom claims to be UL Listed. However, this such product *"Cobalt Coupler System"* displays a certificate of compliance for a conduit fitting and not specifically listed for PVC to HDPE transition.

As you may know, it is common practice to make transitions from underground applications, as permitted in section 353.10(4) to above grade installations, both inside or outside of a structure. Due to this common practice, the aforementioned situation is exactly where a transition fitting would be necessary. A very common and often desired transition is from exterior HDPE to PVC Conduit and a PVC couplings is the prefect transition fitting when used with chemical fusion, similar to what is done with PVC cement since the diameters are identical.

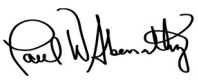
As noted in your panel statement FR-7501, there are available products on the market that will handle conjoining of HDPE products, such as mechanical and electrofusion. However, section 353.6 mandates their listings, yet we know that this is not possible with electrofusion and at the time of this letter I am only aware of one specific mechanical transition fitting expressly listed for HDPE to PVC transitions.

However, there is a common option that has been used for over 20 years and is also utilized on other polymeric raceways, it's called ***chemical fusion***. An example of such chemical fusion is PVC Cement, which is also not "listed" yet has been an acceptable practice for chemical fusion of PVC raceways for over 20 years. You may be interested to know this product, for chemical fusion, also exists for HDPE to PVC utilizing common listed PVC Fittings as a chemical fusion "bonding" alternative. In fact, I have enclosed a fact-finding-report from ***"Condux International"*** and ***"UL"*** that shows the efficacy of a product called "BonDuit®", as simply one example of such a chemical fusion product designed especially for the transition of HDPE to PVC.

The report (attached) conclusively shows that when the product is applied in accordance with the manufacturers instructions, results in a published pull-out tension force (lbs.) of ***460 lbs***. with Trade size 1, ***910 lbs***. with Trade size 1½ , ***1,820 lbs***. with Trade size 2, and ***4,870 lbs.*** with Trade size 4. unlike other methods, such as mechanical, the fusion method is not removable or able to be circumvented exactly as you would expect with traditional PVC Cement style chemical fusion.

In Closing, there are products available on the market today that provide this chemical fusion, and are not required to be "listed", much as PVC Cement. However, such as a product like "BonDuit®", they are proven, lab and field tested to be a reliable alternative to electrofusion or mechanical methods. My recommendation would be to add "chemical fusion" to the newly rewritten section 353.6 or revert back to the original language in the 2020 NEC and simply add "chemical fusion" as one of the methods in the informational note, while continuing to remove "heat fusion" for obvious reasons noted by FR-7501.

Sincerely,



Paul Wilson Abernathy, CMECP®
CEO and Founder
Electrical Code Academy, Inc.

3913 Edward Drive
McKinney, Texas 75071

Phone: 214-945-0653
Email: info@masterthenec.com

Public Comment No. 562-NFPA 70-2021 [Section No. 353.48]

353.48 Joints.

All joints between lengths of conduit, fittings, and boxes shall be made using either ~~electrofusion~~ chemical fusion, electrofusion or mechanical fittings.

Additional Proposed Changes

File Name	Description	Approved
PolyWaterLetterV3.pdf	Letter to Code Making Panel to explain ChemicalFusion and it's long standing history of effective transitions.	
PolyWaterTest.pdf	Test Data that shows ChemicalFusion is more reliable than mechanical transitions.	

Statement of Problem and Substantiation for Public Comment

Greetings Code Making Panel Members -

The current proposed wording of section 353.48 leaves out a very common and industry proven method of "chemical" fusion (or ChemicalFusion) of two raceway methods together that has proven to be as reliable as mechanical method and more readily available and economically viable to the electrical industry. Not including this proven chemical process, similar to the pvc cement's chemical bonding process, of joining HDPE Conduit and associated transition fittings together, only serves to increases the cost of construction needlessly but also reduces the reliability and longevity of the underground connection. Please see the attached, associated documents to collectively review the analysis of this tested method as well as technical data to substantiate the viability of such a chemical fusion method.

Related Public Comments for This Document

Related Comment	Relationship
Public Comment No. 1415-NFPA 70-2021 [Section No. 353.48]	Alternate Public Comment
Public Comment No. 1415-NFPA 70-2021 [Section No. 353.48]	

Related Item

• FR7537 • PI1276

Submitter Information Verification

Submitter Full Name: Paul Abernathy
Organization: Electrical Code Academy, Inc.
Street Address:
City:
State:
Zip:
Submittal Date: Fri Jul 30 12:19:42 EDT 2021
Committee: NEC-P08

Committee Statement

Committee Action:	Rejected but see related SR
Resolution:	SR-8133-NFPA 70-2021
Statement:	UL 651A is performance based, if the CMP creates a laundry list of permitted joints, it may inadvertently omit a joining method that could meet the performance requirements of the standard. By prohibiting heat and butt fusion, that seems to meet the intent of the original PI as well as the intent of the current PC's.

ELECTRICAL CODE ACADEMY, INC.

3913 EDWARD DRIVE, MCKINNEY, TX 75071

Dear ***Code Making Panel 8 Members:***

My name is Paul Abernathy, CEO of Electrical Code Academy, Inc. and program administrator for the ***Certified Master Electrical Code Professional®*** Program, as well as also being a fellow *Code Making Panel* member serving on *CMP 5* and *CMP 17*.

Firstly, I would like to commend you all on the continued outstanding work you're doing on CMP 8. As we all know, the efforts we make, and sometimes sacrifice collectively together within the code development community, will always be focused on the safety of our fellow electrical brothers and sisters and of course the world at large.

Secondly, I think with constant code development (change) we, the electrical community, sometimes demand additional clarity that is born out of common industry practice. With that brings me to the change proposed in section 353.48 regarding the joints within High Density Polyethylene Conduit (HDPE). I whole heartedly applaud the removal of "Heat Fusion" as a joining method for HDPE. As stated in the CMP FR-7501 panel statement, the heat fusion process indeed produces a "lip or bead" that can potentially damage the insulation of conductors as they are installed. With regards to the electrofusion connection option, they are costly and sadly will result in unlikely utilization in the field that results in less reliable mechanical connection usage. With that said, I would like to submit something for your consideration in the public comment stage as a possible CMP 8 second draft revision, and is why I am reaching out.

There are very limited options for a listed non-mechanical transition fittings for PVC to HDPE. In fact, in my opinion, there are less reliable and less secure friction fitting without an enhanced "chemical fusion bond" whom claims to be UL Listed. However, this such product *"Cobalt Coupler System"* displays a certificate of compliance for a conduit fitting and not specifically listed for PVC to HDPE transition.

As you may know, it is common practice to make transitions from underground applications, as permitted in section 353.10(4) to above grade installations, both inside or outside of a structure. Due to this common practice, the aforementioned situation is exactly where a transition fitting would be necessary. A very common and often desired transition is from exterior HDPE to PVC Conduit and a PVC couplings is the prefect transition fitting when used with chemical fusion, similar to what is done with PVC cement since the diameters are identical.

As noted in your panel statement FR-7501, there are available products on the market that will handle conjoining of HDPE products, such as mechanical and electrofusion. However, section 353.6 mandates their listings, yet we know that this is not possible with electrofusion and at the time of this letter I am only aware of one specific mechanical transition fitting expressly listed for HDPE to PVC transitions.

However, there is a common option that has been used for over 20 years and is also utilized on other polymeric raceways, it's called ***chemical fusion***. An example of such chemical fusion is PVC Cement, which is also not "listed" yet has been an acceptable practice for chemical fusion of PVC raceways for over 20 years. You may be interested to know this product, for chemical fusion, also exists for HDPE to PVC utilizing common listed PVC Fittings as a chemical fusion "bonding" alternative. In fact, I have enclosed a fact-finding-report from ***"Condux International"*** and ***"UL"*** that shows the efficacy of a product called "BonDuit®", as simply one example of such a chemical fusion product designed especially for the transition of HDPE to PVC.

The report (attached) conclusively shows that when the product is applied in accordance with the manufacturers instructions, results in a published pull-out tension force (lbs.) of ***460 lbs***. with Trade size 1, ***910 lbs***. with Trade size 1½ , ***1,820 lbs***. with Trade size 2, and ***4,870 lbs.*** with Trade size 4. unlike other methods, such as mechanical, the fusion method is not removable or able to be circumvented exactly as you would expect with traditional PVC Cement style chemical fusion.

In Closing, there are products available on the market today that provide this chemical fusion, and are not required to be "listed", much as PVC Cement. However, such as a product like "BonDuit®", they are proven, lab and field tested to be a reliable alternative to electrofusion or mechanical methods. My recommendation would be to add "chemical fusion" to the newly rewritten section 353.6 or revert back to the original language in the 2020 NEC and simply add "chemical fusion" as one of the methods in the informational note, while continuing to remove "heat fusion" for obvious reasons noted by FR-7501.

Sincerely,

Paul Wilson Abernathy, CMECP®
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P.O. Box 247 • 145 Kingswood Road
Mankato, MN 56002-0247 USA
Phone: 800-553-2077 or Fax: 507-387-1442

www.condux.com

Date May, 25 2005

Purpose

Testing BonDuit Conduit Adhesive use HDPE conduit and PVC coupling.

Test Procedure

Two one-foot pieces of HDPE conduit were joined together with a Schedule 40 PVC coupling using BonDuit® Conduit Adhesive. The BonDuit® Conduit Adhesive was applied using the instruction contained in the kit. The conduit and coupling were sanded using an 80-grit sanding cloth and cleaned with a TR™ Solvent Wipe provided in the kit. The BonDuit® Adhesive was applied in a zigzag pattern onto the conduit, the depth of the coupling. The coupling was twisted on and any excess BonDuit® Adhesive was smoothed. The pieces were cured, then tested as described on the tables below.

24 hour Cure							
Conduit	**Pull-Out, Tension Force, lbs**						
Size	**1**	**2**	**3**	**4**	**5**	**6**	**Ave**
4 inch	6000	4900	4900	5100	6600	4500	5333 lb
2 inch	2000	2200	2100	1800	n/a	n/a	2025 lb
1 1/2 inch	1200	1600	1000	1300	1200	1100	1233 lb
1 inch	665	790	740	690	720	740	724 lb

1 hour Cure					
Conduit	**Pull-Out, Tension Force, lbs**				
Size	**1**	**2**	**3**	**4**	**Ave**
2 inch	2000	1800	1800	1900	1875 lb
1 inch	700	790	750	740	745 lb

Conduit Size	**Published Pull-Out Tension Force, lbs**
4 inch	4870 lb
2 inch	1820 lb
1 ½ inch	910 lb
1 inch	460 lb

Public Comment No. 1358-NFPA 70-2021 [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 Comment

The term "grounding conductor" was removed from the NEC several years ago. The term "equipment grounding conductor" is appropriate.

Related Item

• FR 7538

Submitter Information Verification

Submitter Full Name: Ryan Jackson
Organization: Ryan Jackson
Street Address:
City:
State:
Zip:
Submittal Date: Thu Aug 12 12:22:29 EDT 2021
Committee: NEC-P08

Committee Statement

Committee Action: Rejected

Resolution: The proposed wording change assumes all grounding conductors are Equipment Grounding Conductors, whereas a grounding conductor, whether an EGC, a GEC, or an equipotential bonding conductor is still needed for HDPE Conduit.

Public Comment No. 83-NFPA 70-2021 [Article 354]

Article 354 Nonmetallic Underground Conduit with Conductors ~~: Type~~ (NUCC)

Part I. General

354.1 Scope.

This article covers the use, installation, and construction specifications for nonmetallic underground conduit with conductors (NUCC).

354.6 Listing Requirements.

NUCC and associated fittings shall be listed.

Part II. Installation

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 under nonmetallic raceway and Table 305.15 under RTRC, PVC, HDPE.)

(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

354.12 Uses Not Permitted.

NUCC shall not be used in the following:

(1) In exposed locations

(2) Inside buildings

Exception: The conductor or the cable portion of the assembly, where suitable, shall be permitted to extend within the building for termination purposes in accordance with 300.3.

(3) In any hazardous (classified) location, except as permitted by other articles of this *Code*

354.20 Size.

(A) Minimum.

NUCC smaller than metric designator 16 (trade size ½) shall not be used.

(B) Maximum.

NUCC larger than metric designator 103 (trade size 4) shall not be used.

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.

354.22 Number of Conductors.

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

354.24 Bends.

(A) How Made.

Bends shall be manually made so that the conduit will not be damaged and the internal diameter of the conduit will not be effectively reduced. The radius of the curve of the centerline of such bends shall not be less than shown in Table 354.24(A).

Table 354.24(A) Minimum Bending Radius for Nonmetallic Underground Conduit with Conductors (NUCC)

Conduit Size		Minimum Bending Radius	
Metric Designator	Trade Size	mm	in.
16	½	250	10
21	¾	300	12
27	1	350	14
35	1¼	450	18
41	1½	500	20
53	2	650	26
63	2½	900	36
78	3	1200	48
103	4	1500	60

(B) Number in One Run.

The total degrees of bends in a conduit run shall not exceed 360 degrees between pull points.

354.28 Trimming.

For termination, the conduit shall be trimmed away from the conductors or cables using an approved method that will not damage the conductor or cable insulation or jacket. All conduit ends shall be trimmed inside and out to remove rough edges.

354.46 Bushings.

Where the NUCC enters a box, fitting, or other enclosure, a bushing or adapter shall be provided to protect the conductor or cable from abrasion unless the design of the box, fitting, or enclosure provides equivalent protection.

Informational Note: See 300.4(G) for the protection of conductors size 4 AWG or larger.

354.48 Joints.

All joints between conduit, fittings, and boxes shall be made by an approved method.

354.50 Conductor Terminations.

All terminations between the conductors or cables and equipment shall be made by an approved method for that type of conductor or cable.

354.56 Splices and Taps.

Splices and taps shall be made in junction boxes or other enclosures.

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.

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 Comment

Editorial. “Type” has been removed from the new definitions for the individual conduits and tubings. This editorial deletion correlates with the definitions and clarifies the acronym for usability.

Please Note: This editorial revision only impacts the title of the article. Wonderful Terra required all of the Sections within the Article to be highlighted to make this simple change.

Related Item

• FR 7501

Submitter Information Verification

Submitter Full Name: David Kendall
Organization: ABB Inc.
Street Address:
City:
State:
Zip:
Submittal Date: Thu Jul 01 15:49:16 EDT 2021
Committee: NEC-P08

Committee Statement

Committee Action: Rejected but see related SR
Resolution: SR-8108-NFPA 70-2021

Statement: “Type” has been removed from the new definitions found in Article 100 for conduit and tubings. This editorial deletion correlates with the definition and clarifies the acronym for usability.

Public Comment No. 1359-NFPA 70-2021 [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 under nonmetallic raceway and Table 305.15 under RTRC, PVC, HDPE.)~~

(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 Comment

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.

Related Item

• FR 7539

Submitter Information Verification

Submitter Full Name: Ryan Jackson
Organization: Ryan Jackson
Street Address:
City:
State:
Zip:
Submittal Date: Thu Aug 12 12:24:20 EDT 2021
Committee: NEC-P08

Committee Statement

Committee Action: Rejected but see related SR
Resolution: SR-8135-NFPA 70-2021
Statement: As per direction of the Correlating Committee, this action was to correct a style manual reference violation of Section 4.1.4 of the 2020 NEC Style Manual which prohibits reference to the entire article.

Public Comment No. 1360-NFPA 70-2021 [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 Comment

There is no such thing as a "grounding conductor." The term was removed over 10 years ago.

Related Item

• FR 7541

Submitter Information Verification

Submitter Full Name: Ryan Jackson
Organization: Ryan Jackson
Street Address:
City:
State:
Zip:
Submittal Date: Thu Aug 12 12:26:57 EDT 2021
Committee: NEC-P08

Committee Statement

Committee Action: Rejected

Resolution: The proposed wording change assumes all grounding conductors are Equipment Grounding Conductors, whereas a grounding conductor, whether an EGC, a GEC, or an equipotential bonding conductor is still needed for NUCC.

Public Comment No. 84-NFPA 70-2021 [Article 355]

Article 355 Reinforced Thermosetting Resin Conduit ~~: Type~~ (RTRC)

Part I. General

355.1 Scope.

This article covers the use, installation, and construction specification for reinforced thermosetting resin conduit (RTRC) and associated fittings.

355.6 Listing Requirements.

RTRC, factory elbows, and associated fittings shall be listed.

Part II. Installation

355.10 Uses Permitted.

The use of RTRC shall be permitted in accordance with 355.10(A) through (I).

(A) Concealed.

RTRC shall be permitted in walls, floors, and ceilings.

(B) Corrosive Influences.

RTRC shall be permitted in locations subject to severe corrosive influences as covered in 300.6 and where subject to chemicals for which the materials are specifically approved.

(C) Cinders.

RTRC shall be permitted in cinder fill.

(D) Wet Locations.

RTRC shall be permitted in portions of dairies, laundries, canneries, or other wet locations, and in locations where walls are frequently washed, the entire conduit system, including boxes and fittings used therewith, shall be installed and equipped so as to prevent water from entering the conduit. All supports, bolts, straps, screws, and so forth, shall be of corrosion-resistant materials or be protected against corrosion by approved corrosion-resistant materials.

(E) Dry and Damp Locations.

RTRC shall be permitted for use in dry and damp locations not prohibited by 355.12.

(F) Exposed.

RTRC shall be permitted for exposed work if identified for such use.

Informational Note: RTRC, Type XW, is identified for areas of physical damage.

(G) Underground Installations.

For underground installations, see 300.5 and 305.15.

(H) Support of Conduit Bodies.

RTRC shall be permitted to support nonmetallic conduit bodies not larger than the largest 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).

(I) Insulation Temperature Limitations.

Conductors or cables rated at a temperature higher than the listed temperature rating of RTRC conduit shall be permitted to be installed in RTRC conduit, if the conductors or cables are not operated at a temperature higher than the listed temperature rating of the RTRC conduit.

355.12 Uses Not Permitted.

RTRC shall not be used under the following conditions.

(A) Hazardous (Classified) Locations.

(1) In any hazardous (classified) location, except as permitted by other articles in this *Code*

(2) In Class I, Division 2 locations, except as permitted in 501.10(B)(1)(6)

(B) Support of Luminaires.

For the support of luminaires or other equipment not described in 355.10(H).

(C) Physical Damage.

Where subject to physical damage unless identified for such use.

(D) Ambient Temperatures.

Where subject to ambient temperatures in excess of 50°C (122°F) unless listed otherwise.

(E) Theaters and Similar Locations.

In theaters and similar locations, except as provided in 518.4 and 520.5.

355.20 Size.

(A) Minimum.

RTRC smaller than metric designator 16 (trade size ½) shall not be used.

(B) Maximum.

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

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

355.22 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 number of cables shall not exceed the allowable percentage fill specified in Table 1, Chapter 9.

355.24 Bends.

(A) How Made.

Bends shall be so made that the conduit will not be damaged and the internal diameter of the conduit will not be effectively reduced. Field bends shall be made only with identified bending equipment. The radius of the curve to the centerline of such bends shall not be less than shown in Table 2, Chapter 9.

(B) Number in One Run.

The total degrees of bends in a conduit run shall not exceed 360 degrees between pull points.

355.28 Trimming.

All cut ends shall be trimmed inside and outside to remove rough edges.

355.30 Securing and Supporting.

RTRC shall be installed as a complete system in accordance with 300.18 and shall be securely fastened in place and supported in accordance with 355.30(A) and (B).

(A) Securely Fastened.

RTRC 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.

(B) Supports.

RTRC shall be supported as required in Table 355.30(B). Conduit listed for support at spacing other than as shown in Table 355.30(B) shall be permitted to be installed in accordance with the listing. Horizontal runs of RTRC supported by openings through framing members at intervals not exceeding those in Table 355.30(B) and securely fastened within 900 mm (3 ft) of termination points shall be permitted.

Table 355.30(B) Support of Reinforced Thermosetting Resin Conduit (RTRC)

Conduit Size		Maximum Spacing Between Supports	
Metric Designator	Trade Size	mm or m	ft
16–27	½–1	900 mm	3
35–53	1¼–2	1.5 m	5
63–78	2½–3	1.8 m	6
91–129	3½–5	2.1 m	7
155	6	2.5 m	8

355.44 Expansion Fittings.

Expansion fittings for RTRC shall be provided to compensate for thermal expansion and contraction where the length change, in accordance with Table 355.44, 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.

Table 355.44 Expansion Characteristics of Reinforced Thermosetting Resin Conduit (RTRC)
Coefficient of Thermal Expansion = 2.7×10^{-5} mm/mm/°C (1.5×10^{-5} in./in./°F)

Temperature Change (°C)	Length Change of RTRC Conduit (mm/m)	Temperature Change (°F)	Length Change of RTRC Conduit (in./100 ft)	Temperature Change (°F)	Length Change of RTRC Conduit (in./100 ft)
5	0.14	5	0.09	105	1.89
10	0.27	10	0.18	110	1.98
15	0.41	15	0.27	115	2.07
20	0.54	20	0.36	120	2.16
25	0.68	25	0.45	125	2.25
30	0.81	30	0.54	130	2.34
35	0.95	35	0.63	135	2.43
40	1.08	40	0.72	140	2.52
45	1.22	45	0.81	145	2.61
50	1.35	50	0.90	150	2.70
55	1.49	55	0.99	155	2.79
60	1.62	60	1.08	160	2.88
65	1.76	65	1.17	165	2.97
70	1.89	70	1.26	170	3.06
75	2.03	75	1.35	175	3.15
80	2.16	80	1.44	180	3.24
85	2.30	85	1.53	185	3.33
90	2.43	90	1.62	190	3.42
95	2.57	95	1.71	195	3.51
100	2.70	100	1.80	200	3.60

355.46 Bushings.

Where a conduit enters a box, fitting, or other enclosure, a bushing or adapter shall be provided to protect the wire from abrasion unless the box, fitting, or enclosure design provides equivalent protection.

Informational Note: See 300.4(G) for the protection of conductors 4 AWG and larger at bushings.

355.48 Joints.

All joints between lengths of conduit, and between conduit and couplings, fitting, and boxes, shall be made by an approved method.

355.56 Splices and Taps.

Splices and taps shall be made in accordance with 300.15.

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).

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 Comment

Editorial. “Type” has been removed from the new definitions for the individual conduits and tubings. This editorial deletion correlates with the definitions and clarifies the acronym for usability.

Please Note: This editorial revision only impacts the title of the article. Wonderful Terra required all of the Sections within the Article to be highlighted to make this simple change.

Related Item

• FR 7501

Submitter Information Verification

Submitter Full Name: David Kendall
Organization: ABB Inc.
Street Address:
City:
State:
Zip:
Submittal Date: Thu Jul 01 15:50:46 EDT 2021
Committee: NEC-P08

Committee Statement

Committee Action: Rejected but see related SR
Resolution: SR-8108-NFPA 70-2021
Statement: “Type” has been removed from the new definitions found in Article 100 for conduit and tubings. This editorial deletion correlates with the definition and clarifies the acronym for usability.

Public Comment No. 835-NFPA 70-2021 [Section No. 355.1]

355.1 Scope.

This article covers the use, installation, and construction specification for reinforced thermosetting resin conduit (RTRC) and associated fittings.

Additional Proposed Changes

File Name	Description	Approved
8_CN_341.pdf	70_CN341	

Statement of Problem and Substantiation for Public Comment

The following CC Note No. 341 appeared in the First Draft Report on First Revision No. 7542.

The Correlating Committee advises that article scope statements and location of articles are the responsibility of the Correlating Committee and the Correlating Committee accepts the deletion of the Informational Note.

Related Item

• First Revsion No. 7542

Submitter Information Verification

Submitter Full Name: CC on NEC-AAC
Organization: NEC Correlating Committee
Street Address:
City:
State:
Zip:
Submittal Date: Wed Aug 04 13:36:16 EDT 2021
Committee: NEC-P08

Committee Statement

Committee Action: Rejected
Resolution: No further action is required by the Panel.

Correlating Committee Note No. 341-NFPA 70-2021 [Section No. 355.1]

Submitter Information Verification

Committee: NEC-P08
Submittal Date: Thu May 06 16:58:37 EDT 2021

Committee Statement

Committee Statement: The Correlating Committee advises that article scope statements and location of articles are the responsibility of the Correlating Committee and the Correlating Committee accepts the deletion of the Informational Note.

First Revision No. 7542-NFPA 70-2020 [Section No. 355.1]

Ballot Results

This item has passed ballot

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

Affirmative All

Ayer, Lawrence S.
Gallo, Ernest J.
Hickman, Palmer L.
Holub, Richard A.
Hunter, Dean C.
Johnston, Michael J.
Kendall, David H.
Kovacik, John R.
Manche, Alan
McDaniel, Roger D.
Porter, Christine T.
Williams, David A.

Public Comment No. 1361-NFPA 70-2021 [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 Comment

This revision seeks to use the defined term "equipment grounding conductor" instead of the undefined term "grounding conductor."

Related Item

• FR 7595

Submitter Information Verification

Submitter Full Name: Ryan Jackson
Organization: Ryan Jackson
Street Address:
City:
State:
Zip:
Submittal Date: Thu Aug 12 12:28:39 EDT 2021
Committee: NEC-P08

Committee Statement

Committee Action: Rejected

Resolution: The proposed wording change assumes all grounding conductors are Equipment Grounding Conductors, whereas a grounding conductor, whether an EGC, a GEC, or an equipotential bonding conductor is still needed for RTRC.

Public Comment No. 85-NFPA 70-2021 [Article 356]

Article 356 Liquidtight Flexible Nonmetallic Conduit ~~: Type~~ (LFNC)

Part I. General

356.1 Scope.

This article covers the use, installation, and construction specifications for liquidtight flexible nonmetallic conduit (LFNC) and associated fittings.

356.6 Listing Requirements.

LFNC and associated fittings shall be listed.

Part II. Installation

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) Type 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.

356.12 Uses Not Permitted.

LFNC shall not be used as follows:

(1) Where subject to physical damage

(2) Where any combination of ambient and conductor temperatures is in excess of that for which it is listed

(3) In lengths longer than 1.8 m (6 ft), except as permitted by 356.10(5) or where a longer length is approved as essential for a required degree of flexibility

(4) In any hazardous (classified) location, except as permitted by other articles in this *Code*

356.20 Size.

(A) Minimum.

LFNC smaller than metric designator 16 (trade size ½) shall not be used unless permitted for metric designator 12 (trade size ⅜) as follows:

(1) For enclosing the leads of motors as permitted in 430.245(B)

(2) In lengths not exceeding 1.8 m (6 ft) as part of a listed assembly for tap connections to luminaires as required in 410.117(C), or for utilization equipment

(B) Maximum.

LFNC larger than metric designator 103 (trade size 4) shall not be used.

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.

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 number of cables shall not exceed the allowable percentage fill specified in Table 1, Chapter 9.

356.24 Bends.

(A) How Made.

Bends in conduit shall be so made that the conduit is not damaged and the internal diameter of the conduit is not effectively reduced. Bends shall be permitted to be made manually without auxiliary equipment. The radius of the curve to the centerline of any bend shall not be less than shown in Table 2, Chapter 9 using the column “Other Bends.”

(B) Number in One Run.

The total degrees of bends in a conduit run shall not exceed 360 degrees between pull points.

356.28 Trimming.

All cut ends of conduit shall be trimmed inside and outside to remove rough edges.

356.30 Securing and Supporting.

Type 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 nonmetallic conduit fittings shall be permitted as a means of support.

356.42 Couplings and Connectors.

Only fittings listed for use with LFNC shall be used. Angle connectors shall not be used for concealed raceway installations. Straight LFNC fittings are permitted for direct burial or encasement in concrete.

356.56 Splices and Taps.

Splices and taps shall be made in accordance with 300.15.

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.

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 356.2 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 Comment

Editorial. “Type” has been removed from the new definitions for the individual conduits and tubings. This editorial deletion correlates with the definitions and clarifies the acronym for usability.

Please Note: This editorial revision only impacts the title of the article. Wonderful Terra required all of the Sections within the Article to be highlighted to make this simple change.

Related Item

• FR 7501

Submitter Information Verification

Submitter Full Name: David Kendall
Organization: ABB Inc.
Street Address:
City:
State:
Zip:
Submittal Date: Thu Jul 01 16:01:54 EDT 2021
Committee: NEC-P08

Committee Statement

Committee Action:	Rejected but see related SR
Resolution:	SR-8108-NFPA 70-2021
Statement:	“Type” has been removed from the new definitions found in Article 100 for conduit and tubings. This editorial deletion correlates with the definition and clarifies the acronym for usability.

Public Comment No. 1362-NFPA 70-2021 [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 Comment

This revision uses the defined term instead of the term that was deleted from Article 100 over ten years ago.

Related Item

• FR 7536

Submitter Information Verification

Submitter Full Name: Ryan Jackson
Organization: Ryan Jackson
Street Address:
City:
State:
Zip:
Submittal Date: Thu Aug 12 12:34:06 EDT 2021
Committee: NEC-P08

Committee Statement

Committee Action: Rejected

Resolution: The Public Comment proposed change assumes all grounding conductors are Equipment Grounding Conductors, whereas a grounding conductor, whether an EGC, a GEC, or an equipotential bonding conductor is still needed.

Public Comment No. 86-NFPA 70-2021 [Article 358]

Article 358 Electrical Metallic Tubing ~~: Type~~ (EMT)

Part I. General

358.1 Scope.

This article covers the use, installation, and construction specifications for electrical metallic tubing (EMT) and associated fittings.

358.6 Listing Requirements.

EMT, factory elbows, and associated fittings shall be listed.

Part II. Installation

358.10 Uses Permitted.

(A) Exposed and Concealed.

The use of EMT shall be permitted for both exposed and concealed work for the following:

(1) In concrete, in direct contact with the earth or in areas subject to severe corrosive influences where installed in accordance with 358.10(B)

(2) In dry, damp, and wet locations

(3) In any hazardous (classified) location as permitted by other articles in this *Code*

(4) In direct burial applications when used with fittings listed and identified for direct burial

(5) For manufactured wiring systems as permitted in 604.100(A)(2)

(B) Corrosive Environments.

(1) Galvanized Steel and Stainless Steel EMT, Elbows, and Fittings.

Galvanized steel and stainless steel EMT, elbows, and fittings shall be permitted to be installed in concrete, in direct contact with the earth, or in areas subject to severe corrosive influences where protected by corrosion protection and approved as suitable for the condition.

(2) Supplementary Protection of Aluminum EMT.

Aluminum EMT shall be provided with approved supplementary corrosion protection where encased in concrete or in direct contact with the earth.

(C) Cinder Fill.

Galvanized steel and stainless steel EMT shall be permitted to be installed in cinder concrete or cinder fill where subject to permanent moisture when protected on all sides by a layer of noncinder concrete at least 50 mm (2 in.) thick or when the tubing is installed at least 450 mm (18 in.) under the fill.

(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) Physical Damage.

Steel and stainless steel EMT shall be permitted to be installed where subject to physical damage.

358.12 Uses Not Permitted.

EMT shall not be used under the following conditions:

(1) Where subject to severe physical damage

(2) For the support of luminaires or other equipment except conduit bodies no larger than the largest trade size of the tubing

358.14 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 EMT, and galvanized steel fittings and enclosures shall be permitted to be used with aluminum EMT where not subject to severe corrosive influences.

Stainless steel EMT shall only be used with the following:

(1) Stainless steel fittings

(2) Stainless steel boxes and enclosures

(3) Steel (galvanized, painted, powder or PVC coated, and so forth) boxes and enclosures when not subject to severe corrosive influences

(4) Stainless steel, nonmetallic, or approved accessories

358.20 Size.

(A) Minimum.

EMT smaller than metric designator 16 (trade size ½) shall not be used.

Exception: Metric designator 12 (trade size ⅜) shall be permitted for enclosing the leads of motors as permitted in 430.245(B).

(B) Maximum.

The maximum size of EMT shall be metric designator 155 (trade size 6).

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.

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 number of cables shall not exceed the allowable percentage fill specified in Table 1, Chapter 9.

358.24 Bends.

(A) How Made.

Bends shall be made so that the tubing is not damaged and the internal diameter of the tubing is not effectively reduced. The radius of the curve of any field bend to the centerline of the tubing shall not be less than shown in Table 2, Chapter 9 for one-shot and full shoe benders.

(B) Number in One Run.

The total degrees of bends in a conduit run shall not exceed 360 degrees between pull points.

358.28 Reaming and Threading.

(A) Reaming.

All cut ends of EMT shall be reamed or otherwise finished to remove rough edges.

(B) Threading.

EMT shall not be threaded.

Exception: EMT with factory threaded integral couplings complying with 358.100 shall be permitted.

358.30 Securing and Supporting.

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).

(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.

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.

358.56 Splices and Taps.

Splices and taps shall be made in accordance with 300.15.

358.60 Grounding.

EMT shall be permitted as an equipment grounding conductor.

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 Comment

Editorial. “Type” has been removed from the new definitions for the individual conduits and tubings. This editorial deletion correlates with the definitions and clarifies the acronym for usability.

Please Note: This editorial revision only impacts the title of the article. Wonderful Terra required all of the Sections within the Article to be highlighted to make this simple change.

Related Item

• FR 8640

Submitter Information Verification

Submitter Full Name: David Kendall
Organization: ABB Inc.
Street Address:
City:
State:
Zip:
Submittal Date: Thu Jul 01 16:03:37 EDT 2021
Committee: NEC-P08

Committee Statement

Committee Action: Rejected but see related SR
Resolution: SR-8108-NFPA 70-2021
Statement: “Type” has been removed from the new definitions found in Article 100 for conduit and tubings. This editorial deletion correlates with the definition and clarifies the acronym for usability.

Public Comment No. 1688-NFPA 70-2021 [Section No. 358.10(A)]

(A) Exposed and Concealed.

The use of EMT shall be permitted for both exposed and concealed work for the following:

(1) In concrete, in direct contact with the earth or in areas subject to severe corrosive influences where installed in accordance with 358.10(B)

(2) In dry, damp, and wet locations

(3) In any hazardous (classified) location as permitted by other articles in this *Code*

(4) ~~In direct burial applications when used with fittings listed and identified for direct burial~~

(5) For manufactured wiring systems as permitted in 604.100(A)(2)

Statement of Problem and Substantiation for Public Comment

The installation of EMT in direct burial applications is presently covered in 358.10(A)(1). It includes an appropriate reference to the installation requirements in 358.10(B). There appropriate corrosion protection is required.
Generally, galvanized steel EMT in contact with soil always would require supplementary corrosion protection. Where galvanized steel EMT without supplementary corrosion protection extends directly from concrete encasement to soil burial, severe corrosive effects are likely to occur on the metal in contact with the soil. Installing EMT in direct contact with soil in violation of the UL Guide Information. The UL Guide information on Electrical Metallic Tubing FJMX (used in the substantiation for the Public Input) reads, "Galvanized or stainless steel EMT installed in concrete on grade or above generally requires no supplementary corrosion protection. Galvanized steel EMT in concrete slab below grade level may require supplementary corrosion protection. Also, consider that there is no requirement that a supplemental equipment grounding conductor be contained in EMT that is directly buried, so if the EMT fails, as it is likely to do, the equipment grounding conductor path is lost.

Related Item

• FR 7591

Submitter Information Verification

Submitter Full Name: Dean Hunter
Organization: Minnesota Department of Labor
Street Address:
City:
State:
Zip:
Submittal Date: Tue Aug 17 11:59:04 EDT 2021
Committee: NEC-P08

Committee Statement

Committee Action: Rejected but see related SR
Resolution: SR-8159-NFPA 70-2021

Statement:	The Second Revision clarifies the direct burial applications and requirements already included in 358.10(A)(1).

Public Comment No. 1819-NFPA 70-2021 [Section No. 358.10(A)]

(A) Exposed and Concealed.

The use of EMT shall be permitted for both exposed and concealed work for the following:

(1) In concrete, in direct contact with the earth or in areas subject to severe corrosive influences where installed in accordance with 358.10(B)

(2) In dry, damp, and wet locations

(3) In any hazardous (classified) location as permitted by other articles in this *Code*

(4) ~~In direct burial applications when used with fittings listed and identified for direct burial~~

(5)

(6) For manufactured wiring systems as permitted in 604.100(A)(2)

Statement of Problem and Substantiation for Public Comment

The panel statement asserts that the current UL directory "recognizes ... Galvanized EMT for direct burial applications." That is incorrect. The actual entry (FJMX) reads as follows: "In general, galvanized steel EMT in contact with soil requires supplementary corrosion protection." This is protection beyond the galvanizing. It is true that such protection can be afforded in the field if the inspecting authority is willing to approve the relatively heroic efforts required, such as laboriously painting the entire length being buried with asphalt paint, but this is rare and generally unrealistic. By way of contrast, compare the equivalent sentence from the Guide Card information on rigid ferrous metal conduit, “Galvanized rigid ferrous metal conduit installed in contact with soil does not generally require supplementary corrosion protection.” The identical wording goes with IMC, and both sentences create a presumption of acceptability for the heavy wall products that is not there for EMT. Further, UL does not evaluate supplementary corrosion protection on EMT for this use. Although EMT may be available with supplementary protection, the Guide Card information on this topic reads: “Galvanized electrical metallic tubing that is provided with a metallic or nonmetallic coating, or a combination of both, has been investigated for resistance to atmospheric corrosion” (emphasis supplied). This means that inspectors are entirely on their own if they recognize any form of supplementary protection with respect to the corrosive influences of soil. And supplementary corrosion protection must always be applied unless there is a solid local record of positive experience, which is very unusual. On balance, EMT should not be used for direct burial absent a solid local track record of benign soil conditions. The addition of EMT in this column without any qualifications will, however inadvertently, encourage generally unsafe applications.

Related Item

• FR-7591 • PC-1764

Submitter Information Verification

Submitter Full Name: Frederic Hartwell
Organization: Hartwell Electrical Services, Inc.
Street Address:
City:
State:
Zip:
Submittal Date: Wed Aug 18 07:04:35 EDT 2021

Committee: NEC-P08

Committee Statement

Committee Action: Rejected but see related SR

Resolution: SR-8159-NFPA 70-2021

Statement: The Second Revision clarifies the direct burial applications and requirements already included in 358.10(A)(1).

Public Comment No. 316-NFPA 70-2021 [Section No. 358.10(A)]

(A) Exposed and Concealed.

The use of EMT shall be permitted for both exposed and concealed work for the following:

(1) In concrete, in direct contact with the earth or in areas subject to severe corrosive influences where installed in accordance with 358.10(B)

(2) In dry, damp, and wet locations

(3) In any hazardous (classified) location as permitted by other articles in this *Code*

(4) ~~In direct burial applications when used with fittings listed and identified for direct burial~~

(5) For manufactured wiring systems as permitted in 604.100(A)(2)

Statement of Problem and Substantiation for Public Comment

The installation of EMT in direct burial applications is presently covered in 358.10(A)(1). It includes an appropriate reference to the installation requirements in 358.10(B). There appropriate corrosion protection is required.
Adding a new 358.10(A)(4) that does not require appropriate corrosion protection would be a serious departure from the safety mission of the NEC.
The UL Guide information on Electrical Metallic Tubing FJMX (mentioned in the Public Input but not quoted) reads, "Galvanized or stainless steel EMT installed in concrete on grade or above generally requires no supplementary corrosion protection. Galvanized steel EMT in concrete slab below grade level may require supplementary corrosion protection.

In general, galvanized steel EMT in contact with soil requires supplementary corrosion protection. Where galvanized steel EMT without supplementary corrosion protection extends directly from concrete encasement to soil burial, severe corrosive effects are likely to occur on the metal in contact with the soil."

Installing EMT in direct contact with soil in violation of the UL Guide Information would not only be unwise but can be unsafe. There is no requirement that a supplemental equipment grounding conductor be contained in EMT that is directly buried. If the EMT fails, as it is likely to do, the equipment grounding conductor path is lost. This can leave supplied equipment at an unsafe shock or electrocution hazard.

Many local authorities having jurisdiction prohibit EMT from being directly buried, and for good reason. EMT in the soil has a very poor performance record.

Related Item

• FR-7591

Submitter Information Verification

Submitter Full Name: Phil Simmons
Organization: Simmons Electrical Services
Street Address:
City:
State:
Zip:

Submittal Date: Tue Jul 20 23:42:59 EDT 2021
Committee: NEC-P08

Committee Statement

Committee Action: Rejected but see related SR
Resolution: SR-8159-NFPA 70-2021
Statement: The Second Revision clarifies the direct burial applications and requirements already included in 358.10(A)(1).

Public Comment No. 1364-NFPA 70-2021 [Section No. 358.24(B)]

(B) Number in One Run.

The total degrees of bends ~~in a conduit run~~ shall not exceed 360 degrees between pull points.

Statement of Problem and Substantiation for Public Comment

EMT is not conduit, it is tubing.

Related Item

• FR 7594

Submitter Information Verification

Submitter Full Name: Ryan Jackson
Organization: Ryan Jackson
Street Address:
City:
State:
Zip:
Submittal Date: Thu Aug 12 12:35:46 EDT 2021
Committee: NEC-P08

Committee Statement

Committee Action: Rejected but see related SR
Resolution: SR-8136-NFPA 70-2021
Statement: EMT is not conduit, it is tubing.

Public Comment No. 87-NFPA 70-2021 [Article 360]

Article 360 Flexible Metallic Tubing ~~: Type~~ (FMT)

Part I. General

360.1 Scope.

This article covers the use, installation, and construction specifications for flexible metallic tubing (FMT) and associated fittings.

360.6 Listing Requirements.

FMT and associated fittings shall be listed.

Part II. Installation

360.10 Uses Permitted.

FMT shall be permitted to be used for branch circuits as follows:

(1) In dry locations

(2) Where concealed

(3) In accessible locations

(4) For system voltages of 1000 volts maximum

360.12 Uses Not Permitted.

FMT shall not be used as follows:

(1) In hoistways

(2) In storage battery rooms

(3) In hazardous (classified) locations unless otherwise permitted under other articles in this *Code*

(4) Underground for direct earth burial, or embedded in poured concrete or aggregate

(5) Where subject to physical damage

(6) In lengths over 1.8 m (6 ft)

360.20 Size.

(A) Minimum.

FMT smaller than metric designator 16 (trade size ½) shall not be used.

Exception No. 1: FMT of metric designator 12 (trade size ⅜) shall be permitted to be installed in accordance with 300.22(B) and (C).

Exception No. 2: FMT of metric designator 12 (trade size ⅜) shall be permitted in lengths not in excess of 1.8 m (6 ft) as part of a listed assembly or for luminaires. See 410.117(C).

(B) Maximum.

The maximum size of FMT shall be metric designator 21 (trade size ¾).

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.

360.22 Number of Conductors.

(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 number of cables shall not exceed the allowable percentage fill specified in Table 1, Chapter 9.

(B) FMT — Metric Designator 12 (Trade Size ⅜).

The number of conductors in metric designator 12 (trade size ⅜) shall not exceed that permitted in Table 348.22.

360.24 Bends.

(A) Infrequent Flexing Use.

When FMT is infrequently flexed in service after installation, the radii of bends measured to the inside of the bend shall not be less than specified in Table 360.24(A).

Table 360.24(A) Minimum Radii for Flexing Use

Metric Designator	Trade Size	mm	Minimum Radii for Flexing Use in.
12	⅜	254.0	10
16	½	317.5	12½
21	¾	444.5	17½

(B) Fixed Bends.

Where FMT is bent for installation purposes and is not flexed or bent as required by use after installation, the radii of bends measured to the inside of the bend shall not be less than specified in Table 360.24(B).

Table 360.24(B) Minimum Radii for Fixed Bends

Metric Designator	Trade Size	mm	Minimum Radii for Fixed Bends in.
12	⅜	88.9	3½
16	½	101.6	4
21	¾	127.0	5

360.56 Splices and Taps.

Splices and taps shall be made in accordance with 300.15.

360.60 Grounding.

FMT shall be permitted as an equipment grounding conductor where installed in accordance with 250.118(A)(7).

Part III. Construction Specifications

360.120 Marking.

FMT shall be marked according to 110.21.

Statement of Problem and Substantiation for Public Comment

Editorial. “Type” has been removed from the new definitions for the individual conduits and tubings. This editorial deletion correlates with the definitions and clarifies the acronym for usability.

Please Note: This editorial revision only impacts the title of the article. Wonderful Terra required all of the Sections within the Article to be highlighted to make this simple change.

Related Item

• FR 8640

Submitter Information Verification

Submitter Full Name: David Kendall
Organization: ABB Inc.
Street Address:
City:
State:
Zip:
Submittal Date: Thu Jul 01 16:09:47 EDT 2021
Committee: NEC-P08

Committee Statement

Committee Action: Rejected but see related SR
Resolution: SR-8108-NFPA 70-2021
Statement: “Type” has been removed from the new definitions found in Article 100 for conduit and tubings. This editorial deletion correlates with the definition and clarifies the acronym for usability.

Public Comment No. 88-NFPA 70-2021 [Article 362]

Article 362 Electrical Nonmetallic Tubing ~~: Type~~ (ENT)

Part I. General

362.1 Scope.

This article covers the use, installation, and construction specifications for electrical nonmetallic tubing (ENT) and associated fittings.

362.6 Listing Requirements.

ENT and associated fittings shall be listed.

362.8 Reconditioned.

ENT cannot be reconditioned.

Part II. Installation

362.10 Uses Permitted.

For the purpose of this article, the first floor of a building shall be that floor that has 50 percent or more of the exterior wall surface area level with or above finished grade. One additional level that is the first level and not designed for human habitation and used only for vehicle parking, storage, or similar use shall be permitted. The use of ENT and fittings shall be permitted in the following:

(1) In any building not exceeding three floors above grade as follows:

(2) For exposed work, where not prohibited by 362.12

(3) Concealed within walls, floors, and ceilings

(4) In any building exceeding three floors above grade concealed within combustible or noncombustible walls, floors, and ceilings where the walls, floors, and ceilings provide a thermal barrier of material that has at least a 15-minute finish rating as identified in listings of fire-rated assemblies.

Exception to (2): Where an approved automatic fire protective system(s) is installed on all floors, ENT shall be permitted to be used within walls, floors, and ceilings, exposed or concealed, in buildings exceeding three floors above grade.

Informational Note No. 1: A finish rating is established for assemblies containing combustible (wood) supports. The finish rating is defined as the time at which the wood stud or wood joist reaches an average temperature rise of 121°C (250°F) or an individual temperature of 163°C (325°F) as measured on the plane of the wood nearest the fire. A finish rating is not intended to represent a rating for a membrane ceiling.

Informational Note No. 2: NFPA 13-2019, *Standard for the Installation of Sprinkler Systems*, is a recognized fire sprinkler system(s) standard.

(5) In locations subject to severe corrosive influences as covered in 300.6 and where subject to chemicals for which the materials are specifically approved.

(6) In concealed, dry, and damp locations not prohibited by 362.12.

(7) Above suspended ceilings where the suspended ceilings provide a thermal barrier of material that has at least a 15-minute finish rating as identified in listings of fire-rated assemblies, except as permitted in 362.10(1)a.

Exception to (5): ENT shall be permitted to be used above suspended ceilings in buildings exceeding three floors above grade where the building is protected throughout by an approved automatic fire protective system .

Informational Note No. 3: NFPA 13-2019, *Standard for the Installation of Sprinkler Systems*, is a recognized fire sprinkler system(s) standard.

(8) Encased in poured concrete floors, ceilings, walls, and slabs.

(9) Embedded in a concrete slab on grade where ENT is placed on sand or approved screenings, provided fittings identified for this purpose are used for connections.

(10) For wet locations as permitted in this section or in a concrete slab on or belowgrade, with fittings listed for the purpose.

(11) Metric designator 16 through 27 (trade size ½ through 1) as listed manufactured prewired assembly.

(12) With conductors or cables rated at a temperature higher than the listed temperature rating of ENT if the conductors or cables are not operated at a temperature higher than the listed temperature rating of the ENT.

362.12 Uses Not Permitted.

ENT shall not be used in the following:

(1) In any hazardous (classified) location, except as permitted by other articles in this *Code*

(2) For the support of luminaires and other equipment

(3) Where subject to ambient temperatures in excess of 50°C (122°F) unless listed otherwise

(4) For direct earth burial

(5) In exposed locations, except as permitted by 362.10(1), 362.10(5), and 362.10(8)

(6) In theaters and similar locations, except as provided in 518.4 and 520.5

(7) Where exposed to the direct rays of the sun, unless identified as sunlight resistant

(8) Where subject to physical damage

Informational Note: Extreme cold may cause some types of nonmetallic conduits to become brittle and therefore more susceptible to damage from physical contact.

362.20 Size.

(A) Minimum.

ENT smaller than metric designator 16 (trade size ½) shall not be used.

(B) Maximum.

ENT larger than metric designator 63 (trade size 2½) shall not be used.

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.

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 number of cables shall not exceed the allowable percentage fill specified in Table 1, Chapter 9.

362.24 Bends.

(A) How Made.

Bends shall be so made that the tubing will not be damaged and the internal diameter of the tubing will not be effectively reduced. Bends shall be permitted to be made manually without auxiliary equipment, and the radius of the curve to the centerline of such bends shall not be less than shown in Table 2, Chapter 9 using the column “Other Bends.”

(B) Number in One Run.

The total degrees of bends in a tubing run shall not exceed 360 degrees between pull points.

362.28 Trimming.

All cut ends shall be trimmed inside and outside to remove rough edges.

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, 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.

362.46 Bushings.

Where a tubing enters a box, fitting, or other enclosure, a bushing or adapter shall be provided to protect the wire from abrasion unless the box, fitting, or enclosure design provides equivalent protection.

Informational Note: See 300.4(G) for the protection of conductors size 4 AWG or larger.

362.48 Joints.

All joints between lengths of tubing and between tubing and couplings, fittings, and boxes shall be by an approved method.

362.56 Splices and Taps.

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

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.

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 Comment

Editorial. “Type” has been removed from the new definitions for the individual conduits and tubings. This editorial deletion correlates with the definitions and clarifies the acronym for usability.

Please Note: This editorial revision only impacts the title of the article. Wonderful Terra required all of the Sections within the Article to be highlighted to make this simple change.

Related Item

• FR 8640

Submitter Information Verification

Submitter Full Name: David Kendall
Organization: ABB Inc.
Street Address:
City:
State:
Zip:
Submittal Date: Thu Jul 01 16:11:04 EDT 2021
Committee: NEC-P08

Committee Statement

Committee Action: Rejected but see related SR
Resolution: SR-8108-NFPA 70-2021
Statement: “Type” has been removed from the new definitions found in Article 100 for conduit and tubings. This editorial deletion correlates with the definition and clarifies the acronym for usability.

Public Comment No. 1067-NFPA 70-2021 [Section No. 362.8]

~~**362.8** Reconditioned.~~

~~ENT cannot be reconditioned.~~

Statement of Problem and Substantiation for Public Comment

Proposing to delete this proposed new section concerning reconditioning of this wiring method. No apparent substantiation was given for this rule, which would add more text and length to the NEC. Is there an example of any reputable firm "reconditioning" flexible metal conduit and selling it to a qualified contractor for installation? Having this rule present for this and other wiring methods (but not others) might create room to argue that one can "recondition" types AC and NMB cable, PVC or EMT conduit since it's prohibited for only some of the wiring methods but not others.

Note that while this would prohibit "reconditioning" it doesn't prohibit re-use. cleaning up an old wiring method before re-use may be prohibited, but re-use without any cleaning would be okay. Whether re-use is allowed is judged by 110.2, approval of equipment. It would seem this same section (110.2) is the best way to address the concerns about "reconditioning" of wiring methods.

If we need a rule prohibiting "reconditioning" of wiring methods, maybe we should put in in article 300 instead of having to keep up with adding a prohibition on any new wiring method that is made. Or maybe it should be inserted into the "used prohibited" sections of the wiring methods.

Related Item

• First Revision No. 7548-NFPA 70-2020 [New Section after 362.6]

Submitter Information Verification

Submitter Full Name: Josh Weaver
Organization: [Not Specified]
Street Address:
City:
State:
Zip:
Submittal Date: Sat Aug 07 13:16:19 EDT 2021
Committee: NEC-P08

Committee Statement

Committee Action: Rejected but see related SR
Resolution: SR-8134-NFPA 70-2021
Statement: Cannot was revised to “shall not” to align with the Style Manual.

Per the direction of the CC 362.8 is relocated to 362.2.

Public Comment No. 1715-NFPA 70-2021 [Section No. 362.8]

362.8 Reconditioned.

ENT cannot be reconditioned.

Additional Proposed Changes

File Name	Description	Approved
8_CN_248.pdf	8 CN248	

Statement of Problem and Substantiation for Public Comment

NOTE: The following CC Note No. 248 appeared in the First Draft Report on First Revision No. 7548

The Correlating Committee directs the panel to reconsider the text “cannot be reconditioned” for correlation with FR 7552 and FR 7556. Simplifying the text to state that the equipment “shall not be reconditioned” is suggested as an alternative.

Related Item

• First Revision No. 7548

Submitter Information Verification

Submitter Full Name: CC on NEC-AAC
Organization: NEC Correlating Committee
Street Address:
City:
State:
Zip:
Submittal Date: Tue Aug 17 13:53:28 EDT 2021
Committee: NEC-P08

Committee Statement

Committee Action: Rejected but see related SR
Resolution: SR-8134-NFPA 70-2021
Statement: Cannot was revised to “shall not” to align with the Style Manual.

Per the direction of the CC 362.8 is relocated to 362.2.

Correlating Committee Note No. 248-NFPA 70-2021 [New Section after 362.6]

Submitter Information Verification

Committee: NEC-P08
Submittal Date: Thu May 06 09:30:52 EDT 2021

Committee Statement

Committee Statement: The Correlating Committee directs the panel to reconsider the text “cannot be reconditioned” for correlation with FR 7552 and FR 7556. Simplifying the text to state that the equipment “shall not be reconditioned” is suggested as an alternative.

First Revision No. 7548-NFPA 70-2020 [New Section after 362.6]

Ballot Results

This item has passed ballot

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

Affirmative All

Ayer, Lawrence S.
Gallo, Ernest J.
Hickman, Palmer L.
Holub, Richard A.
Hunter, Dean C.
Johnston, Michael J.
Kendall, David H.
Kovacik, John R.
Manche, Alan
McDaniel, Roger D.
Porter, Christine T.
Williams, David A.

Public Comment No. 1365-NFPA 70-2021 [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 Comment

This revision seeks to use the defined term instead of an undefined one.

Related Item

• FR 7597

Submitter Information Verification

Submitter Full Name: Ryan Jackson
Organization: Ryan Jackson
Street Address:
City:
State:
Zip:
Submittal Date: Thu Aug 12 12:39:10 EDT 2021
Committee: NEC-P08

Committee Statement

Committee Action: Rejected

Resolution: The proposed wording change assumes all grounding conductors are Equipment Grounding Conductors, whereas a grounding conductor, whether an EGC, a GEC, or an equipotential bonding conductor is still needed for ENT.

Public Comment No. 829-NFPA 70-2021 [Section No. 366.12]

366.12 Uses Not Permitted.

Auxiliary gutters shall not be used to enclose switches, overcurrent devices, appliances, or other similar equipment.

Additional Proposed Changes

File Name	Description	Approved
8_CN_336.pdf	70_CN336	

Statement of Problem and Substantiation for Public Comment

The following CC Note No. 336 appeared in the First Draft Report on First Revision No. 7610.

The Correlating Committee directs that FR-761 0 be referred to CMP-12 for review of references in 620.35 to align with the relocation of material in Article 366. The material in 366.12(2) has been moved to 366.1 0(C).

Related Item

• First Revision No. 7610

Submitter Information Verification

Submitter Full Name: CC on NEC-AAC
Organization: NEC Correlating Committee
Street Address:
City:
State:
Zip:
Submittal Date: Wed Aug 04 13:20:31 EDT 2021
Committee: NEC-P08

Committee Statement

Committee Action: Rejected
Resolution: No further action is required by the panel.

Correlating Committee Note No. 336-NFPA 70-2021 [Section No. 366.12]

Submitter Information Verification

Committee: NEC-P08
Submittal Date: Thu May 06 16:35:35 EDT 2021

Committee Statement

Committee Statement: The Correlating Committee directs that FR-7610 be referred to CMP-12 for review of references in 620.35 to align with the relocation of material in Article 366. The material in 366.12(2) has been moved to 366.10(C).

First Revision No. 7610-NFPA 70-2020 [Section No. 366.12]

Ballot Results

This item has passed ballot

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

Affirmative All

Ayer, Lawrence S.
Gallo, Ernest J.
Hickman, Palmer L.
Holub, Richard A.
Hunter, Dean C.
Johnston, Michael J.
Kendall, David H.
Kovacik, John R.
Manche, Alan
McDaniel, Roger D.
Porter, Christine T.
Williams, David A.

Public Comment No. 1439-NFPA 70-2021 [Article 369]

Article 369 Insulated Bus Pipe (IBP)/Tubular Covered Conductors (TCC) Systems

Part I. General

369.1 Scope.

This article covers the use, installation, and construction specifications for insulated bus pipe (IBP) systems , Type IBP.

Informational Note: IBP is also referred to as tubular covered conductor (TCC).

369.2 Definitions.

Insulated Bus Pipe (IBP), Type IBP.

A cylindrical solid or hollow conductor with a solid insulation system, having conductive grading layers and a grounding layer imbedded in the insulation, and provided with an overall covering of insulating or metallic material

IBP Systems.

An assembly that includes bus pipe, connectors, fittings, mounting structures, and other fittings and accessories.

369.6 Listing Requirements.

IBP and IBP systems shall be listed.

369.8 Reconditioning.

IBP and IBP systems shall not be permitted to be reconditioned.

Part II. Installation

369.10 Uses Permitted.

~~IBP~~ IBP systems shall be permitted for use on power systems in accordance with the following:

(1) ~~IBP shall be permitted as~~ As exposed runs in accordance with 300.37.

(2) ~~IBP shall be permitted to be installed in~~ In wet or damp locations only when listed for such use.

(3) ~~IBP shall be permitted to be installed~~ Installed through walls, in unbroken lengths. Where IBP penetrates an exterior wall, the entire length that penetrates the wall shall be listed for outdoor use, and the opening in the wall shall be sealed by an approved method.

(4) ~~IBP shall be permitted to be extended~~ Extended vertically through dry floors if totally enclosed in metal where passing through the floor and for a minimum distance of 1.8 m (6 ft) above the floor to provide protection from physical damage.

(5) ~~IBP shall be permitted for~~ For voltages up to and including 35,000 ac volts phase-to-phase , nominal.

369.12 Uses Not Permitted.

~~IBP~~ IBP systems shall not be used under the following conditions:

(1) In any hazardous (classified) location except as permitted by other articles in this *Code*

(2) For the support of luminaires or other equipment

(3) Where concealed by the building structure

(4) Where accessible to unqualified persons

369.14 Installation.

~~IBP~~ IBP systems shall be installed, supported, terminated, and tested in accordance with the manufacturer's instructions by qualified persons under engineering supervision . All documentation shall be available to the authority having jurisdiction.

369.20 Termination.

Manufacturer's supplied terminating means shall be used for ~~IBP~~ IBP system connections.

Informational Note No. 1: See 110.14(C) for conductor temperature limitations due to termination provisions for installations up to and including 2000 volts.

Informational Note 2: See 110.40 for conductor temperature limitations due to termination provisions for installations 2001 volts to 35,000 volts.

Informational Note No. 3: Where practicable, connections made up employing dissimilar metals in connections shall be avoided to eliminate the possibility of galvanic action.

369.80 Ampacity.

~~IBP~~ IBP systems shall be used within the marked ampacity of the IBP.

369.90 Temperature Rating.

~~IBP~~ IBP systems shall be used within the maximum rated conductor temperature.

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.

Note: See 300.21 for information concerning the spread of fire or products of combustion.

Fire barriers shall be provided where fire walls, floors, or ceilings are penetrated.

Note: See 300.21 for information concerning the spread of fire or products of combustion.

369.120 Marking.

All ~~IBP~~ IBP systems 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 Comment

Insulated bus pipe (IBP), also known as Tubular Covered Conductor (TCC), was submitted for proposed inclusion into the 2023 version of NFPA 70. Upon discussion and feedback from the CMP the proposed changes were made to address that IBP/TCC should be treated as a system rather than a standalone product. The changes proposed in this Public Comment serve to address IBP as a

system and fix minor editorial changes for ease of use to the initial proposal.

Related Item

• PI 2589

Submitter Information Verification

Submitter Full Name: Paul Knapp
Organization: UL LLC
Street Address:
City:
State:
Zip:
Submittal Date: Fri Aug 13 12:58:37 EDT 2021
Committee: NEC-P08

Committee Statement

Committee Action: Rejected but see related SR

Resolution: SR-8151-NFPA 70-2021

Statement: The term “Systems” or “systems” is added throughout the Article 369, along with minor editorial changes to on text structure to address the word addition, in order to clarify that Insulated Bus Pipe (IBP), also known as Tubular Covered Conductor (TCC), IBP/TCC should be treated as a system rather than a standalone product. The term "unqualified" is removed from 369.12 (4) and the terms “size” and “area” are removed from 369.120(4).

Insulated Bus Pipe (IBP)/Tubular Covered Conductors (TCC) and Systems are not permitted to be reconditioned. Therefore, the panel has relocated , retitled and reconsidered the First Revision text to move the text from the 369.8 to 362.2 , retitled the section and simplified the text to simply state "shall not be reconditioned" rather than shall not be permitted to be" per direction from the correlating committee.

Section 369.14 is revised per 110.3(B) the general rule for the installation, testing, and manufacturing instructions for electrical equipment. Section 4.1.1 of the 2020 NEC Style Manual states that the general requirements contained in Chapters 1 through 4 shall not be repeated in other articles of the code.

The word “connections” is added to the title of the section since connections and terminations, which may be one in the same, are being addressed in this rule. Informational Note No. 3 contains a requirement which is not permitted by the NEC Style Manual, so it is relocated to be a new second sentence in 369.20. Additionally the term “made-up” has been removed to improve code language.

for all but the request to add the term “phase-to-phase” in 369.10 (5) on account it being unnecessary since throughout the code nominal voltages are considered to be phase-to phase without the additional text.

clarifying that the "Note" in NEC 369.110 is indeed an "Informational Note." and is consistent with other existing Articles within the code, e.g. the informational note found in Section 368.10.

section 369.14 was revised per 110.3(B) the general rule for the installation, testing, and manufacturing instructions for electrical equipment. Section 4.1.1 of the 2020 NEC Style Manual states that the general requirements contained in Chapters 1 through 4 shall not

be repeated in other articles of the code.

Second Revision TG6-5 8151 which added the word “connections” to the title of the section since connections and terminations, which may be one in the same, are being addressed in this rule. Also Informational Note No. 3 which contained a requirement which is not permitted by the NEC Style Manual, was relocated to be a new second sentence in 369.20. Lastly, the term “made-up” was removed to improve code language.

Public Comment No. 130-NFPA 70-2021 [Section No. 369.2]

~~**369.2** Definitions.~~

~~**Insulated Bus Pipe (IBP), Type IBP.**~~

~~A cylindrical solid or hollow conductor with a solid insulation system, having conductive grading layers and a grounding layer imbedded in the insulation, and provided with an overall covering of insulating or metallic material~~

~~**IBP Systems.**~~

~~An assembly that includes bus pipe, connectors, fittings, mounting structures, and accessories.~~

Statement of Problem and Substantiation for Public Comment

The definitions for Insulated Bus Pipe (IBP) and IBP Systems were editorially revised and relocated to Article 100 per the 2020 NEC Style Manual. See Public Comment PC-129.

Related Item

• PC-129

Submitter Information Verification

Submitter Full Name: David Kendall
Organization: ABB Inc.
Street Address:
City:
State:
Zip:
Submittal Date: Tue Jul 06 10:35:44 EDT 2021
Committee: NEC-P08

Committee Statement

Committee Action: Rejected but see related SR
Resolution: SR-8149-NFPA 70-2021
Statement: The definitions have been relocated to Article 100 per the NEC Style Manual and deleted from Article 369.

Public Comment No. 1931-NFPA 70-2021 [Section No. 369.8]

369.8 Reconditioning.

IBP and IBP systems shall not be permitted to be reconditioned.

Additional Proposed Changes

File Name	Description	Approved
CN_249.pdf	70_CN249	

Statement of Problem and Substantiation for Public Comment

NOTE: The following CC Note No. 249 appeared in the First Draft Report.

The Correlating Committee directs the panel to reconsider the text "shall not be permitted to be" for clarification and ease of use. Simplifying the text to state that the equipment "shall not be reconditioned" is suggested as an alternative.

Related Item

• Correlating Note No. 249

Submitter Information Verification

Submitter Full Name: CC on NEC-AAC
Organization: NEC Correlating Committee
Street Address:
City:
State:
Zip:
Submittal Date: Wed Aug 18 16:53:41 EDT 2021
Committee: NEC-P08

Committee Statement

Committee Action: Rejected but see related SR

Resolution: SR-8151-NFPA 70-2021

Statement: The term “Systems” or “systems” is added throughout the Article 369, along with minor editorial changes to on text structure to address the word addition, in order to clarify that Insulated Bus Pipe (IBP), also known as Tubular Covered Conductor (TCC), IBP/TCC should be treated as a system rather than a standalone product. The term "unqualified" is removed from 369.12 (4) and the terms “size” and “area” are removed from 369.120(4).

Insulated Bus Pipe (IBP)/Tubular Covered Conductors (TCC) and Systems are not permitted to be reconditioned. Therefore, the panel has relocated , retitled and reconsidered the First Revision text to move the text from the 369.8 to 362.2 , retitled the section and simplified the text to simply state "shall not be reconditioned" rather than shall not be permitted to be" per direction from the correlating committee.

Section 369.14 is revised per 110.3(B) the general rule for the installation, testing, and manufacturing instructions for electrical equipment. Section 4.1.1 of the 2020 NEC Style Manual states that the general requirements contained in Chapters 1 through 4 shall not be repeated in other articles of the code.

The word “connections” is added to the title of the section since connections and terminations, which may be one in the same, are being addressed in this rule. Informational Note No. 3 contains a requirement which is not permitted by the NEC Style Manual, so it is relocated to be a new second sentence in 369.20. Additionally the term “made-up” has been removed to improve code language.

for all but the request to add the term “phase-to-phase” in 369.10 (5) on account it being unnecessary since throughout the code nominal voltages are considered to be phase-to phase without the additional text.

clarifying that the "Note" in NEC 369.110 is indeed an "Informational Note." and is consistent with other existing Articles within the code, e.g. the informational note found in Section 368.10.

section 369.14 was revised per 110.3(B) the general rule for the installation, testing, and manufacturing instructions for electrical equipment. Section 4.1.1 of the 2020 NEC Style Manual states that the general requirements contained in Chapters 1 through 4 shall not be repeated in other articles of the code.

Second Revision TG6-5 8151 which added the word “connections” to the title of the section since connections and terminations, which may be one in the same, are being addressed in this rule. Also Informational Note No. 3 which contained a requirement which is not permitted by the NEC Style Manual, was relocated to be a new second sentence in 369.20. Lastly, the term “made-up” was removed to improve code language.

Correlating Committee Note No. 249-NFPA 70-2021 [Section No. 369.8]

Submitter Information Verification

Committee: NEC-AAC
Submittal Date: Thu May 06 09:33:17 EDT 2021

Committee Statement

Committee Statement: The Correlating Committee directs the panel to reconsider the text “shall not be permitted to be” for clarification and ease of use. Simplifying the text to state that the equipment “shall not be reconditioned” is suggested as an alternative.

Ballot Results

This item has passed ballot

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

Affirmative All

Ayer, Lawrence S.
Gallo, Ernest J.
Hickman, Palmer L.
Holub, Richard A.
Hunter, Dean C.
Johnston, Michael J.
Kendall, David H.
Kovacik, John R.
Manche, Alan
McDaniel, Roger D.
Porter, Christine T.
Williams, David A.

Public Comment No. 76-NFPA 70-2021 [Section No. 369.14]

369.14 Installation.

IBP shall be installed ~~, supported, terminated, and tested in accordance with the manufacturer's instructions~~ by qualified persons.

Statement of Problem and Substantiation for Public Comment

Section 369.14 should be revised per 110.3(B). Section 110.3(B) is the general rule for the installation, testing, and manufacturing instructions for electrical equipment. Section 4.1.1 of the 2020 NEC Style Manual states that the general requirements contained in Chapters 1 through 4 shall not be repeated in other articles of the code.

Related Item

• FR 7620

Submitter Information Verification

Submitter Full Name: David Kendall
Organization: ABB Inc.
Street Address:
City:
State:
Zip:
Submittal Date: Thu Jul 01 15:21:49 EDT 2021
Committee: NEC-P08

Committee Statement

Committee Action: Rejected but see related SR

Resolution: SR-8151-NFPA 70-2021

Statement: The term "Systems" or "systems" is added throughout the Article 369, along with minor editorial changes to on text structure to address the word addition, in order to clarify that Insulated Bus Pipe (IBP), also known as Tubular Covered Conductor (TCC), IBP/TCC should be treated as a system rather than a standalone product. The term "unqualified" is removed from 369.12 (4) and the terms "size" and "area" are removed from 369.120(4).

Insulated Bus Pipe (IBP)/Tubular Covered Conductors (TCC) and Systems are not permitted to be reconditioned. Therefore, the panel has relocated , retitled and reconsidered the First Revision text to move the text from the 369.8 to 362.2 , retitled the section and simplified the text to simply state "shall not be reconditioned" rather than shall not be permitted to be" per direction from the correlating committee.

Section 369.14 is revised per 110.3(B) the general rule for the installation, testing, and manufacturing instructions for electrical equipment. Section 4.1.1 of the 2020 NEC Style Manual states that the general requirements contained in Chapters 1 through 4 shall not be repeated in other articles of the code.

The word “connections” is added to the title of the section since connections and terminations, which may be one in the same, are being addressed in this rule. Informational Note No. 3 contains a requirement which is not permitted by the NEC Style Manual, so it is relocated to be a new second sentence in 369.20. Additionally the term “made-up” has been removed to improve code language.

for all but the request to add the term “phase-to-phase” in 369.10 (5) on account it being unnecessary since throughout the code nominal voltages are considered to be phase-to phase without the additional text.

clarifying that the "Note" in NEC 369.110 is indeed an "Informational Note." and is consistent with other existing Articles within the code, e.g. the informational note found in Section 368.10.

section 369.14 was revised per 110.3(B) the general rule for the installation, testing, and manufacturing instructions for electrical equipment. Section 4.1.1 of the 2020 NEC Style Manual states that the general requirements contained in Chapters 1 through 4 shall not be repeated in other articles of the code.

Second Revision TG6-5 8151 which added the word “connections” to the title of the section since connections and terminations, which may be one in the same, are being addressed in this rule. Also Informational Note No. 3 which contained a requirement which is not permitted by the NEC Style Manual, was relocated to be a new second sentence in 369.20. Lastly, the term “made-up” was removed to improve code language.

Public Comment No. 1880-NFPA 70-2021 [Section No. 369.20]

369.20 Termination or Connections .

Manufacturer's supplied terminating means shall be used for IBP connections or terminations .Connections made up employing dissimilar metals shall be avoided to eliminate the possibility of galvanic reaction.

Informational Note No. 1: See 110.14(C) for conductor temperature limitations due to termination provisions for installations up to and including 2000 volts.

Informational Note 2: See 110.40 for conductor temperature limitations due to termination provisions for installations 2001 volts to 35,000 volts.

~~Informational Note No. 3: Where practicable, connections made up employing dissimilar metals in connections shall be avoided to eliminate the possibility of galvanic action.~~

Statement of Problem and Substantiation for Public Comment

The word "connections" is added to the title of the section since it seems connections and terminations, which may be one in the same, seem to be addressed in this rule. Informational Note No. 3 contains a requirement which is not permitted by the NEC Style Manual, so it is suggested to relocate that text as a new second sentence in 369.20. No other suggested revisions to this section are being submitted in this comment.

Related Item

• FR 7620

Submitter Information Verification

Submitter Full Name: Agnieszka Golriz
Organization: NECA
Street Address:
City:
State:
Zip:
Submittal Date: Wed Aug 18 13:32:32 EDT 2021
Committee: NEC-P08

Committee Statement

Committee Action: Rejected but see related SR

Resolution: SR-8151-NFPA 70-2021

Statement: The term "Systems" or "systems" is added throughout the Article 369, along with minor editorial changes to on text structure to address the word addition, in order to clarify that Insulated Bus Pipe (IBP), also known as Tubular Covered Conductor (TCC), IBP/TCC should be treated as a system rather than a standalone product. The term "unqualified" is removed from 369.12 (4) and the terms "size" and "area" are removed from 369.120(4).

Insulated Bus Pipe (IBP)/Tubular Covered Conductors (TCC) and Systems are not permitted to be reconditioned. Therefore, the panel has relocated , retitled and reconsidered the First Revision text to move the text from the 369.8 to 362.2 , retitled the section and simplified the text to simply state "shall not be reconditioned" rather than shall not be permitted to be" per direction from the correlating committee.

Section 369.14 is revised per 110.3(B) the general rule for the installation, testing, and manufacturing instructions for electrical equipment. Section 4.1.1 of the 2020 NEC Style Manual states that the general requirements contained in Chapters 1 through 4 shall not be repeated in other articles of the code.

The word “connections” is added to the title of the section since connections and terminations, which may be one in the same, are being addressed in this rule. Informational Note No. 3 contains a requirement which is not permitted by the NEC Style Manual, so it is relocated to be a new second sentence in 369.20. Additionally the term “made-up” has been removed to improve code language.

for all but the request to add the term “phase-to-phase” in 369.10 (5) on account it being unnecessary since throughout the code nominal voltages are considered to be phase-to phase without the additional text.

clarifying that the "Note" in NEC 369.110 is indeed an "Informational Note." and is consistent with other existing Articles within the code, e.g. the informational note found in Section 368.10.

section 369.14 was revised per 110.3(B) the general rule for the installation, testing, and manufacturing instructions for electrical equipment. Section 4.1.1 of the 2020 NEC Style Manual states that the general requirements contained in Chapters 1 through 4 shall not be repeated in other articles of the code.

Second Revision TG6-5 8151 which added the word “connections” to the title of the section since connections and terminations, which may be one in the same, are being addressed in this rule. Also Informational Note No. 3 which contained a requirement which is not permitted by the NEC Style Manual, was relocated to be a new second sentence in 369.20. Lastly, the term “made-up” was removed to improve code language.

Public Comment No. 1894-NFPA 70-2021 [Article 371]

Article 371 Flexible Bus Systems

Part I. General

371.1 Scope.

This article covers the use and installation requirements of flexible bus systems and associated fittings.

371.2 Definitions.

The definitions in this section shall apply within this article and throughout the *Code* .

Flexible Bus Systems.

An assembly of flexible insulated bus, with a system of associated fittings used to secure, support, and terminate the bus.

Informational Note: Flexible bus systems are engineered systems for a specific site location and are ordinarily assembled at the point of installation from the components furnished or specified by the manufacturer.

Flexible Insulated Bus.

A flexible rectangular conductor with an overall insulation.

371.6 Listing Requirements.

Flexible bus systems shall be listed.

Part II. Installation

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

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

371.14 Engineering Supervision.

Flexible bus systems shall be designed and specified for specific installation site applications under engineering supervision.

371.17 Overcurrent Protection.

Overcurrent protection shall be provided in accordance with 371.17(A) through (G).

(A) Rating of Overcurrent Protection — Services.

Flexible bus systems installed for services shall be protected against overcurrent in accordance with 230.90 .

(B) Rating of Overcurrent Protection — Feeders.

Flexible bus systems installed as feeders shall be protected against overcurrent in accordance with 215.3 .

Exception: The applicable requirements of 240.4 shall be permitted.

(C) Rating of Overcurrent Protection — Branch Circuits.

Flexible bus systems installed as branch circuits shall be protected against overcurrent in accordance with 210.20 .

Exception: The applicable requirements of 240.4 shall be permitted.

(D) Transformer Secondary Flexible Bus Systems.

Flexible bus systems installed on a transformer secondary to the disconnect and overcurrent protection device shall be protected from overcurrent in accordance with 240.21(C) .

(E) Flexible Bus Systems from Generator Terminals.

Flexible bus systems installed from generator terminals that meet the size requirement in 445.13 shall be permitted to be protected against overload by the generator overload protective device(s) required by 445.12 .

(F) Flexible Bus Systems from Battery Terminals.

Flexible bus systems installed for battery systems shall be protected from overcurrent in accordance with 240.21(H) .

(G) Reduction in Size of Flexible Bus Systems.

Overcurrent protection shall be required at the point where flexible bus systems are reduced in size.

Exception: For industrial establishments only, omission of overcurrent protection shall be permitted at points where a flexible bus system is reduced in size, provided that the length of the flexible bus system having a reduced size does not exceed 15 m (50 ft) and has a current rating at least equal to one-third the rating or setting of the overcurrent device ahead of the point of connection and provided that such a flexible bus system is free from contact with combustible material.

371.18 Flexible Bus Systems Installation.

Installation of flexible bus systems shall comply with 371.18(A) through (E).

(A) Manufacturer's Installation Instructions.

Flexible bus systems shall be installed under engineering supervision and in accordance with the manufacturer's instructions including supporting and securing. All documentation shall be available to the authority having jurisdiction.

(B) Physical Damage.

Flexible bus systems subject to physical damage shall have approved protective means installed.

Infomational Note: Typical methods of protecting flexible bus systems from physical damage include suitable barriers, guards, or elevation.

(C) Transversely Routed.

Flexible bus systems shall be permitted to extend transversely through partitions or walls if the section within the wall is continuous and protected against physical damage. Where the flexible bus systems penetrate a fire-resistant-rated wall or partition, the installation shall be made in accordance with 300.21 .

(D) Through Dry Floors and Platforms.

Flexible bus systems shall be permitted to extend vertically through dry floors and platforms. Where the flexible bus systems penetrate a fire-resistant-rated floor or ceiling, the installation shall be made in accordance with 300.21 .

(E) Through Floors and Platforms in Wet Locations.

Flexible bus systems shall be permitted to extend vertically through floors and platforms in wet locations as follows:

(1) Where there are curbs or other suitable means to prevent waterflow through the floor or platform opening

(2) Where the flexible bus system provides a means to seal the floor penetration

Where the flexible bus systems penetrate a fire-resistant-rated floor or ceiling, the installation shall be made in accordance with 300.21 .

371.20 Terminations.

Flexible bus systems shall be terminated with fittings or devices listed for flexible bus systems.

371.30 Securing and Supporting.

Flexible insulated bus conductors shall be supported on identified mounting means at intervals not greater than 900 mm (3 ft) for horizontal runs and 450 mm (1 **1**/**2** ft) for vertical runs unless otherwise permitted by the product listing. Flexible bus systems shall be secured and supported by listed associated fittings in accordance with 371.30(A) through (C).

(A) Associated Fittings.

Associated fittings shall be part of a listed flexible bus system.

(B) Support Brackets.

The support brackets for flexible bus systems shall be secured to the building structure or to other associated fittings that are secured to the building structure.

(C) Support Tray.

Flexible bus systems shall be permitted to be installed in support trays supplied as associated fittings for the listed flexible bus system. Support trays shall not be required to be continuous.

371.40 Short Circuit Current Rating.

Flexible bus systems shall have a short circuit current rating sufficient for the available fault current.

371.60 Grounding.

Conductive associated fitting supports for flexible bus systems shall be bonded together and grounded.

Part III. Construction Specifications

371.120 Marking.

Each section of flexible bus systems shall be marked with the manufacturer's name or trade designation, voltage rating, and current rating. Markings shall be located so as to be visible after installation.

~~**(A)** System Nameplate.~~

~~A system nameplate shall contain the manufacturer's name or trademark and the flexible bus system ratings. The ratings shall include the voltage, phase, current rating, short circuit current rating, and applicable environmental ratings. The nameplate shall be installed at each end of the flexible bus system. The nameplate shall be visible after installation.~~

~~**(B)** Associated Fittings.~~

~~Associated fittings shall be marked as suitable for flexible bus systems.~~

~~**(C)** Flexible Insulated Bus.~~

~~The flexible insulated bus shall be marked along the insulation with the manufacturer's name or trademark, voltage, current rating, and insulation temperature ratings.~~

~~**Part IV.** Requirements for Over 1000 Volts, Nominal~~

~~**371.214** Adjacent and Supporting Structures.~~

~~Flexible bus systems shall be installed so that temperature rise from induced circulating currents in adjacent ferrous metal parts will not be hazardous to personnel or constitute a fire hazard.~~

~~**371.216** Neutral Conductor.~~

~~The neutral bus of a flexible bus system, where required, shall be sized to carry all neutral load current, including harmonic currents, and shall have adequate momentary and short-circuit current ratings consistent with system requirements.~~

Statement of Problem and Substantiation for Public Comment

CMP-8 should revisit the inclusion of a new Article 371.

Based on the substantiation provided with PI 3616, the submitters presentation made to CMP-8, and as expressed in the committee statement associated with FR 7621 it was understood that the associated product standard and/or outline of investigation would be available to allow adequate time to develop public comments prior to the comment closing date of August 19, 2021.

I was asked to lead a task group to review and comment on the requirements contained in the newly proposed Article 371 with respect to the outline of investigation and/or product standard. Without a publicly available outline of investigation or product standard, we were unable to compare the contents of the product standard with the draft installation requirements in the newly proposed article.

CMP-8 should revisit the inclusion of a new Article 371 to determine if it is still appropriate at this time.

Related Item

• FR7621

Submitter Information Verification

Submitter Full Name: Rodney West
Organization: Schneider Electric
Street Address:
City:
State:
Zip:
Submittal Date: Wed Aug 18 13:55:09 EDT 2021
Committee: NEC-P08

Committee Statement

Committee Action:	Rejected but see related SR
Resolution:	SR-8156-NFPA 70-2021
Statement:	This second revision clarifies in 371.14 and 371.18 that qualified design engineering supervision is needed for proper installation of flexible bus systems and that such installations must remain within the limitations of the listing and manufacturers installation instructions. Additional language is added to 371.20 to clarify the acceptable termination methods. This second revision removes the current rating marking requirement from the flexible insulated bus insulation in 371.120(C) to accommodate the possibility of different installation locations, ambient conditions, bundling, and other factors. A marking requirement for the manufacturers part identification is added to assist in correct component identification for the installer and AHJ.As shown in 371.120(A) the listed current rating for the system continues to be marked on the system nameplate. Part IV Requirements for Over 1000 Volts is removed as the product listing standard does not presently address flexible insulated bus rated over 1000 volts. If the scope is expanded in the future to include such systems additional language is needed to address topics such as shielding, terminations, impulse withstand voltage ratings, rated momentary current, and possibly other installation items.

Public Comment No. 132-NFPA 70-2021 [Section No. 371.2]

~~**371.2** Definitions.~~

~~The definitions in this section shall apply within this article and throughout the *Code* .~~

~~**Flexible Bus Systems.**~~

~~An assembly of flexible insulated bus, with a system of associated fittings used to secure, support, and terminate the bus.~~

~~Informational Note: Flexible bus systems are engineered systems for a specific site location and are ordinarily assembled at the point of installation from the components furnished or specified by the manufacturer.~~

~~**Flexible Insulated Bus.**~~

~~A flexible rectangular conductor with an overall insulation.~~

Statement of Problem and Substantiation for Public Comment

The definitions for Flexible Bus Systems and Flexible Insulated Bus were relocated to Article 100 per the 2020 NEC Style Manual. See Public Comment PC-131.

Related Item

• PC-131

Submitter Information Verification

Submitter Full Name: David Kendall
Organization: ABB Inc.
Street Address:
City:
State:
Zip:
Submittal Date: Tue Jul 06 10:52:16 EDT 2021
Committee: NEC-P08

Committee Statement

Committee Action: Rejected but see related SR
Resolution: SR-8122-NFPA 70-2021
Statement: The definitions have been relocated to Article 100 per the NEC Style Manual and removed from Article 371.

Public Comment No. 1811-NFPA 70-2021 [Section No. 371.2]

~~**371.2** Definitions.~~

~~The definitions in this section shall apply within this article and throughout the *Code* .~~

~~**Flexible Bus Systems.**~~

~~An assembly of flexible insulated bus, with a system of associated fittings used to secure, support, and terminate the bus.~~

~~Informational Note: Flexible bus systems are engineered systems for a specific site location and are ordinarily assembled at the point of installation from the components furnished or specified by the manufacturer.~~

~~**Flexible Insulated Bus.**~~

~~A flexible rectangular conductor with an overall insulation.~~

Additional Proposed Changes

File Name	Description	Approved
PC_for_Definition_Relocation_Draft_3.docx	371.2 text in Word file	

Statement of Problem and Substantiation for Public Comment

The definitions in the new Article 371 created in the first draft under FR 7621 are being relocated to Article 100 in accordance with 2.2.2 of the NEC Style Manual. There are no technical changes to the definitions in this public comment, only relocation of the definition and any associated informational note.

Related Item

• PI 3616

Submitter Information Verification

Submitter Full Name: Ward Judson
Organization: nVent Electric
Street Address:
City:
State:
Zip:
Submittal Date: Tue Aug 17 22:23:28 EDT 2021
Committee: NEC-P08

Committee Statement

Committee Action: Rejected but see related SR
Resolution: SR-8122-NFPA 70-2021
Statement: The definitions have been relocated to Article 100 per the NEC Style Manual and removed from Article 371.

PC for Definition Relocation

PC Text -- Article 371

371.2 Definition.

~~The definitions in this section shall apply within this article and throughout the Code.~~

~~**Flexible Bus Systems.** An assembly of flexible insulated bus, with a system of associated fittings used to secure, support and terminate the bus.~~

> ~~Informational Note: Flexible bus systems are engineered systems for a specific site location and are ordinarily assembled at the point of installation from the components furnished or specified by the manufacturer.~~

~~**Flexible Insulated Bus.** A flexible rectangular conductor with an overall insulation.~~

PC Text --- Article 100

Flexible Bus Systems. An assembly of flexible insulated bus, with a system of associated fittings used to secure, support and terminate the bus.

> Informational Note: Flexible bus systems are engineered systems for a specific site location and are ordinarily assembled at the point of installation from the components furnished or specified by the manufacturer.

Flexible Insulated Bus. A flexible rectangular conductor with an overall insulation.

Substantiation:

The definitions in the new Article 371 created in the first draft under FR 7621 are being relocated to Article 100 in accordance with 2.2.2 of the NEC Style Manual. There are no technical changes to the definitions in this public comment, only relocation of the definition and any associated informational note.

Public Comment No. 1809-NFPA 70-2021 [Section No. 371.120(C)]

(C) Flexible Insulated Bus.

The flexible insulated bus shall be marked along the insulation with the manufacturer's name or trademark, voltage, ~~current rating~~ manufacturer's part identification , and insulation temperature ratings.

Additional Proposed Changes

File Name	Description	Approved
PC_for_371.120_Draft_3.docx	371.120 text in Word file	

Statement of Problem and Substantiation for Public Comment

The Flexible Bus System may have different current ratings depending on system configuration, parallel conductors and other factors when the same Flexible Insulated Bus component is being used for each. A current rating marked on the Flexible Insulated Bus could be misleading the same as marking a current rating on any other conductor, such as 500 kcmil copper wire. To ensure there is some identification on the Flexible Insulated Bus for the installer and inspector to confirm the correct components were installed in the engineered system, the marking requirement for the Flexible Insulated Bus component part was revised to be the "manufacturer's part identification". This marking along with the installation instructions that denote the configuration of the final listed Flexible Bus System with associated current rating allows the installer and inspector to ensure the installation is correct.

Related Item

• PI 3616

Submitter Information Verification

Submitter Full Name: Ward Judson
Organization: nVent Electric
Street Address:
City:
State:
Zip:
Submittal Date: Tue Aug 17 22:15:39 EDT 2021
Committee: NEC-P08

Committee Statement

Committee Action: Rejected but see related SR
Resolution: SR-8156-NFPA 70-2021
Statement: This second revision clarifies in 371.14 and 371.18 that qualified design engineering supervision is needed for proper installation of flexible bus systems and that such installations must remain within the limitations of the listing and manufacturers installation instructions.

Additional language is added to 371.20 to clarify the acceptable termination methods.

This second revision removes the current rating marking requirement from the flexible insulated bus insulation in 371.120(C) to accommodate the possibility of different installation locations, ambient conditions, bundling, and other factors. A marking requirement for the manufacturers part identification is added to assist in correct component identification for the installer and AHJ.As shown in 371.120(A) the listed current rating for the system continues to be marked on the system nameplate.

Part IV Requirements for Over 1000 Volts is removed as the product listing standard does not presently address flexible insulated bus rated over 1000 volts. If the scope is expanded in the future to include such systems additional language is needed to address topics such as shielding, terminations, impulse withstand voltage ratings, rated momentary current, and possibly other installation items.

PC Code Text

371.120 Marking.

Each section of flexible bus systems shall be marked with the manufacturer's name or trade designation, voltage rating, and current rating. Markings shall be located so as to be visible after installation.

(A) System Nameplate.

A system nameplate shall contain the manufacturer’s name or trademark and the flexible bus system ratings. The ratings shall include the voltage, phase, current rating, short circuit current rating, and applicable environmental ratings. The nameplate shall be installed at each end of the flexible bus system. The nameplate shall be visible after installation.

(B) Associated Fittings.

Associated fittings shall be marked as suitable for flexible bus systems.

(C) Flexible Insulated Bus.

The flexible insulated bus shall be marked along the insulation with the manufacturer’s name or trademark, voltage, ~~current rating~~ manufacturer’s part identification, and insulation temperature ratings.

Substantiation:

The Flexible Bus System may have different current ratings depending on system configuration, parallel conductors and other factors when the same Flexible Insulated Bus component is being used for each. A current rating marked on the Flexible Insulated Bus could be misleading the same as marking a current rating on any other conductor, such as 500 kcmil copper wire. To ensure there is some identification on the Flexible Insulated Bus for the installer and inspector to confirm the correct components were installed in the engineered system, the marking requirement for the Flexible Insulated Bus component part was revised to be the “manufacturer’s part identification”. This marking along with the installation instructions that denote the configuration of the final listed Flexible Bus System with associated current rating allows the installer and inspector to ensure the installation is correct.

Public Comment No. 253-NFPA 70-2021 [Section No. 371.120(C)]

(C) Flexible Insulated Bus.

The flexible insulated bus shall be marked along the insulation with the manufacturer's name or trademark, voltage, ~~current rating, and~~ and insulation temperature ratings.

Statement of Problem and Substantiation for Public Comment

The current rating of the Flexible Insulated Bus is not known until the Flexible Insulated Bus is installed. Different installation locations, ambient conditions, bundling, and other factors are not known until the Flexible Insulated Bus is installed. Therefore, it is not appropriate to mark the current rating on the Flexible Insulated Bus.

Related Item

• FR7621

Submitter Information Verification

Submitter Full Name: Susan Stene
Organization: UL LLC
Street Address:
City:
State:
Zip:
Submittal Date: Fri Jul 16 08:01:04 EDT 2021
Committee: NEC-P08

Committee Statement

Committee Action: Rejected but see related SR

Resolution: SR-8156-NFPA 70-2021

Statement: This second revision clarifies in 371.14 and 371.18 that qualified design engineering supervision is needed for proper installation of flexible bus systems and that such installations must remain within the limitations of the listing and manufacturers installation instructions.

Additional language is added to 371.20 to clarify the acceptable termination methods.

This second revision removes the current rating marking requirement from the flexible insulated bus insulation in 371.120(C) to accommodate the possibility of different installation locations, ambient conditions, bundling, and other factors. A marking requirement for the manufacturers part identification is added to assist in correct component identification for the installer and AHJ.As shown in 371.120(A) the listed current rating for the system continues to be marked on the system nameplate.

Part IV Requirements for Over 1000 Volts is removed as the product listing standard does not presently address flexible insulated bus rated over 1000 volts. If the scope is expanded in the future to include such systems additional language is needed to

address topics such as shielding, terminations, impulse withstand voltage ratings, rated momentary current, and possibly other installation items.

Public Comment No. 1881-NFPA 70-2021 [Section No. 376.60]

376.60 Grounding.

(A) Listed metal wireway shall be permitted as an equipment grounding conductor in accordance with 250.118(13).

(B) Non-listed metal wireways shall be grounded by connection to an equipment grounding conductor. Non-listed metal wireways shall not be permitted as an equipment grounding conductor. addressing grounding requirements for non-listed metal wireway.

Statement of Problem and Substantiation for Public Comment

Article 376 does not require metal wireways to be listed. It appears that listed metal wireways are evaluated for use as equipment grounding conductors. Custom fabricated (non-listed metal wireways must meet the construction specifications in Part III of Article 376. This comment intends to build on the concept introduced by CMP-8 in the first draft stage by addressing the apparent gap created by the revised text in 376.60. The new subdivision clarifies the equipment grounding requirements for metal wire ways that are not listed.

Related Item

• FR 7619

Submitter Information Verification

Submitter Full Name: Agnieszka Golriz
Organization: NECA
Street Address:
City:
State:
Zip:
Submittal Date: Wed Aug 18 13:35:13 EDT 2021
Committee: NEC-P08

Committee Statement

Committee Action: Rejected

Resolution: 376.60 permits listed metal wireways to serve as an equipment grounding conductor in accordance with the existing language in 250.118(13). The additional proposed language is not necessary as grounding and bonding requirements between sections of unlisted metal wireway are adequately addressed in 250.4(A).

Public Comment No. 1371-NFPA 70-2021 [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 Comment

Please use the defined term.

Related Item

• FR 7515

Submitter Information Verification

Submitter Full Name: Ryan Jackson
Organization: Ryan Jackson
Street Address:
City:
State:
Zip:
Submittal Date: Thu Aug 12 12:48:08 EDT 2021
Committee: NEC-P08

Committee Statement

Committee Action: Rejected

Resolution: The Public Comment proposed change assumes all grounding conductors are Equipment Grounding Conductors, whereas a grounding conductor, whether an EGC, a GEC, or an equipotential bonding conductor is still needed.

Public Comment No. 1377-NFPA 70-2021 [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 Comment

This revision seeks to use the defined term in Article 100.

Related Item

• FR 7655

Submitter Information Verification

Submitter Full Name: Ryan Jackson
Organization: Ryan Jackson
Street Address:
City:
State:
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Submittal Date: Thu Aug 12 12:58:24 EDT 2021
Committee: NEC-P08

Committee Statement

Committee Action: Rejected

Resolution: The Public Comment proposed change assumes all grounding conductors are Equipment Grounding Conductors, whereas a grounding conductor, whether an EGC, a GEC, or an equipotential bonding conductor is still needed.

Public Comment No. 1068-NFPA 70-2021 [Article 392]

Article 392 Cable Trays

Part I. General

392.1 Scope.

This article covers cable tray systems, including ladder, ventilated trough, ventilated channel, solid bottom, and other similar structures.

Informational Note: For further information on cable trays, see ANSI/NEMA–VE 1-2017, *Metal Cable Tray Systems*, and NECA/NEMA 105-2015, *Standard for Installing Metal Cable Tray Systems*.

Part II. Installation

392.10 Uses Permitted.

Cable tray shall be permitted to be used as a support system for wiring methods containing service conductors, feeders, branch circuits, communications circuits, control circuits, and signaling circuits. Single insulated cables and single insulated conductors shall be permitted in cable tray only when installed in accordance with 392.10(B)(1). Cable tray installations shall not be limited to industrial establishments. Where exposed to direct rays of the sun, insulated conductors and jacketed cables shall be identified as being sunlight resistant. Cable trays and their associated fittings shall be identified for the intended use.

(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	725
Communications cables	800 and 805
Communications raceways	800
Electrical metallic tubing: Type EMT	358
Electrical nonmetallic tubing: Type ENT	362
Fire alarm cables	760
Flexible metal conduit: Type FMC	348
Flexible metallic tubing: Type FMT	360
Instrumentation tray cable: Type ITC	727
Intermediate metal conduit: Type IMC	342
Liquidtight flexible metal conduit: Type LFMC	350
Liquidtight flexible nonmetallic conduit: Type 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	760
Optical fiber cables	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	760
Power-limited tray cable	725
Rigid metal conduit: Type RMC	344
Rigid polyvinyl chloride conduit: Type PVC	352
Reinforced thermosetting resin conduit: Type RTRC	355
Service-entrance cable: Types SE and USE	338
Underground feeder and branch-circuit cable: Type UF	340

(B) In Industrial Establishments.

The wiring methods in Table 392.10(A) shall be permitted to be used in any industrial establishment under the conditions described in their respective articles. In industrial establishments only, where conditions of maintenance and supervision ensure that only qualified persons service the installed cable tray system, any of the cables in 392.10(B)(1) and (B)(2) shall be permitted to be installed in ladder, ventilated trough, solid bottom, or ventilated channel cable trays.

(1) Single-Conductor Cables and Single Insulated Conductors.

Single-conductor cables and single insulated conductors shall be permitted to be installed in accordance with 392.10(B)(1)(a) through (B)(1)(c).

(a) Single-conductor cables and single insulated conductors shall be 1/0 AWG or larger and shall be of a type listed and marked on the surface for use in cable trays. Where 1/0 AWG through 4/0 AWG single-conductor cables and single insulated conductors are installed in ladder cable tray, the maximum allowable rung spacing for the ladder cable tray shall be 225 mm (9 in.).

(b) Welding cables shall comply with Article 630, Part IV.

(c) Single conductors used as equipment grounding conductors shall be insulated, covered, or bare, and they shall be 4 AWG or larger.

(2) Single- and Multiconductor Medium Voltage Cables.

Single- and multiconductor medium voltage cables shall be Type MV cable. Single conductors shall be installed in accordance with 392.10(B)(1).

(C) Hazardous (Classified) Locations.

Cable trays in hazardous (classified) locations shall contain only the cable types and raceways permitted by other articles in this *Code*.

(D) Nonmetallic Cable Tray.

In addition to the uses permitted elsewhere in 392.10, nonmetallic cable tray shall be permitted in corrosive areas and in areas requiring voltage isolation.

(E) Airfield Lighting Cable Tray.

In airports where maintenance and supervision conditions ensure that only qualified persons can access, install, or service the cable, airfield lighting cable used in series circuits that are rated up to 5000 volts and are powered by constant current regulators shall be permitted to be installed in cable trays.

Informational Note: Federal Aviation Administration (FAA) Advisory Circulars (ACs) provide additional practices and methods for airport lighting.

392.12 Uses Not Permitted.

Cable tray systems shall not be used in hoistways or where subject to severe physical damage.

392.18 Cable Tray Installation.

(A) Complete System.

Cable trays shall be installed as a complete system. Field bends or modifications shall be so made that the electrical continuity of the cable tray system and support for the cables is maintained. Cable tray systems shall be permitted to have mechanically discontinuous segments between cable tray runs or between cable tray runs and equipment.

(B) Completed Before Installation.

Each run of cable tray shall be completed before the installation of cables.

(C) Covers.

In portions of runs where additional protection is required, covers or enclosures providing the required protection shall be of a material that is compatible with the cable tray.

(D) Through Partitions and Walls.

Cable trays shall be permitted to extend transversely through partitions and walls or vertically through platforms and floors in wet or dry locations where the installations, complete with installed cables, are made in accordance with 300.21.

(E) Exposed and Accessible.

Cable trays shall be exposed and accessible, except as permitted by 392.18(D).

(F) Adequate Access.

Sufficient space shall be provided and maintained about cable trays to permit adequate access for installing and maintaining the cables.

(G) Raceways, Cables, Boxes, and Conduit Bodies Supported from Cable Tray Systems.

In industrial facilities where conditions of maintenance and supervision ensure that only qualified persons service the installation and where the cable tray systems are designed and installed to support the load, such systems shall be permitted to support raceways and cables, and boxes and conduit bodies covered in 314.1. For raceways terminating at the tray, a listed cable tray clamp or adapter shall be used to securely fasten the raceway to the cable tray system. Additional supporting and securing of the raceway shall be in accordance with the appropriate raceway article. For raceways or cables running parallel to and attached to the bottom or side of a cable tray system, fastening and supporting shall be in accordance with the appropriate raceway or cable article.

For boxes and conduit bodies attached to the bottom or side of a cable tray system, fastening and supporting shall be in accordance with 314.23.

(H) Marking.

Cable trays containing conductors operating over 600 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.

392.20 Cable and Conductor Installation.

(A) Multiconductor Cables Operating at 1000 Volts or Less.

Multiconductor cables operating at 1000 volts or less shall be permitted to be installed in the same tray.

(B) Cables Operating at Over 1000 Volts.

Cables operating at over 1000 volts and those operating at 1000 volts or less installed in the same cable tray shall comply with either of the following:

(1) The cables operating at over 1000 volts are Type MC.

(2) The cables operating at over 1000 volts are separated from the cables operating at 1000 volts or less by a solid fixed barrier of a material compatible with the cable tray.

(C) Connected in Parallel.

Where single conductor cables comprising each phase, neutral, or grounded conductor of an alternating-current circuit are connected in parallel as permitted in 310.10(G), the conductors shall be installed in groups consisting of not more than one conductor per phase, neutral, or grounded conductor to prevent current imbalance in the paralleled conductors due to inductive reactance.

Single conductors shall be securely bound in circuit groups to prevent excessive movement due to fault-current magnetic forces unless single conductors are cabled together, such as triplexed assemblies.

(D) Single Conductors.

Where any of the single conductors installed in ladder or ventilated trough cable trays are 1/0 through 4/0 AWG, all single conductors 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.

392.22 Number of Conductors or Cables.

(A) Number of Multiconductor Cables, Rated 2000 Volts or Less, in Cable Trays.

The number of multiconductor cables, rated 2000 volts or less, permitted in a single cable tray shall not exceed the requirements of this section. The conductor sizes shall apply to both aluminum and copper conductors. Where dividers are used, fill calculations shall apply to each divided section of the cable tray.

(1) Ladder or Ventilated Trough Cable Trays Containing Any Mixture of Cables.

Where ladder or ventilated trough cable trays contain multiconductor power or lighting cables, or any mixture of multiconductor power, lighting, control, and signal cables, the maximum number of cables shall conform to 392.22(A)(1)(a) through (A)(1)(c).

(a) Where all of the cables are 4/0 AWG or larger, the sum of the diameters of all cables shall not exceed the cable tray width, and the cables shall be installed in a single layer. Where the cable ampacity is determined according to 392.80(A)(1)(c), the cable tray width shall not be less than the sum of the diameters of the cables and the sum of the required spacing widths between the cables.

(b) Where all of the cables are smaller than 4/0 AWG, the sum of the cross-sectional areas of all cables shall not exceed the maximum allowable cable fill area in Column 1 of Table 392.22(A)(1) for the appropriate cable tray width.

(c) Where 4/0 AWG or larger cables are installed in the same cable tray with cables smaller than 4/0 AWG, the sum of the cross-sectional areas of all cables smaller than 4/0 AWG shall not exceed the maximum allowable fill area resulting from the calculation in Column 2 of Table 392.22(A)(1) for the appropriate cable tray width. The 4/0 AWG and larger cables shall be installed in a single layer, and no other cables shall be placed on them.

Table 392.22(A)(1) Allowable Cable Fill Area for Multiconductor Cables in Ladder, Ventilated Trough, or Solid Bottom Cable Trays for Cables Rated 2000 Volts or Less

Inside Width of Cable Tray		Maximum Allowable Fill Area for Multiconductor Cables							
		Ladder or Ventilated Trough or Wire Mesh Cable Trays, 392.22(A)(1)				Solid Bottom Cable Trays, 392.22(A)(3)			
		Column 1 Applicable for 392.22(A)(1)(b) Only		Column 2[a] Applicable for 392.22(A)(1)(c) Only		Column 3 Applicable for 392.22(A)(3)(b) Only		Column 4[a] Applicable for 392.22(A)(3)(c) Only	
mm	in.	mm^2	$in.^2$	mm^2	$in.^2$	mm^2	$in.^2$	mm^2	$in.^2$
50	2.0	1,500	2.5	1,500 – (30 Sd)[b]	2.5 – (1.2 Sd)[b]	1,200	2.0	1,200 – (25 Sd)[b]	2.0 – Sd[b]
100	4.0	3,000	4.5	3,000 – (30 Sd)[b]	4.5 – (1.2 Sd)	2,300	3.5	2,300 – (25 Sd)	3.5 – Sd
150	6.0	4,500	7.0	4,500 – (30 Sd)[b]	7 – (1.2 Sd)	3,500	5.5	3,500 – (25 Sd)[b]	5.5– Sd
200	8.0	6,000	9.5	6,000 – (30 Sd)[b]	9.5 – (1.2 Sd)	4,500	7.0	4,500 – (25 Sd)	7.0 – Sd
225	9.0	6,800	10.5	6,800 – (30 Sd)	10.5 – (1.2 Sd)	5,100	8.0	5,100 – (25 Sd)	8.0 – Sd
300	12.0	9,000	14.0	9,000 – (30 Sd)	14 – (1.2 Sd)	7,100	11.0	7,100 – (25 Sd)	11.0 – Sd
400	16.0	12,000	18.5	12,000 – (30 Sd)	18.5 – (1.2 Sd)	9,400	14.5	9,400 – (25 Sd)	14.5 – Sd
450	18.0	13,500	21.0	13,500 – (30 Sd)	21 – (1.2 Sd)	10,600	16.5	10,600 – (25 Sd)	16.5 – Sd
500	20.0	15,000	23.5	15,000 – (30 Sd)	23.5 – (1.2 Sd)	11,800	18.5	11,800 – (25 Sd)	18.5 – Sd
600	24.0	18,000	28.0	18,000 – (30 Sd)	28 – (1.2 Sd)	14,200	22.0	14,200 – (25 Sd)	22.0 – Sd

Inside Width of Cable Tray		Maximum Allowable Fill Area for Multiconductor Cables							
		Ladder or Ventilated Trough or Wire Mesh Cable Trays, 392.22(A)(1)				Solid Bottom Cable Trays, 392.22(A)(3)			
		Column 1 Applicable for 392.22(A)(1)(b) Only		Column 2[a] Applicable for 392.22(A)(1)(c) Only		Column 3 Applicable for 392.22(A)(3)(b) Only		Column 4[a] Applicable for 392.22(A)(3)(c) Only	
mm	in.	mm^2	$in.^2$	mm^2	$in.^2$	mm^2	$in.^2$	mm^2	$in.^2$
750	30.0	22,500	35.0	22,500 – (30 Sd)	35 – (1.2 Sd)	17,700	27.5	17,700 – (25 Sd)	27.5 – Sd
900	36.0	27,000	42.0	27,000 – (30 Sd)	42 – (1.2 Sd)	21,300	33.0	21,300 – (25 Sd)	33.0 – Sd

[a]The maximum allowable fill areas in Columns 2 and 4 shall be calculated. For example, the maximum allowable fill in mm^2 for a 150-mm wide cable tray in Column 2 shall be 4500 minus (30 multiplied by Sd) [the maximum allowable fill, in square inches, for a 6-in. wide cable tray in Column 2 shall be 7 minus (1.2 multiplied by Sd)].

[b]The term *Sd* in Columns 2 and 4 is equal to the sum of the diameters, in mm, of all cables 107.2 mm (in inches, of all 4/0 AWG) and larger multiconductor cables in the same cable tray with smaller cables.

(2) Ladder or Ventilated Trough Cable Trays Containing Multiconductor Control and/or Signal Cables Only.

Where a ladder or ventilated trough cable tray having a usable inside depth of 150 mm (6 in.) or less contains multiconductor control and/or signal cables only, the sum of the cross-sectional areas of all cables at any cross section shall not exceed 50 percent of the interior cross-sectional area of the cable tray. A depth of 150 mm (6 in.) shall be used to calculate the allowable interior cross-sectional area of any cable tray that has a usable inside depth of more than 150 mm (6 in.).

(3) Solid Bottom Cable Trays Containing Any Mixture of Cables.

Where solid bottom cable trays contain multiconductor power or lighting cables, or any mixture of multiconductor power, lighting, control, and signal cables, the maximum number of cables shall conform to 392.22(A)(3)(a) through (A)(3)(c).

(a) Where all of the cables are 4/0 AWG or larger, the sum of the diameters of all cables shall not exceed 90 percent of the cable tray width, and the cables shall be installed in a single layer.

(b) Where all of the cables are smaller than 4/0 AWG, the sum of the cross-sectional areas of all cables shall not exceed the maximum allowable cable fill area in Column 3 of Table 392.22(A)(1) for the appropriate cable tray width.

(c) Where 4/0 AWG or larger cables are installed in the same cable tray with cables smaller than 4/0 AWG, the sum of the cross-sectional areas of all cables smaller than 4/0 AWG shall not exceed the maximum allowable fill area resulting from the computation in Column 4 of Table 392.22(A)(1) for the appropriate cable tray width. The 4/0 AWG and larger cables shall be installed in a single layer, and no other cables shall be placed on them.

(4) Solid Bottom Cable Tray Containing Multiconductor Control and/or Signal Cables Only.

Where a solid bottom cable tray having a usable inside depth of 150 mm (6 in.) or less contains multiconductor control and/or signal cables only, the sum of the cross sectional areas of all cables at any cross section shall not exceed 40 percent of the interior cross-sectional area of the cable tray. A depth of 150 mm (6 in.) shall be used to calculate the allowable interior cross-sectional area of any cable tray that has a usable inside depth of more than 150 mm (6 in.).

(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

(6) Solid Channel Cable Trays Containing Multiconductor Cables of Any Type.

Where solid channel cable trays contain multiconductor cables of any type, 392.22(A)(6)(a) and (A)(6)(b) shall apply.

(a) Where only one multiconductor cable is installed, the cross-sectional area of the cable shall not exceed the value specified in Column 1 of Table 392.22(A)(6).

(b) Where more than one multiconductor cable is installed, the sum of the cross-sectional area of all cable shall not exceed the value specified in Column 2 of Table 392.22(A)(6).

Table 392.22(A)(6) Allowable Cable Fill Area for Multiconductor Cables in Solid Channel Cable Trays for Cables Rated 2000 Volts or Less

Inside Width of Cable Tray		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	1300	2.0	700	1.1
100	4	2400	3.7	1400	2.1
150	6	3600	5.5	2100	3.2

(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 copper conductors.

(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.

(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.

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)
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.

(C) Number of Type MV and Type MC Cables (2001 Volts or Over) in Cable Trays.

The number of cables rated 2001 volts or over permitted in a single cable tray shall not exceed the requirements of this section.

The sum of the diameters of single-conductor and multiconductor cables shall not exceed the cable tray width, and the cables shall be installed in a single layer. Where single conductor cables are triplexed, quadruplexed, or bound together in circuit groups, the sum of the diameters of the single conductors shall not exceed the cable tray width, and these groups shall be installed in single layer arrangement.

392.30 Securing and Supporting.

(A) Cable Trays.

Cable trays shall be supported at intervals in accordance with the installation instructions.

(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.

392.44 Expansion Splice Plates.

Expansion splice plates for cable trays shall be provided where necessary to compensate for thermal expansion and contraction.

392.46 Bushed Conduit and Tubing.

A box shall not be required where cables or conductors are installed in bushed conduit and tubing used for support or for protection against physical damage or where conductors or cables transition to a raceway wiring method from the cable tray. Conductors shall be permitted to enter equipment in accordance with 392.46(A) or (B).

(A) Through Bushed Conduit or Tubing.

Individual conductors or multiconductor cables with entirely nonmetallic sheaths shall be permitted to enter enclosures where they are terminated through nonflexible bushed conduit or tubing installed for their protection provided they are secured at the point of transition from the cable tray and the conduit or tubing is sealed at the outer end using an approved means so as to prevent debris from entering the equipment through the conduit or tubing.

(B) Flanged Connections.

Individual conductors or multiconductor cables with entirely nonmetallic sheaths shall be permitted to enter enclosures through openings associated with flanges from cable trays where the cable tray is attached to the flange and the flange is mounted directly to the equipment. The openings shall be made such that the conductors are protected from abrasion and the opening shall be sealed or covered to prevent debris from entering the enclosure through the opening.

Informational Note: One method of preventing debris from entering the enclosure is to seal the outer end of the raceway or the opening with duct seal.

392.56 Cable Splices and Type MV Cable Joints.

Cable splices and Type MV cable joints made and insulated by approved methods shall be permitted to be located within a cable tray, provided they are accessible. Splices and Type MV cable joints shall be permitted to project above the side rails where not subject to physical damage.

392.60 Grounding and Bonding.

(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 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.

(B) Steel or Aluminum Cable Tray Systems.

Steel or aluminum cable tray systems shall be permitted to be used as equipment grounding conductors, provided all the following requirements are met:

(1) The cable tray sections and fittings are identified as an equipment grounding conductor.

(2) The minimum cross-sectional area of cable trays conform to the requirements in Table 392.60(B).

(3) All cable tray sections and fittings are legibly and durably marked to show the cross-sectional area of metal in channel cable trays, or cable trays of one-piece construction, and the total cross-sectional area of both side rails for ladder or trough cable trays.

(4) Cable tray sections, fittings, and connected raceways are bonded in accordance with 250.96, using bolted mechanical connectors or bonding jumpers sized and installed in accordance with 250.102.

Table 392.60(B) Metal Area Requirements for Cable Trays Used as Equipment Grounding Conductor

Maximum Fuse Ampere Rating, Circuit Breaker Ampere Trip Setting, or Circuit Breaker Protective Relay Ampere Trip Setting for Ground-Fault Protection of Any Cable Circuit in the Cable Tray System	Minimum Cross-Sectional Area of Metal*			
	Steel Cable Trays		Aluminum Cable Trays	
	mm^2	$in.^2$	mm^2	$in.^2$
60	129	0.20	129	0.20
100	258	0.40	129	0.20
200	451.5	0.70	129	0.20
400	645	1.00	258	0.40
600	967.5	1.50†	258	0.40
1000	—	—	387	0.60
1200	—	—	645	1.00
1600	—	—	967.5	1.50
2000	—	—	1290	2.00†

*Total cross-sectional area of both side rails for ladder or trough cable trays; or the minimum cross-sectional area of metal in channel cable trays or cable trays of one-piece construction.

†Steel cable trays shall not be used as equipment grounding conductors for circuits with ground-fault protection above 600 amperes. Aluminum cable trays shall not be used as equipment grounding conductors for circuits with ground-fault protection above 2000 amperes.

(C) Transitions.

Where metal cable tray systems are mechanically discontinuous, as permitted in 392.18(A), a bonding jumper sized in accordance with 250.102 shall connect the two sections of the cable tray, or the cable tray and the raceway or equipment. Bonding shall be in accordance with 250.96.

392.80 Ampacity of Conductors.

(A) Ampacity of Cables, Rated 2000 Volts or Less, in Cable Trays.

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

(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 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).

(2) Single-Conductor Cables.

The ampacity of single-conductor cables shall be as permitted by 310.14(A)(2). The adjustment factors of 310.15(C)(1) shall not apply to the ampacity of cables in cable trays. The ampacity of single-conductor cables, or single conductors cabled together (triplexed, quadruplexed, and so forth), nominally rated 2000 volts or less, shall comply with 392.80(A)(2)(a) through (A)(2)(d).

(a) Where installed according to the requirements of 392.22(B), the ampacities for 600 kcmil and larger single-conductor cables in uncovered cable trays shall not exceed 75 percent of the ampacities in Table 310.17 and Table 310.19. Where cable trays are continuously covered for more than 1.8 m (6 ft) with solid unventilated covers, the ampacities for 600 kcmil and larger cables shall not exceed 70 percent of the ampacities in Table 310.17 and Table 310.19.

(b) Where installed according to the requirements of 392.22(B), the ampacities for 1/0 AWG through 500 kcmil single-conductor cables in uncovered cable trays shall not exceed 65 percent of the ampacities in Table 310.17 and Table 310.19. Where cable trays are continuously covered for more than 1.8 m (6 ft) with solid unventilated covers, the ampacities for 1/0 AWG through 500 kcmil cables shall not exceed 60 percent of the ampacities in Table 310.17 and Table 310.19.

(c) Where single conductors are installed in a single layer in uncovered cable trays, with a maintained space of not less than one cable diameter between individual conductors, the ampacity of 1/0 AWG and larger cables shall not exceed the ampacities in Table 310.17 and Table 310.19.

Exception to (c): For solid bottom cable trays, the ampacity of single conductor cables shall be determined by 310.14(B).

(d) Where single conductors are installed in a triangular or square configuration in uncovered cable trays, with a maintained free airspace of not less than 2.15 times one conductor diameter (2.15 × O.D.) of the largest conductor contained within the configuration and adjacent conductor configurations or cables, the ampacity of 1/0 AWG and larger cables shall not exceed the ampacities of two or three single insulated conductors rated 0 through 2000 volts supported on a messenger in accordance with 310.15.

Informational Note: See Table 310.20.

(3) Combinations of Multiconductor and Single-Conductor Cables.

Where a cable tray contains a combination of multiconductor and single-conductor cables, the ampacities shall be as given in 392.80(A)(1) for multiconductor cables and 392.80(A)(2) for single-conductor cables, provided that the following conditions apply:

(1) The sum of the multiconductor cable fill area as a percentage of the allowable fill area for the tray calculated in accordance with 392.22(A), and the single-conductor cable fill area as a percentage of the allowable fill area for the tray calculated in accordance with 392.22(B), totals not more than 100 percent.

(2) Multiconductor cables are installed according to 392.22(A), and single-conductor cables are installed according to 392.22(B) and 392.22(C).

(B) Ampacity of Type MV and Type MC Cables (2001 Volts or Over) in Cable Trays.

The ampacity of cables, rated 2001 volts, nominal, or over, installed according to 392.22(C) shall not exceed the requirements of this section.

Informational Note: See 110.40 for conductor temperature limitations due to termination provisions.

(1) Multiconductor Cables (2001 Volts or Over).

The ampacity of multiconductor cables shall be as given in Table 315.60(C)(9) and Table 315.60(C)(10), subject to the following:

(1) Where cable trays are continuously covered for more than 1.8 m (6 ft) with solid unventilated covers, not more than 95 percent of the ampacities of Table 315.60(C)(9) and Table 315.60(C)(10) shall be permitted for multiconductor cables.

(2) Where multiconductor cables are installed in a single layer in uncovered cable trays, with maintained spacing of not less than one cable diameter between cables, the ampacity shall not exceed the allowable ampacities of Table 315.60(C)(5) and Table 315.60(C)(6).

(2) Single-Conductor Cables (2001 Volts or Over).

The ampacity of single-conductor cables, or single conductors cabled together (triplexed, quadruplexed, and so forth), shall comply with the following:

(1) The ampacities for 1/0 AWG and larger single-conductor cables in uncovered cable trays shall not exceed 75 percent of the ampacities in Table 315.60(C)(3) and Table 315.60(C)(4). Where the cable trays are covered for more than 1.8 m (6 ft) with solid unventilated covers, the ampacities for 1/0 AWG and larger single-conductor cables shall not exceed 70 percent of the ampacities in Table 315.60(C)(3) and Table 315.60(C)(4).

(2) Where single-conductor cables are installed in a single layer in uncovered cable trays, with a maintained space of not less than one cable diameter between individual conductors, the ampacity of 1/0 AWG and larger cables shall not exceed the ampacities in Table 315.60(C)(3) and Table 315.60(C)(4).

(3) Where single conductors are installed in a triangular or square configuration in uncovered cable trays, with a maintained free air space of not less than 2.15 times the diameter (2.15 × O.D.) of the largest conductor contained within the configuration and adjacent conductor configurations or cables, the ampacity of 1/0 AWG and larger cables shall not exceed the ampacities in Table 315.60(C)(1) and Table 315.60(C)(2).

Part III. Construction Specifications

392.100 Construction.

(A) Strength and Rigidity.

Cable trays shall have suitable strength and rigidity to provide adequate support for all contained wiring.

(B) Smooth Edges.

Cable trays shall not have sharp edges, burrs, or projections that could damage the insulation or jackets of the wiring.

(C) Corrosion Protection.

Cable tray systems shall be corrosion resistant. If made of ferrous material, the system shall be protected from corrosion as required by 300.6.

(D) Side Rails.

Cable trays shall have side rails or equivalent structural members.

(E) Fittings.

Cable trays shall include fittings or other suitable means for changes in direction and elevation of runs.

(F) Nonmetallic Cable Tray.

Nonmetallic cable trays shall be made of flame-retardant material.

Statement of Problem and Substantiation for Public Comment

I have not provided a proposed text revision as this comment is more general. All throughout previous sections of this first draft of the NEC, there has been an effort to use "shall be in accordance with the following" (which might be more user friendly) instead of, for example, 392.22A1 saying that something shall be in accordance with 392.22(A)(1)(a) through (A)(1)(c). However, this draft of article 392 has some sections where "the following' is proposed to be replaced with a list of subsections, and others where a list of subsections is proposed to be replaced with "the following."

It would seem we should strive for consistency throughout the NEC, or at least throughout a given article. If we can't have consistency, there would seem to be reason to swap the 2 forms of text around in article 392.

Related Item

• Public Input No. 1115-NFPA 70-2020 [Section No. 392.22(A)(1)]

Submitter Information Verification

Submitter Full Name: Josh Weaver
Organization: [Not Specified]
Street Address:
City:
State:
Zip:
Submittal Date: Sat Aug 07 13:34:29 EDT 2021
Committee: NEC-P08

Committee Statement

Committee Action: Rejected
Resolution: Proposed text was not submitted and is required by the Regulations Governing the Development of NFPA Standards Section 4.3.4.1(c).

Public Comment No. 908-NFPA 70-2021 [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: Type EMT	358
Electrical nonmetallic tubing: Type ENT	362
Fire alarm cables	722 and 760
Flexible metal conduit: Type FMC	348
Flexible metallic tubing: Type FMT	360
Instrumentation tray cable: Type ITC	~~727~~ 341
Intermediate metal conduit: Type IMC	342
Liquidtight flexible metal conduit: Type LFMC	350
Liquidtight flexible nonmetallic conduit: Type 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	722 and 725
Rigid metal conduit: Type RMC	344
Rigid polyvinyl chloride conduit: Type PVC	352
Reinforced thermosetting resin conduit: Type 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 Comment

Instrumentation tray cables were relocated to Article 341. Requirements for cables in Chapter 7 have been consolidated in Article 722. The relevant article for the appropriate wiring method shall be referenced.

Related Item

• FR 9581 • FR 9582

Submitter Information Verification

Submitter Full Name: Susan Stene
Organization: UL LLC
Street Address:
City:
State:
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Submittal Date: Wed Aug 04 16:56:17 EDT 2021
Committee: NEC-P08

Committee Statement

Committee Action: Rejected but see related SR

Resolution: SR-8180-NFPA 70-2021

Statement: References to Article 722 were added to Table 392.10(A) as an acceptable wiring method to be installed in Cable Tray. Instrumentation tray cables were relocated to Article 341from 727.

“Type” has been removed from the new definitions found in Article 100 for conduit and tubings. The reference to “Type” has been removed for the article in the purview of CMP-8.

Public Comment No. 2205-NFPA 70-2021 [Section No. C.8]

C.8

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)	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)
CONDUCTORS														
RHH, RHW, RHW-2	14	—	4	8	13	22	30	49	70	108	144	186	—	—
	12	—	4	6	11	18	25	41	58	89	120	154	—	—
	10	—	3	5	8	15	20	33	47	72	97	124	—	—
	8	—	1	3	4	8	10	17	24	38	50	65	—	—
	6	—	1	1	3	6	8	14	19	30	40	52	—	—
	4	—	1	1	3	5	6	11	15	23	31	41	—	—
	3	—	1	1	2	4	6	9	13	21	28	36	—	—
	2	—	1	1	1	3	5	8	11	18	24	31	—	—
	1	—	0	1	1	2	3	5	7	12	16	20	—	—
	1/0	—	0	1	1	1	3	4	6	10	14	18	—	—
	2/0	—	0	1	1	1	2	4	6	9	12	15	—	—
	3/0	—	0	0	1	1	1	3	5	7	10	13	—	—
	4/0	—	0	0	1	1	1	3	4	6	9	11	—	—
	250	—	0	0	1	1	1	1	3	5	6	8	—	—
	300	—	0	0	0	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	0	1	1	1	3	3	—	—
	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	1	—	—
	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	—	10	17	27	47	64	104	147	228	304	392	—	—
	12	—	7	13	21	36	49	80	113	175	234	301	—	—
	10	—	5	9	15	27	36	59	84	130	174	224	—	—
	8	—	3	5	8	15	20	33	47	72	97	124	—	—
RHH*, RHW*, RHW-2*	14	—	6	11	18	31	42	69	98	151	202	261	—	—
	12	—	5	9	14	25	34	56	79	122	163	209	—	—
	10	—	4	7	11	19	26	43	61	95	127	163	—	—

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	12	16	26	37	57	76	98	—	—
TW, THW, THHW, THW-2, RHH*, RHW*, RHW-2*	6	—	1	3	5	9	12	20	28	43	58	75	—	—
	4	—	1	2	4	6	9	15	21	32	43	56	—	—
	3	—	1	1	3	6	8	13	18	28	37	48	—	—
	2	—	1	1	3	5	6	11	15	23	31	41	—	—
	1	—	1	1	1	3	4	7	11	16	22	28	—	—
	1/0	—	1	1	1	3	4	6	9	14	19	24	—	—
	2/0	—	0	1	1	2	3	5	8	12	16	20	—	—
	3/0	—	0	1	1	1	3	4	6	10	13	17	—	—
	4/0	—	0	1	1	1	2	4	5	8	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	0	1	1	1	3	4	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	0	1	1	1	3	4	5	—	—
	750	—	0	0	0	0	1	1	1	2	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	0	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	—	14	24	39	68	91	149	211	326	436	562	—	—
	12	—	10	17	29	49	67	109	154	238	318	410	—	—
	10	—	6	11	18	31	42	69	97	150	200	258	—	—
	8	—	3	6	10	18	24	39	56	86	115	149	—	—
	6	—	2	4	7	13	17	28	40	62	83	107	—	—
	4	—	1	3	4	8	11	17	25	38	51	66	—	—
	3	—	1	2	4	6	9	15	21	32	43	56	—	—
	2	—	1	1	3	5	7	12	17	27	36	47	—	—
	1	—	1	1	2	4	5	9	13	20	27	35	—	—
	1/0	—	1	1	1	3	4	8	11	17	23	29	—	—
	2/0	—	1	1	1	3	4	6	9	14	19	24	—	—
	3/0	—	0	1	1	2	3	5	7	12	16	20	—	—
	4/0	—	0	1	1	1	2	4	6	9	13	17	—	—
	250	—	0	0	1	1	1	3	5	8	10	13	—	—
	300	—	0	0	1	1	1	3	4	7	9	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)
	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	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	0	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	—	13	23	38	66	89	145	205	317	423	545	—	—
	12	—	10	17	28	48	65	106	150	231	309	398	—	—
	10	—	7	12	20	34	46	76	107	166	221	285	—	—
	8	—	4	7	11	19	26	43	61	95	127	163	—	—
	6	—	3	5	8	14	19	31	44	67	90	116	—	—
	4	—	1	3	5	10	13	21	30	47	63	81	—	—
	3	—	1	3	4	8	11	18	25	39	52	68	—	—
	2	—	1	2	4	6	9	15	21	32	43	56	—	—
PFA, PFAH, TFE	1	—	1	1	2	4	6	10	14	22	30	39	—	—
PFA, PFAH, TFE, Z	1/0	—	1	1	1	4	5	8	12	19	25	32	—	—
	2/0	—	1	1	1	3	4	7	10	15	21	27	—	—
	3/0	—	0	1	1	2	3	6	8	13	17	22	—	—
	4/0	—	0	1	1	1	3	5	7	10	14	18	—	—
Z	14	—	16	28	46	79	107	175	247	381	510	657	—	—
	12	—	11	20	32	56	76	124	175	271	362	466	—	—
	10	—	7	12	20	34	46	76	107	166	221	285	—	—
	8	—	4	7	12	22	29	48	68	105	140	180	—	—
	6	—	3	5	9	15	20	33	47	73	98	127	—	—
	4	—	1	3	6	10	14	23	33	50	67	87	—	—
	3	—	1	2	4	7	10	17	24	37	49	63	—	—
	2	—	1	1	3	6	8	14	20	30	41	53	—	—
	1	—	1	1	3	5	7	11	16	25	33	43	—	—
XHHW, ZW, XHHW-2, XHH	14	—	10	17	27	47	64	104	147	228	304	392	—	—
	12	—	7	13	21	36	49	80	113	175	234	301	—	—
	10	—	5	9	15	27	36	59	84	130	174	224	—	—
	8	—	3	5	8	15	20	33	47	72	97	124	—	—
	6	—	1	4	6	11	15	24	35	53	71	92	—	—
	4	—	1	3	4	8	11	18	25	39	52	67	—	—
	3	—	1	2	4	7	9	15	21	33	44	56	—	—
	2	—	1	1	3	5	7	12	18	27	37	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)
XHHW, XHHW-2, XHH	1	—	1	1	2	4	6	9	13	20	27	35	—	—
	1/0	—	1	1	1	3	5	8	11	17	23	30	—	—
	2/0	—	1	1	1	3	4	6	9	14	19	25	—	—
	3/0	—	0	1	1	2	3	5	7	12	16	20	—	—
	4/0	—	0	1	1	1	2	4	6	10	13	17	—	—
	250	—	0	0	1	1	1	3	5	8	11	14	—	—
	300	—	0	0	1	1	1	3	4	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	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	—	—
	800	—	0	0	0	0	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	—	9	16	26	45	61	100	141	218	292	376	—	—
	16	—	8	13	22	38	51	84	119	184	246	317	—	—
SF-2, SFF-2	18	—	12	20	33	57	77	126	178	275	368	474	—	—
	16	—	10	17	27	47	64	104	147	228	304	392	—	—
	14	—	8	13	22	38	51	84	119	184	246	317	—	—
SF-1, SFF-1	18	—	21	36	59	101	137	223	316	487	651	839	—	—
RFH-1, TF, TFF, XF, XFF	18	—	15	26	43	75	101	165	233	360	481	619	—	—
	16	—	12	21	35	60	81	133	188	290	388	500	—	—
XF, XFF	14	—	10	17	27	47	64	104	147	228	304	392	—	—
TFN, TFFN	18	—	25	42	69	119	162	264	373	576	769	991	—	—
	16	—	19	32	53	91	123	201	285	440	588	757	—	—
PF, PFF, PGF, PGFF, PAF, PTF, PTFF, PAFF	18	—	23	40	66	113	153	250	354	546	730	940	—	—
	16	—	18	31	51	88	118	193	274	422	564	727	—	—
	14	—	13	23	38	66	89	145	205	317	423	545	—	—

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)
ZF, ZFF, ZHF	18	—	30	52	85	146	197	322	456	704	941	1211	—	—
	16	—	22	38	63	108	146	238	336	519	694	894	—	—
	14	—	16	28	46	79	107	175	247	381	510	657	—	—
KF-2, KFF-2	18	—	45	78	128	219	296	484	684	1056	1411	1817	—	—
	16	—	32	54	89	153	207	337	477	737	984	1268	—	—
	14	—	21	36	60	103	139	227	321	495	661	852	—	—
	12	—	15	25	41	71	96	158	223	344	460	592	—	—
	10	—	10	17	27	47	64	104	147	228	304	392	—	—
KF-1, KFF-1	18	—	52	90	147	253	342	558	790	1218	1628	2097	—	—
	16	—	37	63	103	178	240	392	555	856	1144	1473	—	—
	14	—	25	42	69	119	162	264	373	576	769	991	—	—
	12	—	16	28	46	79	107	175	247	381	510	657	—	—
	10	—	10	18	30	52	70	114	161	249	333	429	—	—
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.

Additional Proposed Changes

File Name	Description	Approved
Fill_table_IMC_Annex_C.xlsx	Fill table annex C on sheet 1	

Statement of Problem and Substantiation for Public Comment

Updated Fill table to include trade size 5 and six. I included the information in Terra but it did not seem to take so i attached the spreadsheet I was using to do the calculations. Use sheet 1.

Related Public Comments for This Document

Related Comment	Relationship
Public Comment No. 1209-NFPA 70-2021 [Section No. 342.20(B)]	

Related Item

- Related to First revision adding sizez 5 and 6 to EMT

Submitter Information Verification

Submitter Full Name: Raymond Horner
Organization: Atkore International
Street Address:
City:
State:
Zip:
Submittal Date: Thu Aug 19 16:40:43 EDT 2021
Committee: NEC-P08

Committee Statement

Committee Action: Rejected but see related SR
Resolution: SR-8190-NFPA 70-2021
Statement: Table C.8 was revised to include trade size 5 and 6 for IMC. Table C.9 will need to be revised in a future edition of the NEC.

RHH, RHW, RHW-2	14	—	4	8	13	22	30	49	70	108
	12	—	4	6	11	18	25	41	58	89
	10	—	3	5	8	15	20	33	47	72
	8	—	1	3	4	8	10	17	24	38
	6	—	1	1	3	6	8	14	19	30
	4	—	1	1	3	5	6	11	15	23
	3	—	1	1	2	4	6	9	13	21
	2	—	1	1	1	3	5	8	11	18
	1	—	0	1	1	2	3	5	7	12
	1/0	—	0	1	1	1	3	4	6	10
	2/0	—	0	1	1	1	2	4	6	9
	3/0	—	0	0	1	1	1	3	5	7
	4/0	—	0	0	1	1	1	3	4	6
	250	—	0	0	1	1	1	1	3	5
	300	—	0	0	0	1	1	1	3	4
	350	—	0	0	0	1	1	1	2	4
	400	—	0	0	0	1	1	1	2	3
	500	—	0	0	0	1	1	1	1	3
	600	—	0	0	0	0	1	1	1	2
	700	—	0	0	0	0	1	1	1	2
	750	—	0	0	0	0	1	1	1	1
	800	—	0	0	0	0	0	1	1	1
	900	—	0	0	0	0	0	1	1	1
	1000	—	0	0	0	0	0	1	1	1
	1250	—	0	0	0	0	0	1	1	1
	1500	—	0	0	0	0	0	0	1	1
	1750	—	0	0	0	0	0	0	1	1
	2000	—	0	0	0	0	0	0	1	1
	14	—	10	17	27	47	64	104	147	228

TW, THHW, THW, THW-2	12	—	7	13	21	36	49	80	113	175
	10	—	5	9	15	27	36	59	84	130
	8	—	3	5	8	15	20	33	47	72
RHH*, RHW*, RHW-2*	14	—	6	11	18	31	42	69	98	151
	12	—	5	9	14	25	34	56	79	122
	10	—	4	7	11	19	26	43	61	95
	8	—	2	4	7	12	16	26	37	57
TW, THW, THHW, THW-2, RHH*, RHW*, RHW-2*	6	—	1	3	5	9	12	20	28	43
	4	—	1	2	4	6	9	15	21	32
	3	—	1	1	3	6	8	13	18	28
	2	—	1	1	3	5	6	11	15	23
	1	—	1	1	1	3	4	7	11	16
	1/0	—	1	1	1	3	4	6	9	14
	2/0	—	0	1	1	2	3	5	8	12
	3/0	—	0	1	1	1	3	4	6	10
	4/0	—	0	1	1	1	2	4	5	8
	250	—	0	0	1	1	1	3	4	7
	300	—	0	0	1	1	1	2	4	6
	350	—	0	0	1	1	1	2	3	5
	400	—	0	0	0	1	1	1	3	4
	500	—	0	0	0	1	1	1	2	4
	600	—	0	0	0	1	1	1	1	3
	700	—	0	0	0	0	1	1	1	3
	750	—	0	0	0	0	1	1	1	2
	800	—	0	0	0	0	1	1	1	2
	900	—	0	0	0	0	1	1	1	2
	1000	—	0	0	0	0	0	1	1	1
	1250	—	0	0	0	0	0	1	1	1
	1500	—	0	0	0	0	0	1	1	1
	1750	—	0	0	0	0	0	0	1	1
	2000	—	0	0	0	0	0	0	1	1

THHN, THWN, THWN-2	14	—	14	24	39	68	91	149	211	326
	12	—	10	17	29	49	67	109	154	238
	10	—	6	11	18	31	42	69	97	150
	8	—	3	6	10	18	24	39	56	86
	6	—	2	4	7	13	17	28	40	62
	4	—	1	3	4	8	11	17	25	38
	3	—	1	2	4	6	9	15	21	32
	2	—	1	1	3	5	7	12	17	27
	1	—	1	1	2	4	5	9	13	20
	1/0	—	1	1	1	3	4	8	11	17
	2/0	—	1	1	1	3	4	6	9	14
	3/0	—	0	1	1	2	3	5	7	12
	4/0	—	0	1	1	1	2	4	6	9
	250	—	0	0	1	1	1	3	5	8
	300	—	0	0	1	1	1	3	4	7
	350	—	0	0	1	1	1	2	4	6
	400	—	0	0	1	1	1	2	3	5
	500	—	0	0	0	1	1	1	3	4
	600	—	0	0	0	1	1	1	2	3
	700	—	0	0	0	1	1	1	1	3
	750	—	0	0	0	1	1	1	1	3
	800	—	0	0	0	0	1	1	1	3
	900	—	0	0	0	0	1	1	1	2
	1000	—	0	0	0	0	1	1	1	2
FEP, FEPB, PFA, PFAH, TFE	14	—	13	23	38	66	89	145	205	317
	12	—	10	17	28	48	65	106	150	231
	10	—	7	12	20	34	46	76	107	166
	8	—	4	7	11	19	26	43	61	95
	6	—	3	5	8	14	19	31	44	67
	4	—	1	3	5	10	13	21	30	47
	3	—	1	3	4	8	11	18	25	39
	2	—	1	2	4	6	9	15	21	32

PFA, PFAH, TFE	1	—	1	1	2	4	6	10	14	22
PFA, PFAH, TFE, Z	1/0	—	1	1	1	4	5	8	12	19
	2/0	—	1	1	1	3	4	7	10	15
	3/0	—	0	1	1	2	3	6	8	13
	4/0	—	0	1	1	1	3	5	7	10
Z	14	—	16	28	46	79	107	175	247	381
	12	—	11	20	32	56	76	124	175	271
	10	—	7	12	20	34	46	76	107	166
	8	—	4	7	12	22	29	48	68	105
	6	—	3	5	9	15	20	33	47	73
	4	—	1	3	6	10	14	23	33	50
	3	—	1	2	4	7	10	17	24	37
	2	—	1	1	3	6	8	14	20	30
	1	—	1	1	3	5	7	11	16	25
XHHW, ZW, XHHW-2, XHH	14	—	10	17	27	47	64	104	147	228
	12	—	7	13	21	36	49	80	113	175
	10	—	5	9	15	27	36	59	84	130
	8	—	3	5	8	15	20	33	47	72
	6	—	1	4	6	11	15	24	35	53
	4	—	1	3	4	8	11	18	25	39
	3	—	1	2	4	7	9	15	21	33
	2	—	1	1	3	5	7	12	18	27
XHHW, XHHW-2, XHH	1	—	1	1	2	4	6	9	13	20
	1/0	—	1	1	1	3	5	8	11	17
	2/0	—	1	1	1	3	4	6	9	14
	3/0	—	0	1	1	2	3	5	7	12
	4/0	—	0	1	1	1	2	4	6	10
	250	—	0	0	1	1	1	3	5	8
	300	—	0	0	1	1	1	3	4	7
	350	—	0	0	1	1	1	3	4	6
	400	—	0	0	1	1	1	2	3	5
	500	—	0	0	0	1	1	1	3	4
	600	—	0	0	0	1	1	1	2	3

	700	—	0	0	0	1	1	1	1	3
	750	—	0	0	0	1	1	1	1	3
	800	—	0	0	0	0	1	1	1	3
	900	—	0	0	0	0	1	1	1	2
	1000	—	0	0	0	0	1	1	1	2
	1250	—	0	0	0	0	0	1	1	1
	1500	—	0	0	0	0	0	1	1	1
	1750	—	0	0	0	0	0	1	1	1
	2000	—	0	0	0	0	0	0	1	1
FIXTURE WIRES										
RFH-2, FFH-2, RFHH-2	18	—	9	16	26	45	61	100	141	218
	16	—	8	13	22	38	51	84	119	184
SF-2, SFF-2	18	—	12	20	33	57	77	126	178	275
	16	—	10	17	27	47	64	104	147	228
	14	—	8	13	22	38	51	84	119	184
SF-1, SFF-1	18	—	21	36	59	101	137	223	316	487
RFH-1, TF, TFF, XF, XFF	18	—	15	26	43	75	101	165	233	360
	16	—	12	21	35	60	81	133	188	290
XF, XFF	14	—	10	17	27	47	64	104	147	228
TFN, TFFN	18	—	25	42	69	119	162	264	373	576
	16	—	19	32	53	91	123	201	285	440
PF, PFF, PGF, PGFF, PAF, PTF, PTFF, PAFF	18	—	23	40	66	113	153	250	354	546
	16	—	18	31	51	88	118	193	274	422
	14	—	13	23	38	66	89	145	205	317
ZF, ZFF, ZHF	18	—	30	52	85	146	197	322	456	704
	16	—	22	38	63	108	146	238	336	519
	14	—	16	28	46	79	107	175	247	381
KF-2, KFF-2	18	—	45	78	128	219	296	484	684	1056

	16	—	32	54	89	153	207	337	477	737
	14	—	21	36	60	103	139	227	321	495
	12	—	15	25	41	71	96	158	223	344
	10	—	10	17	27	47	64	104	147	228
KF-1, KFF-1	18	—	52	90	147	253	342	558	790	1218
	16	—	37	63	103	178	240	392	555	856
	14	—	25	42	69	119	162	264	373	576
	12	—	16	28	46	79	107	175	247	381
	10	—	10	18	30	52	70	114	161	249
XF, XFF	12	—	5	9	14	25	34	56	79	122
	10	—	4	7	11	19	26	43	61	95

144	186	291	419
120	154	241	348
97	124	195	281
50	65	102	147
40	52	81	118
31	41	63	92
28	36	56	80
24	31	48	70
16	20	32	46
14	18	28	40
12	15	24	35
10	13	20	30
9	11	17	25
6	8	13	19
6	7	12	17
5	7	10	15
5	6	9	14
4	5	8	12
3	4	7	10
3	4	6	9
3	4	5	8
3	3	5	8
2	3	5	7
2	3	4	6
1	1	3	5
1	1	3	4
1	1	2	4
1	1	2	3
304	392	613	885

234	301	471	679
174	224	350	506
97	124	195	281
202	261	408	588
163	209	328	473
127	163	256	369
76	98	153	221
58	75	117	169
43	56	87	126
37	48	75	108
31	41	63	92
22	28	44	64
19	24	38	55
16	20	32	46
13	17	27	39
11	14	22	33
9	12	18	26
8	10	16	23
7	9	14	20
6	8	12	18
5	7	10	15
4	5	8	12
4	5	7	11
3	4	7	10
3	4	6	10
3	4	6	9
3	3	5	8
1	3	4	6
1	2	3	5
1	1	3	4
1	1	3	4

436	562	879	1268
318	410	641	925
200	258	404	583
115	149	233	336
83	107	168	242
51	66	103	149
43	56	87	126
36	47	73	106
27	35	54	78
23	29	45	66
19	24	38	55
16	20	31	45
13	17	26	38
10	13	21	30
9	12	18	26
8	10	16	23
7	9	14	20
6	7	12	17
5	6	9	14
4	5	8	12
4	5	8	11
4	5	7	11
3	4	6	9
3	4	6	9
423	545	852	1230
309	398	622	898
221	285	446	644
127	163	256	369
90	116	182	262
63	81	127	183
52	68	106	153
43	56	87	126

30	39	60	87
25	32	50	73
21	27	42	60
17	22	34	49
14	18	28	41
510	657	1027	1482
362	466	728	1051
221	285	446	644
140	180	282	407
98	127	198	286
67	87	136	196
49	63	99	143
41	53	82	119
33	43	67	96
304	392	613	885
234	301	471	679
174	224	350	506
97	124	195	281
71	92	144	208
52	67	104	151
44	56	88	127
37	47	74	107
27	35	55	80
23	30	46	67
19	25	38	56
16	20	32	46
13	17	26	38
11	14	21	31
9	12	18	27
8	10	16	23
7	9	14	21
6	8	12	17
5	6	9	14

4	5	8	12
4	5	8	11
4	5	7	11
3	4	6	9
3	4	6	9
2	3	4	7
1	2	4	6
1	2	3	5
1	1	3	4
292	376	588	848
246	317	495	715
368	474	741	1069
304	392	613	885
246	317	495	715
651	839	1312	1892
481	619	969	1398
388	500	782	1128
304	392	613	885
769	991	1550	2237
588	757	1184	1708
730	940	1470	2121
564	727	1137	1640
423	545	852	1230
941	1211	1895	2734
694	894	1398	2017
510	657	1027	1482
1411	1817	2842	4101

984	1268	1983	2861
661	852	1332	1922
460	592	926	1337
304	392	613	885
1628	2097	3280	4732
1144	1473	2304	3325
769	991	1550	2237
510	657	1027	1482
333	429	671	968
163	209	—	—
127	163	—	—

Public Comment No. 1210-NFPA 70-2021 [Section No. Table]

Table 4 Article 342

		Article 342 — Intermediate Metal Conduit (I								
Metric Designator	Trade Size	Over 2 Wires 40%		60%		1 Wire 53%				
		mm²	in.²	mm²	in.²	mm²	in.²			
12	⅜	—	—	—	—	—	—			
16	½	89	0.137	133	0.205	117	0.181			
21	¾	151	0.235	226	0.352	200	0.311			
27	1	248	0.384	372	0.575	329	0.508			
35	1¼	425	0.659	638	0.988	564	0.873			
41	1½	573	0.890	859	1.335	759	1.179			
53	2	937	1.452	1405	2.178	1241	1.924			
63	2½	1323	2.054	1985	3.081	1753	2.722			
78	3	2046	3.169	3069	4.753	2711	4.199			
91	3½	2729	4.234	4093	6.351	3616	5.610			
103	4	3490	5.452	5235	8.179	4624	7.224			
129	5	5455	8.528	8183	12.792	7229	11.30	4228	6.610	13
155	6	7878	12.304	11817	18.456	10439	16.302	6106	9.536	15

Statement of Problem and Substantiation for Public Comment

During the first draft Trade size 5 & 6 EMT were added to article 358. In doing this all the metal conduit articles allow for trade size 5 and 6 except for IMC. I am suggesting that IMC Trade sizes 5 & 6 be added to article 342 for consistency with articles 344 and 358. In doing so I am adding the trade sizes to this table.

Related Item

• FR-7593

Submitter Information Verification

Submitter Full Name: Raymond Horner
Organization: Atkore
Street Address:
City:
State:
Zip:
Submittal Date: Tue Aug 10 16:14:19 EDT 2021

Committee: NEC-P08

Committee Statement

Committee Action: Rejected but see related SR

Resolution: SR-8183-NFPA 70-2021

Statement: Table 4 Article 342 was revised to correlate with the trade sizes between IMC, RMC and EMT. It also correlates with the action taken on Public Comment 1209 for 342.20(B).