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M E M O R A N D U M

TO: Code-Making Panel 6

FROM: Sarah Caldwell, *Committee Administrator*

DATE: April 15, 2021

SUBJECT: NEC® First Draft Technical Committee FINAL Ballot Results (A22)

According to the final ballot results, all ballot items received the necessary affirmative votes to pass ballot.

14 Members Eligible to Vote
0 Members Not Returned

The attached report shows the number of affirmative, negative, and abstaining votes as well as the explanation of the vote for each revision.

To pass ballot, each revision requires: (1) a simple majority of those eligible to vote and (2) an affirmative vote of $\frac{2}{3}$ of ballots returned. See Sections 3.3.4.3.(c) and 4.3.10.1 of the *Regulations Governing the Development of NFPA Standards*.



First Revision No. 8304-NFPA 70-2021 [Global Input]

This FR moves all existing definitions under the purview of CMP-6 to Article 100 and revises these definitions for compliance with Section 2.2.2 of the NEC Style Manual. Additionally all definition sections (XXX.2) in the articles under the responsibility of CMP-6 are deleted.

See attached WORD document for relocated definitions.

Supplemental Information

<u>File Name</u>	<u>Description Approved</u>
NEC_CMP-6_Defs_to_100.1610061951459_2_.docx	For ballot

Submitter Information Verification

Committee: NEC-P06

Submittal Date: Mon Jan 04 07:54:07 EST 2021

Committee Statement

Committee Statement: All definitions have been moved to Article 100 to align with the Style Manual.

Response Message: FR-8304-NFPA 70-2021

[Public Input No. 3579-NFPA 70-2020 \[Section No. 382.2\]](#)

[Public Input No. 3595-NFPA 70-2020 \[Section No. 394.2\]](#)

[Public Input No. 3527-NFPA 70-2020 \[Section No. 322.2\]](#)

[Public Input No. 3599-NFPA 70-2020 \[Section No. 399.2\]](#)

[Public Input No. 3531-NFPA 70-2020 \[Section No. 330.2\]](#)

[Public Input No. 3529-NFPA 70-2020 \[Section No. 326.2\]](#)

[Public Input No. 3534-NFPA 70-2020 \[Section No. 334.2\]](#)

[Public Input No. 3539-NFPA 70-2020 \[Section No. 338.2\]](#)

[Public Input No. 3596-NFPA 70-2020 \[Section No. 396.2\]](#)

[Public Input No. 3524-NFPA 70-2020 \[Section No. 311.2\]](#)

[Public Input No. 3598-NFPA 70-2020 \[Section No. 398.2\]](#)

[Public Input No. 3537-NFPA 70-2020 \[Section No. 337.2\]](#)

[Public Input No. 3533-NFPA 70-2020 \[Section No. 332.2\]](#)

[Public Input No. 3536-NFPA 70-2020 \[Section No. 336.2\]](#)

[Public Input No. 3528-NFPA 70-2020 \[Section No. 324.2\]](#)

[Public Input No. 4312-NFPA 70-2020 \[Definition: Armored Cable, Type AC.\]](#)

[Public Input No. 3525-NFPA 70-2020 \[Section No. 320.2\]](#)

[Public Input No. 3540-NFPA 70-2020 \[Section No. 340.2\]](#)

Ballot Results

✔ This item has passed ballot

14 Eligible Voters

0 Not Returned

14 Affirmative All

0 Affirmative with Comments

0 Negative with Comments

0 Abstention

Affirmative All

Crisman, Todd

Cross, Joseph W.

Deacy, Brian

Earl, Timothy

Graser, Peter

Hunter, Christel K.

Kent, Gerald W.

Lamp, Kelly

Newman Searce, Susan

Nielsen, Dennis A.

Porcaro, Michael Thomas

Riedl, Kenneth

Stene, Susan L.

Watson, Dave

NEC_CMP-6 Definitions moving to Article 100

~~311.2 Definitions.~~

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

Electrical Ducts.

Electrical conduits, or other raceways round in cross section, that are suitable for use underground or embedded in concrete. (CMP-6)

Cable, Medium Voltage~~Cable~~, Type MV.

A single or multiconductor solid dielectric insulated cable rated 2001 volts up to and including 35,000 volts, nominal. (CMP-6)

Thermal Resistivity.

~~As used in this Code, the~~ The heat transfer capability through a substance by conduction.

Informational Note: Thermal resistivity is the reciprocal of thermal conductivity and is designated Rho, which is expressed in the units °C-cm / W.

(CMP-6)

~~320.2 Definition.~~

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

Armored Cable, Type AC.

A fabricated assembly of insulated conductors in a flexible interlocked metallic armor. ~~See 320.100-~~ (CMP-6)

~~322.2 Definition.~~

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

Flat Cable Assembly, Type FC.

An assembly of parallel conductors formed integrally with an insulating material web specifically designed for field installation in surface metal raceway. (CMP-6)

~~324.2 Definitions.~~

~~The definitions in this section shall apply only within this article.~~

Bottom Shield, Type FCC.

A protective layer that is installed between the floor and Type FCC flat conductor cable to protect the cable from physical damage and may or may not be incorporated as an integral part of the cable. (324)
(CMP-6)

Cable Connector, Type FCC.

A connector designed to join Type FCC cables without using a junction box. (324) (CMP-6)

FCC-Flat Conductor Cable System.

A complete wiring system for branch circuits that is designed for installation under carpet squares. (324)
(CMP-6)

Informational Note: The FCC system includes Type FCC cable and associated shielding, connectors, terminators, adapters, boxes, and receptacles.

Insulating End, Type FCC.

An insulator designed to electrically insulate the end of a Type FCC cable. (324) (CMP-6)

Metal Shield Connections, Type FCC.

Means of connection designed to electrically and mechanically connect a metal shield to another metal shield, to a receptacle housing or self-contained device, or to a transition assembly. (324) (CMP-6)

Top Shield, Type FCC.

A grounded metal shield covering under-carpet components of the FCC system for the purposes of providing protection against physical damage. (324) (CMP-6)

Transition Assembly, Type FCC.

An assembly to facilitate connection of the FCC system to other wiring systems, incorporating (1) a means of electrical interconnection and (2) a suitable box or covering for providing electrical safety and protection against physical damage. (324) (CMP-6)

Flat Conductor Cable, Type FCC Cable.

Three or more flat copper conductors placed edge-to-edge and separated and enclosed within an insulating assembly. (324) (CMP-6)

~~326.2 Definition.~~

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

Integrated Gas Spacer Cable, Type IGS.

A factory assembly of one or more conductors, each individually insulated and enclosed in a loose fit, nonmetallic flexible conduit as an integrated gas spacer cable rated 0 volts through 600 volts. (CMP-6)

~~330.2 Definition.~~

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

Metal Clad Cable, Type MC.

A factory assembly of one or more insulated circuit conductors with or without optical fiber members enclosed in an armor of interlocking metal tape, or a smooth or corrugated metallic sheath. (CMP-6)

~~332.2 Definition.~~

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

Mineral-Insulated, Metal-Sheathed Cable, Type MI.

A factory assembly of one or more conductors insulated with a highly compressed refractory mineral insulation and enclosed in a liquidtight and gastight continuous copper or alloy steel sheath. (CMP-6)

~~334.2 Definitions.~~

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

Nonmetallic-Sheathed Cable.

A factory assembly of two or more insulated conductors enclosed within an overall nonmetallic jacket. [\(CMP-6\)](#)

Nonmetallic-Sheathed Cable, Type NM.

Insulated conductors enclosed within an overall nonmetallic jacket. [\(CMP-6\)](#)

Nonmetallic-Sheathed Cable, Type NMC.

Insulated conductors enclosed within an overall, corrosion resistant, nonmetallic jacket. [\(CMP-6\)](#)

~~336.2 Definition.~~

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

Power and Control Tray Cable, Type TC.

A factory assembly of two or more insulated conductors, with or without associated bare or covered equipment grounding conductors, under a nonmetallic jacket. [\(CMP-6\)](#)

~~337.2 Definition.~~

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

Drilling Rig Cable, Type P. Cable

A factory assembly of one or more insulated flexible tinned copper conductors, with associated equipment grounding conductor(s), with or without a braided metallic armor and with an overall nonmetallic jacket. [\(CMP-6\)](#)

~~338.2 Definitions.~~

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

Service-Entrance Cable.

A single conductor or multiconductor cable provided with an overall covering, primarily used for services, and of the following types:

Type SE.

Service-entrance cable having a flame-retardant, moisture-resistant covering.

Type USE.

Service-entrance cable, identified for underground use, having a moisture-resistant covering, but not required to have a flame-retardant covering.

[\(CMP-6\)](#)

Service-Entrance Conductor Assembly.

Multiple single-insulated conductors twisted together without an overall covering, other than an optional binder intended only to keep the conductors together. [\(CMP-6\)](#)

~~340.2 Definition.~~

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

Underground Feeder and Branch-Circuit Cable, Type UF.

A factory assembly of one or more insulated conductors with an integral or an overall covering of nonmetallic material suitable for direct burial in the earth. (CMP-6)

~~382.2 Definitions.~~

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

Concealable Nonmetallic Extension.

A listed assembly of two, three, or four insulated circuit conductors within a nonmetallic jacket, an extruded thermoplastic covering, or a sealed nonmetallic covering. The classification includes surface extensions intended for mounting directly on the surface of walls or ceilings and concealed with paint, texture, joint compound, plaster, wallpaper, tile, wall paneling, or other similar materials. (CMP-6)

Nonmetallic Extension.

An assembly of two insulated conductors within a nonmetallic jacket or an extruded thermoplastic covering. The classification includes surface extensions intended for mounting directly on the surface of walls or ceilings. (CMP-6)

~~394.2 Definition.~~

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

Concealed Knob-and-Tube Wiring.

A wiring method using knobs, tubes, and flexible nonmetallic tubing for the protection and support of single insulated conductors. (CMP-6)

~~396.2 Definitions.~~

Conductor, Insulated Conductor. (as applied to messenger-supported wiring)

~~This definition shall apply only within this article.~~

Overhead service conductor encased in a polymeric material that has been evaluated for the applied nominal voltage and any conductor types described in 310.4 Conductor Construction and Applications.

~~For the purposes of this article, an insulated conductor includes the following:~~

- ~~(1) Conductor types described in 310.4, and~~
- ~~(2) Overhead service conductors encased in a polymeric material that has been evaluated for the applied nominal voltage.~~

Informational Note: See ICEA S-76-474-2011, Standard for Neutral Supported Power Cable Assemblies with Weather-Resistant Extruded Insulation Rated 600 Volts for evidence of evaluation of overhead service conductors. ~~for the applied nominal voltage can be given by certification that the conductors have met the requirements of ICEA S-76-474-2011, Standard for Neutral Supported Power Cable Assemblies with Weather-Resistant Extruded Insulation Rated 600 Volts.~~

(396) (CMP-6)

Messenger-Supported Wiring.

~~This definition shall apply within this article and throughout the Code.~~

An exposed wiring support system using a messenger wire to support insulated conductors by any one of the following:

- (1) A messenger with rings and saddles for conductor support
- (2) A messenger with a field-installed lashing material for conductor support
- (3) Factory-assembled aerial cable
- (4) Multiplex cables utilizing a bare conductor, factory assembled and twisted with one or more insulated conductors, such as duplex, triplex, or quadruplex type of construction

(CMP-6)

~~398.2 Definition.~~

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

Open Wiring on Insulators.

An exposed wiring method using cleats, knobs, tubes, and flexible tubing for the protection and support of single insulated conductors run in or on buildings. (CMP-6)

~~399.2 Definition.~~

~~The definitions in this section shall apply only within this article.~~

Outdoor Overhead Conductors.

Single conductors, insulated, covered, or bare, installed outdoors on support structures in free air. (399) (CMP-6)



First Revision No. 8560-NFPA 70-2021 [Global Input]

Renumber Article 399 to 395.

Submitter Information Verification

Committee: NEC-P06

Submission Date: Thu Jan 07 15:09:43 EST 2021

Committee Statement

Committee Statement: The affected articles for this Public Input that fall under the scope of CMP-6 are Articles 311 and 399. This First revision will renumber Articles 311 and 399. This Public Input requested to delete Article 399 and relocate to new Article 305 as Part IV. Article 399 will not be deleted; however, it will be renumbered to match the numbering sequence recommended by the Public Input.

Response Message: FR-8560-NFPA 70-2021

Ballot Results

✓ This item has passed ballot

14 Eligible Voters

0 Not Returned

13 Affirmative All

1 Affirmative with Comments

0 Negative with Comments

0 Abstention

Affirmative All

Crisman, Todd

Cross, Joseph W.

Deacy, Brian

Earl, Timothy

Hunter, Christel K.

Kent, Gerald W.

Lamp, Kelly

Newman Searce, Susan

Nielsen, Dennis A.

Porcaro, Michael Thomas

Riedl, Kenneth

Stene, Susan L.

Watson, Dave

Affirmative with Comment

Graser, Peter

Article 305 Part 1V is a logical spot for guidance on Outdoor Overhead Conductors over 1000 volts, which is the most critical piece of the PI's request.



First Revision No. 8616-NFPA 70-2021 [Global Input]

Revise Article 311 to Article 315 and Modify Per the Attached Word Document "Revised Article 311-315"

Supplemental Information

<u>File Name</u>	<u>Description</u>	<u>Approved</u>
Revised_Article_311-315.docx	Revised Article 311 to 315. For staff use	
Revised_Article_311-315.Global_FR-8616_For_ballot.pdf	For ballot	

Submitter Information Verification

Committee: NEC-P06

Submittal Date: Thu Jan 07 22:43:06 EST 2021

Committee Statement

Committee Statement: Terminations, MV cable joints and MV cable connectors are being added to provide for complete system installation. The listing requirement in 311/315.6 was expanded to include these additional items with a future effective date to allow the industry time to exhaust inventory of unlisted inventory and to comply with the listing requirement. New section 311/315.17 was added detailing the application of these connectors and markings. Section 311/315.30 was revised to require qualified personnel to complete the installation including cable joints and terminations. Other revisions were made dealing with the installation of these connectors. Code Making Panel 6 refers to the Correlating Committee for review of the modification to the Title of Article 311/315 to include the words Cable, Cable Joints and Terminations.

The Direct Current Voltage rating is being limited to 2500 Volts due to industry experience. Higher voltages are being investigated for their effect on extruded insulation materials. This change is being referred to the Correlating Committee which has purview over Scopes of Articles.

The most current edition of the standard was updated to 2020 in 311/315.30 information note.

Correcting an oversight in 311/315.32 when Article 311 was created out of Article 328 and 310.

The shielding for cables is not suitable for clearing ground fault events unless sized properly.

The note in 311/315.60(D)4 gives users guidance on conductor ampacities and considering terminations.

Information notes were added to refer to industry standards.

Response FR-8616-NFPA 70-2021

Message:

[Public Input No. 2642-NFPA 70-2020 \[Article 311\]](#)

[Public Input No. 3911-NFPA 70-2020 \[Section No. 311.1\]](#)

[Public Input No. 97-NFPA 70-2019 \[Section No. 311.60\(D\)\(4\)\]](#)

[Public Input No. 895-NFPA 70-2020 \[Section No. 311.30\]](#)

[Public Input No. 3325-NFPA 70-2020 \[Section No. 311.44\]](#)

[Public Input No. 1162-NFPA 70-2020 \[Section No. 311.32\]](#)

Ballot Results

✓ **This item has passed ballot**

14 Eligible Voters

0 Not Returned

14 Affirmative All

0 Affirmative with Comments

0 Negative with Comments

0 Abstention

Affirmative All

Crisman, Todd

Cross, Joseph W.

Deacy, Brian

Earl, Timothy

Graser, Peter

Hunter, Christel K.

Kent, Gerald W.

Lamp, Kelly

Newman Searce, Susan

Nielsen, Dennis A.

Porcaro, Michael Thomas

Riedl, Kenneth

Stene, Susan L.

Watson, Dave

Article ~~311~~**315** Medium Voltage Conductors, Cable, Cable Joints, and Cable Terminations

Part I. General

~~311~~**315.1** Scope.

This article covers the use, installation, construction specifications, and ampacities for Type MV medium voltage conductors, cable, cable joints, and cable terminations. This article does not cover cables used above 2500 volts for dc circuits.

~~311.2 Definitions.~~

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

~~Electrical Ducts.~~

Electrical conduits, or other raceways round in cross-section, that are suitable for use underground or embedded in concrete.

~~Medium Voltage Cable, Type MV.~~

A single or multiconductor solid dielectric insulated cable rated 2001 volts up to and including 35,000 volts, nominal.

~~Thermal Resistivity.~~

As used in this Code, the heat transfer capability through a substance by conduction.

Informational Note: Thermal resistivity is the reciprocal of thermal conductivity and is designated Rho, which is expressed in the units °C-cm/W.

~~311~~**315.6** Listing Requirements.

Type MV cables, type MV cable joints, type MV cable terminations, connectors, and associated fittings shall be listed. The listing requirement for Type MV cable joints, cable terminations, and connectors shall be effective January 1, 2026.

Part II. Construction Specifications

~~311~~**315.10** Constructions and Applications.

Type MV cables shall comply with the applicable provisions in ~~311~~**315.10**(A) through (C).

(A) Conductor Application and Insulation.

Conductor application and insulation shall comply with Table ~~311~~**315.10**(A).

(B) Thickness of Insulation and Jacket for Nonshielded Insulated Conductors.

Thickness of insulation and jacket for nonshielded solid dielectric insulated conductors rated 2,001 volts to 5,000 volts shall comply with Table ~~311~~**315.10**(B).

(C) Thickness of Insulation for Shielded Insulated Conductors.

Commented [SB1]: Global FR-8304

Thickness of insulation for shielded solid dielectric insulated conductors rated 2,001 volts to 35,000 volts shall comply with Table ~~311~~315.10(C) and ~~311~~315.10(C)(1) through (C)(3).

(1) 100 Percent Insulation Level.

Cables shall be permitted to be applied where the system is provided with relay protection such that ground faults will be cleared as rapidly as possible but, in any case, within 1 minute. These cables are applicable to cable installations that are on grounded systems and shall be permitted to be used on other systems provided the above clearing requirements are met in completely de-energizing the faulted section.

(2) 133 Percent Insulation Level.

Cables shall be permitted to be applied in situations where the clearing time requirements of the 100 percent level category cannot be met and the faulted section will be de-energized in a time not exceeding 1 hour. Cable shall be permitted to be used in 100 percent insulation level applications where the installation requires additional insulation.

(3) 173 Percent Insulation Level.

Cables shall be permitted to be applied under all of the following conditions:

- (1) In industrial establishments where the conditions of maintenance and supervision ensure only qualified persons service the installation
- (2) Where the fault clearing time requirements of the 133 percent level category cannot be met
- (3) Where an orderly shutdown is required to protect equipment and personnel
- (4) Where the faulted section will be de-energized in an orderly shutdown

Cables shall be permitted to be used in 100 percent or 133 percent insulation level applications where the installation requires additional insulation.

Informational Note: See UL 1072, Medium-Voltage Power Cable, ANSI/ICEA S-93-639, American National Standard for 5-46kV Shielded Power Cable for Use in the Transmission and Distribution of Electric Energy, and ICEA S-94-649 2013, Standard for Concentric Neutral Cables Rated 5 through 46 kV for Medium Voltage Cables.

Table ~~311~~315.10(A) Conductor Application and Insulation Rated 2001 Volts and Higher

Trade	Type Letter	Maximum Operating Temperature	Application Provision	Insulation	Outer Covering
Name					
Medium voltage solid dielectric	MV-90	90°C	Dry or wet locations	Thermoplastic or thermosetting	Jacket, sheath, or armor
	MV-105*	105°C			

*Where design conditions require maximum conductor temperatures above 90°C.

Table ~~311~~315.10(B) Thickness of Insulation and Jacket for Nonshielded Solid Dielectric Insulated Conductors Rated 2001 Volts to 5000 Volts

Conductor Size (AWG or kcmil)	Dry Locations, Single Conductor						Wet or Dry Locations					
	Without Jacket Insulation			With Jacket Insulation			Single Conductor			Multiconductor Insulation*		
	mm	mils	mm	mils	mm	mils	mm	mils	mm	mils	mm	mils
8	2.79	110	2.29	90	0.76	30	3.18	125	2.03	80	2.29	90
6	2.79	110	2.29	90	0.76	30	3.18	125	2.03	80	2.29	90
4-2	2.79	110	2.29	90	1.14	45	3.18	125	2.03	80	2.29	90
1-2/0	2.79	110	2.29	90	1.14	45	3.18	125	2.03	80	2.29	90
3/0-4/0	2.79	110	2.29	90	1.65	65	3.18	125	2.41	95	2.29	90
213-500	3.05	120	2.29	90	1.65	65	3.56	140	2.79	110	2.29	90
501-750	3.30	130	2.29	90	1.65	65	3.94	155	3.18	125	2.29	90
751-1000	3.30	130	2.29	90	1.65	65	3.94	155	3.18	125	2.29	90
1001-1250	3.56	140	2.92	115	1.65	65	4.32	170	3.56	140	2.92	115
1251-1500	3.56	140	2.92	115	2.03	80	4.32	170	3.56	140	2.92	115
1501-2000	3.56	140	2.92	115	2.03	80	4.32	170	3.94	155	3.56	140

*Under a common overall covering such as a jacket, sheath, or armor.

Table 311.10(C) Thickness of Insulation for Shielded Solid Dielectric Insulated Conductors Rated 2001 Volts to 35,000 Volts

2001–5000														
5001–8000 Volts														
8001–15,000 Volts														
15,001–25,000 Volts														
Volts														
Conductor														
	100	100	133	173	100	133	173	100	133	173	100	133	173	
Size (AWG or kcmil)	Percent Insulation	Percent Insulation	Percent Insulation	Percent Insulation	Percent Insulation	Percent Insulation	Percent Insulation	Percent Insulation	Percent Insulation	Percent Insulation	Percent Insulation	Percent Insulation	Percent Insulation	Percent Insulation
	Level	Level	Level	Level	Level	Level	Level	Level	Level	Level	Level	Level	Level	Level
8	2.29	90	—	—	—	—	—	—	—	—	—	—	—	—
6–4	2.29	90	2.92	115	3.56	140	4.45	175	—	—	—	—	—	—
2	2.29	90	2.92	115	3.56	140	4.45	175	5.59	220	6.60	260	—	—
1	2.29	90	2.92	115	3.56	140	4.45	175	5.59	220	6.60	260	8.60	320
													10.67	420

2001–5000														

311.12 Conductors.

(A) Minimum Size of Conductors.

The minimum size of conductors shall be as shown in Table 311.12(A), except as permitted elsewhere in this Code.

Table 311.12(A) Minimum Size of Conductors

Conductor Voltage Rating (Volts)	Minimum Conductor Size (AWG)	
	Copper, Aluminum, or Copper-Clad Aluminum	
2001–5000	8	
5001–8000	6	
8001–15,000	2	

Conductor Voltage Rating (Volts)	Minimum Conductor Size (AWG)
	Copper, Aluminum, or Copper-Clad Aluminum
15,001–28,000	1
28,001–35,000	1/0

(B) Conductor Material.

Conductors shall be of aluminum, copper-clad aluminum, or copper unless otherwise specified.

(C) Stranded Conductors.

Where installed in raceways, conductors not specifically permitted or required elsewhere in this *Code* to be solid shall be stranded.

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~~311~~315.14 Conductor Identification.

Conductors that are intended for use as ungrounded conductors, whether used as a single conductor or in multiconductor cables, shall be finished to be clearly distinguishable from grounded and grounding conductors. Distinguishing markings shall not conflict in any manner with the surface markings required by 311.16(B)(1). Branch-circuit ungrounded conductors shall be identified in accordance with 210.5(C). Feeders shall be identified in accordance with 215.12.

~~311~~315.16 Marking for Type MV Cables and Conductors.

(A) Required Information for Type MV Cables and Conductors.

All conductors and cables shall be marked to indicate the following information, using the applicable method described in ~~311~~315.16(B):

- (1) The maximum rated voltage
- (2) The proper type letter or letters for the type of wire or cable as specified elsewhere in this *Code*
- (3) The manufacturer's name, trademark, or other distinctive marking by which the organization responsible for the product can be readily identified
- (4) The AWG size or circular mil area

Informational Note: See Chapter 9, Table 8, Conductor Properties, for conductor area expressed in SI units for conductor sizes specified in AWG or circular mil area.

(B) Method of Marking for Type MV Cables and Conductors.

One or more of the methods in ~~311~~315.16(B)(1) through (B)(4) shall be used for marking of cable.

(1) Surface Marking.

Cables shall be durably marked on the surface. The AWG size or circular mil area shall be repeated at intervals not exceeding 610 mm (24 in.). All other markings shall be repeated at intervals not exceeding 1.0 m (40 in.).

(2) Marker Tape.

Metal-covered multiconductor cables shall employ a marker tape located within the cable and along its complete length.

(3) Tag Marking.

Metal-covered, single-conductor cables shall be marked by means of a printed tag attached to the reel.

(4) Optional Marking of Wire Size.

The information required in ~~314~~315.16(A)(4) shall be permitted to be marked on the surface of the individual insulated conductors for multiconductor Type MC cable.

(C) Optional Markings.

Cables shall be permitted to be marked to indicate special characteristics of the cable materials, such as limited smoke and sunlight resistance.

315.17 Marking for Type MV Cable Joints and Terminations.

(A) Required Information for Type MV Cable Joints, Terminations, and Connectors.

All Type MV cable joints, cable terminations, and connectors shall be marked to indicate the following information, using one or more of the methods described in 315.17(B)(1) or (B)(2), and shall be permitted to be optionally marked as described in 315.17(D):

(1) The maximum rated voltage.

(2) The proper type letter or letters for the type of wire or cable as specified elsewhere in this Code that the cable joint or cable terminations is listed for use with.

(3) The manufacturer's name, trademark, or other distinctive marking by which the organizations responsible for the product can be readily identified.

(4) The conductor AWG size or circular mil area size, or range of sizes, that the cable joint or cable terminations is listed for use with.

(5) The cable outer diameter size, or size range, that the cable joint or cable termination is listed for use with.

(6) Connectors shall be marked with the following information; the marking shall also be on the unit container (the smallest container in which the connector is packaged):

a. The manufacturer's name, trademark, or other distinctive marking by which the organization responsible for the product can be readily identified

b. The manufacturer's catalog number

c. The conductor AWG size or circular mil use range, and die number if applicable

d. The type of conductor material(s) the connector is for use with

(B) Method of Marking for Type MV Cable Joints, Terminations, and Connectors.

One or both of the methods in 315.17(B)(1) or (B)(2) shall be used for the marking of cable joints, terminations, or connectors.

(1) Surface Marking.

Type MV cable joints, terminations, or connectors shall be durably marked on the surface.

(2) Tag Marking.

Type MV cable joints, terminations, or connectors shall be marked by means of a durably printed tag or label attached to joint or termination.

(C) Optional Markings.

Type MV cable joints and cable terminations shall be permitted to be marked to indicate special characteristics, such as limited smoke and sunlight resistance.

Part III. Installation

~~311~~315.30 Installation.

A qualified person(s) with documented training and experience shall perform the installation and testing of Type MV cable. A qualified person(s) with documented training and experience in the installation of Type MV cable joints shall perform the installation of Type MV cable joints. A qualified person(s) with documented training and experience in the installation of Type MV cable terminations shall perform the installation of Type MV cable terminations. Type MV cable shall be installed, terminated, and tested by qualified persons.

Informational Note No. 1: See ANSI/NECA/NCSCB 600-2020, Standard for Installing and Maintaining Medium-Voltage Cable, and IEEE 576, Recommended Practice for Installation, Termination, and Testing of Insulated Power Cables as Used in Industrial and Commercial Applications, for information about accepted industry practices and installation procedures for medium-voltage cable, are described in ANSI/NECA/NCSCB 600-2020, Standard for Installing and Maintaining Medium-Voltage Cable, and in IEEE 576, Recommended Practice for Installation, Termination, and Testing of Insulated Power Cables as Used in Industrial and Commercial Applications.

Informational Note No. 2: Where medium-voltage cable is used for dc circuits, low frequency polarization can create hazardous voltages. When handling the cable these voltages ~~may~~could be present or ~~may~~could develop on dc stressed cable while the circuit is energized. Solidly grounding the cable prior to contacting, cutting, or disconnecting cables in dc circuits is a method to discharge these voltages.

~~311~~315.32 Uses Permitted.

[Move text to (A)] Type MV cable shall be permitted for use on power systems rated up to and including 35,000 volts, nominal, as follows:

(1) In wet or dry locations.

(2) In raceways.

(3) In cable trays, where identified for the use, in accordance with 392.10, 392.20(B), (C), and (D), 392.22(C), 392.30(B)(1), 392.46, 392.56, and 392.60. Type MV cable that has an overall metallic sheath or armor, complies with the requirements for Type MC cable, and is identified as "MV or MC" shall be permitted to be installed in cable trays in accordance with 392.10(B)(2).

(4) In messenger-supported wiring in accordance with Part II of Article 396.

(5) As exposed runs in accordance with 300.37. Type MV cable that has an overall metallic sheath or armor, complies with the requirements for Type MC cable, and is identified as "MV or MC" shall be permitted to be installed as exposed runs of metal-clad cable in accordance with 300.37.

~~(6) Corrosive conditions where exposed to oils, greases, vapors, gases, fumes, liquids, or other substances having a deleterious effect on the conductor or insulation shall be of a type suitable for the application.~~

~~(7) Conductors in parallel in accordance with 310.10(G).~~

~~(8) Type MV cable used where exposed to direct sunlight shall be identified for the use.~~

Informational Note: The "uses permitted" is not an all-inclusive list.

(A) Type MV Cable.

Type MV cable shall be permitted for use on power systems rated up to and including 35,000 volts, nominal, as follows:

- (1) In wet or dry locations.
- (2) In raceways.
- (3) In cable trays, where identified for the use, in accordance with 392.10, 392.20(B), (C), and (D), 392.22(C), 392.30(B)(1), 392.46, 392.56, and 392.60. Type MV cable that has an overall metallic sheath or armor, complies with the requirements for Type MC cable, and is identified as "MV or MC" shall be permitted to be installed in cable trays in accordance with 392.10(B)(2).
- (4) In messenger-supported wiring in accordance with Part II of Article 396.
- (5) As exposed runs in accordance with 300.37. Type MV cable that has an overall metallic sheath or armor, complies with the requirements for Type MC cable, and is identified as "MV or MC" shall be permitted to be installed as exposed runs of metal-clad cable in accordance with 300.37.
- (6) Corrosive conditions where exposed to oils, greases, vapors, gases, fumes, liquids, or other substances having a deleterious effect on the conductor or insulation shall be of a type suitable for the application.
- (7) Conductors in parallel in accordance with 310.10(G).
- (8) Type MV cable used where exposed to direct sunlight shall be identified for the use.

~~(9) Direct buried in accordance with 315.36.~~

(B) Type MV cable Joints and Terminations.

Type MV cable joints and terminations shall be permitted for use on power systems rated up to and including 35,000 volts, nominal, as follows:

(1) Type MV cable joints and terminations, used where exposed to direct sunlight, shall be identified for the use.

(2) Direct buried.

(3) Where used intermittently or continuously submerged in water at a depth not exceeding 7 m (23 ft) type MV cable joints and terminations shall be identified for the use.

(4) The environmental operating temperature range shall be identified.

(5) Where used in one or more of the following conditions Type MV cable joints and terminations shall be identified for the use:

- a. Underground chambers
- b. Tunnels
- c. Conduits
- d. Manholes
- e. Vaults

(6) Corrosive conditions where exposed to oils, greases, vapors, gases, fumes, liquids, or other substances having a deleterious effect on the joint or termination shall be of a type suitable for the application.

(7) In cable trays, where identified for use, in accordance with 392.10, 392.20(B), (C) and (D), 392.22 (C), 392.30(B)(1), 392.46, 392.56, and 392.60.

Informational Note No. 1: The "uses permitted" is not an all-inclusive list.

Informational Note No. 2: See IEEE-404, *IEEE Standard for Extruded and Laminated Dielectric Shielded Cable Joints Rated 2.5kV to 500kV*, for more information on cable joints. Cable joints are often referred to as splices. However, the term *splice* includes many other applications not included in the definition of a cable joint.

Informational Note No. 3: See IEEE-48, *IEEE Standard for Test Procedures and Requirements for Alternating-Current Cable Terminations Used on Shielded Cables Having Laminated Insulation Rated 2.5 kV through 765 kV or Extruded Insulation Rated 2.5 kV through 500 kV*, for information on terminations. Type MV cable terminations include terminations used to connect directly to equipment or insulators.

Informational Note No. 4: See IEEE-386, *IEEE Standard for Separable Insulated Connector Systems for Power Distribution Systems Rated 2.5kV through 35 kV*, and IEEE-1215, *IEEE Guide for the Application of Separable Insulated Connectors*, for more information on separable insulated connectors. Type MV cable terminations also include separable insulated connectors, which are a type of pluggable cable termination and may be used for connection to equipment, such as, switchgear or transformers. A separable connector has a matching interface that the separable connector plugs into on the equipment, such as switchgear or transformers. Separable connectors may also be ganged together to form a distribution junction using specialized junction brackets.

~~314~~315.36 Direct-Burial Conductors.

Type MV conductors and cables used for direct burial applications shall be shielded, identified for such use, and installed in accordance with 300.50.

Exception No. 1: Nonshielded multiconductor cables rated 2001 volts to 2400 volts shall be permitted if the cable has an overall metallic sheath or armor.

The metallic shield, sheath, or armor shall be connected to a grounding electrode conductor, a grounding busbar, or a grounding electrode.

Exception No. 2: Airfield lighting cable used in series circuits that are rated up to 5000 volts and are powered by regulators shall be permitted to be nonshielded.

Informational Note to Exception No. 2: Federal Aviation Administration (FAA) Advisory Circulars (ACs) provide additional practices and methods for airport lighting.

311.40 Support.

Type MV cable terminated in equipment or installed in pull boxes or vaults shall be secured and supported by metallic or nonmetallic supports suitable to withstand the weight by cable ties listed and identified for securement and support, or other approved means, at intervals not exceeding 1.5 m (5 ft) from terminations or a maximum of 1.8 m (6 ft) between supports.

311.44 Shielding.

Nonshielded, ozone-resistant insulated conductors with a maximum phase-to-phase voltage of 5000 volts shall be permitted in Type MC cables in industrial establishments where the conditions of maintenance and supervision ensure that only qualified persons service the installation. For other establishments, solid dielectric insulated conductors operated above 2000 volts in permanent installations shall have ozone-resistant insulation and shall be shielded. All metallic insulation shields shall be connected to a grounding electrode conductor, a grounding busbar, an equipment grounding conductor, or a grounding electrode. Equipment grounding conductors installed with circuits using medium voltage cables shall be sized according to 250.190(C).

Informational Note: The primary purposes of shielding are to confine the voltage stresses to the insulation, dissipate insulation leakage current, and drain off the capacitive charging current, and carry ground-fault current to facilitate operation of ground-fault protective devices in the event of an electrical cable fault.

Exception No. 1: Nonshielded insulated conductors listed by a qualified testing laboratory shall be permitted for use up to 2,400 volts under the following conditions:

- (1) Conductors shall have insulation resistant to electric discharge and surface tracking, or the insulated conductor(s) shall be covered with a material resistant to ozone, electric discharge, and surface tracking.
- (2) Where used in wet locations, the insulated conductor(s) shall have an overall nonmetallic jacket or a continuous metallic sheath.
- (3) Insulation and jacket thicknesses shall be in accordance with Table 311.10(B).

Exception No. 2: Nonshielded insulated conductors listed by a qualified testing laboratory shall be permitted for use up to 5,000 volts to replace existing nonshielded conductors, on existing equipment in industrial establishments only, under the following conditions:

- (1) Where the condition of maintenance and supervision ensures that only qualified personnel install and service the installation.
- (2) Conductors shall have insulation resistant to electric discharge and surface tracking, or the insulated conductor(s) shall be covered with a material resistant to ozone, electric discharge, and surface tracking.
- (3) Where used in wet locations, the insulated conductor(s) shall have an overall nonmetallic jacket or a continuous metallic sheath.
- (4) Insulation and jacket thicknesses shall be in accordance with Table 311.10(B).

Informational Note: Relocation or replacement of equipment may not comply with the term existing as related to this exception.

Exception No. 3: Where permitted in 311.36, Exception No. 2.

315.45 Shielding at Type MV Cable Joints and Terminations.

Type MV cable joints and terminations shall be provided with means to connect the metallic insulation shield to ground if required.

Part IV. Ampacities

~~311~~315.60 Ampacities of Conductors.

(A) General.

(1) Tables or Engineering Supervision.

Ampacities for solid dielectric-insulated conductors shall be permitted to be determined by tables or under engineering supervision, as provided in ~~311~~315.60(B) and (C).

The ampacity of Type MV cable installed in cable tray shall be determined in accordance with 392.80(B).

(2) Selection of Ampacity.

Where more than one calculated or tabulated ampacity could apply for a given circuit length, the lowest value shall be used.

Exception: Where different ampacities apply to portions of a circuit, the higher ampacity shall be permitted to be used if the total portion(s) of the circuit with the lower ampacity does not exceed the lesser of 3.0 m (10 ft) or 10 percent of the total circuit.

Informational Note: See 110.40 for conductor temperature limitations due to termination provisions.

(B) Engineering Supervision.

Under engineering supervision, conductor ampacities shall be permitted to be calculated by using the following general equation:

$$I = \sqrt{\frac{T_c - (T_a + \Delta T_d)}{R_{dc}(1 + Y_c)R_{ca}}} \times 10^3 \text{ amperes} \quad [\del{311}315.60(\text{B})]$$

where:

T_c = conductor temperature (°C)

T_a = ambient temperature (°C)

ΔT_d = dielectric loss temperature rise

R_{dc} = dc resistance of conductor at temperature, T_c

Y_c = component ac resistance resulting from skin effect and proximity effect

R_{ca} = effective thermal resistance between conductor and surrounding ambient

Informational Note: The dielectric loss temperature rise (ΔT_d) is negligible for single circuit extruded dielectric cables rated below 46 ~~kilovolts~~kV.

(C) Tables.

Ampacities for conductors rated 2001 volts to 35,000 volts shall be as specified in Table ~~311~~315.60(C)(~~167~~) through Table ~~311~~315.60(C)(~~2086~~). Ampacities for ambient temperatures other than those specified in the ampacity tables shall be corrected in accordance with ~~311~~315.60(D)(4).

Informational Note No. 1: See IEEE 835, *Standard Power Cable Ampacity Tables*, and the references therein for availability of all factors and constants. For ampacities calculated in accordance with 311.315.60(A), reference IEEE 835, *Standard Power Cable Ampacity Tables*, and the references therein for availability of all factors and constants.

Informational Note No. 2: See 210.19(A), Informational Note No. 4, for voltage drop on branch circuits that this section does not take into consideration. See 215.2(A), Informational Note No. 2, for voltage drop on feeders that this section does not take into consideration. Ampacities provided by this section do not take voltage drop into consideration. See 210.19(A), Informational Note No. 4, for branch circuits and 215.2(A), Informational Note No. 2, for feeders.

Table 311.315.60(C)(167) Ampacities of Insulated Single Copper Conductor Cables Triplexed in Air

Conductor	Temperature Rating of Conductor			
	2001–5000 Volts Ampacity		5001–35,000 Volts Ampacity	
Size (AWG or kcmil)	90°C (194°F) Type MV-90	105°C (221°F) Type MV-105	90°C (194°F) Type MV-90	105°C (221°F) Type MV-105
8	65	74	—	—
6	90	99	100	110
4	120	130	130	140
2	160	175	170	195
1	185	205	195	225
1/0	215	240	225	255
2/0	250	275	260	295
3/0	290	320	300	340
4/0	335	375	345	390
250	375	415	380	430
350	465	515	470	525
500	580	645	580	650
750	750	835	730	820
1000	880	980	850	950

Note: Refer to 311.315.60(E) for the basis of ampacities, 311.315.10(A) for conductor maximum operating temperature and application, and 311.315.60(D)(4) for the ampacity correction factors where the ambient air temperature is other than 40°C (104°F).

Table 311.315.60(C)(268) Ampacities of Insulated Single Aluminum Conductor Cables Triplexed in Air

Conductor	Temperature Rating of Conductor			
	2001–5000 Volts Ampacity		5001–35,000 Volts Ampacity	
Size	90°C (194°F) Type MV-90	105°C (221°F) Type MV-105	90°C (194°F) Type MV-90	105°C (221°F) Type MV-105
(AWG or kcmil)				
8	50	57	—	—
6	70	77	75	84
4	90	100	100	110
2	125	135	130	150
1	145	160	150	175
1/0	170	185	175	200
2/0	195	215	200	230
3/0	225	250	230	265
4/0	265	290	270	305
250	295	325	300	335
350	365	405	370	415
500	460	510	460	515
750	600	665	590	660
1000	715	800	700	780

Note: Refer to 311.60(E) for basis of ampacities, 311.10(A) for conductor maximum operating temperature and application, and 311.60(D)(4) for the ampacity correction factors where the ambient air temperature is other than 40°C (104°F).

Table 311.60(C)(369) Ampacities of Insulated Single Copper Conductor Isolated in Air

Conductor	Temperature Rating of Conductor					
	2001–5000 Volts Ampacity		5001–15,000 Volts Ampacity		15,001–35,000 Volts Ampacity	
Size	90°C (194°F) Type MV-90	105°C (221°F) Type MV-105	90°C (194°F) Type MV-90	105°C (221°F) Type MV-105	90°C (194°F) Type MV-90	105°C (221°F) Type MV-105
(AWG or kcmil)						
8	83	93	—	—	—	—
6	110	120	110	125	—	—
4	145	160	150	165	—	—
2	190	215	195	215	—	—
1	225	250	225	250	225	250
1/0	260	290	260	290	260	290
2/0	300	330	300	335	300	330

Conductor		Temperature Rating of Conductor					
		2001–5000 Volts Ampacity		5001–15,000 Volts Ampacity		15,001–35,000 Volts Ampacity	
Size							
(AWG)		90°C (194°F) Type MV-90	105°C (221°F) Type MV-105	90°C (194°F) Type MV-90	105°C (221°F) Type MV-105	90°C (194°F) Type MV-90	105°C (221°F) Type MV-105
or kcmil)							
3/0		345	385	345	385	345	380
4/0		400	445	400	445	395	445
250		445	495	445	495	440	490
350		550	615	550	610	545	605
500		695	775	685	765	680	755
750		900	1000	885	990	870	970
1000		1075	1200	1060	1185	1040	1160
1250		1230	1370	1210	1350	1185	1320
1500		1365	1525	1345	1500	1315	1465
1750		1495	1665	1470	1640	1430	1595
2000		1605	1790	1575	1755	1535	1710

Note: Refer to 311.315.60(E) for the basis of ampacities, 311.315.10(A) for conductor maximum operating temperature and application, and 311.315.60(D)(4) for the ampacity correction factors where the ambient air temperature is other than 40°C (104°F).

Table 311.315.60(C)(470) Ampacities of Insulated Single Aluminum Conductor Isolated in Air

Conductor		Temperature Rating of Conductor					
		2001–5000 Volts Ampacity		5001–15,000 Volts Ampacity		15,001–35,000 Volts Ampacity	
Size							
(AWG)		90°C (194°F) Type MV-90	105°C (221°F) Type MV-105	90°C (194°F) Type MV-90	105°C (221°F) Type MV-105	90°C (194°F) Type MV-90	105°C (221°F) Type MV-105
or kcmil)							
8	64	71	—	—	—	—	—
6	85	95	87	97	—	—	—
4	115	125	115	130	—	—	—
2	150	165	150	170	—	—	—
1	175	195	175	195	175	195	—
1/0	200	225	200	225	200	225	—
2/0	230	260	235	260	230	260	—
3/0	270	300	270	300	270	300	—

Conductor	Temperature Rating of Conductor					
	2001–5000 Volts Ampacity		5001–15,000 Volts Ampacity		15,001–35,000 Volts Ampacity	
Size						
(AWG	90°C (194°F) Type MV-90	105°C (221°F) Type MV-105	90°C (194°F) Type MV-90	105°C (221°F) Type MV-105	90°C (194°F) Type MV-90	105°C (221°F) Type MV-105
or kcmil)						
4/0	310	350	310	350	310	345
250	345	385	345	385	345	380
350	430	480	430	480	430	475
500	545	605	535	600	530	590
750	710	790	700	780	685	765
1000	855	950	840	940	825	920
1250	980	1095	970	1080	950	1055
1500	1105	1230	1085	1215	1060	1180
1750	1215	1355	1195	1335	1165	1300
2000	1320	1475	1295	1445	1265	1410

Note: Refer to 311.315.60(E) for the basis of ampacities, 311.315.10(A) for conductor maximum operating temperature and application, and 311.315.60(D)(4) for the ampacity correction factors where the ambient air temperature is other than 40°C (104°F).

Table 311.315.60(C)(574) Ampacities of an Insulated

Three-Conductor Copper Cable Isolated in Air

Conductor	Temperature Rating of Conductor			
	2001–5000 Volts Ampacity		5001–35,000 Volts Ampacity	
Size				
(AWG	90°C (194°F) Type MV-90	105°C (221°F) Type MV-105	90°C (194°F) Type MV-90	105°C (221°F) Type MV-105
or kcmil)				
8	59	66	—	—
6	79	88	93	105
4	105	115	120	135
2	140	154	165	185
1	160	180	185	210
1/0	185	205	215	240

Conductor	Temperature Rating of Conductor			
	2001–5000 Volts Ampacity		5001–35,000 Volts Ampacity	
Size				
(AWG	90°C (194°F) Type MV-90	105°C (221°F) Type MV-105	90°C (194°F) Type MV-90	105°C (221°F) Type MV-105
or kcmil)				
2/0	215	240	245	275
3/0	250	280	285	315
4/0	285	320	325	360
250	320	355	360	400
350	395	440	435	490
500	485	545	535	600
750	615	685	670	745
1000	705	790	770	860

Note: Refer to 311.315.60(E) for the basis of ampacities, 311.315.10(A) for conductor maximum operating temperature and application, and 311.315.60(D)(4) for the ampacity correction factors where the ambient air temperature is other than 40°C (104°F).

Table 311.315.60(C)(672) Ampacities of an Insulated

Three-Conductor Aluminum Cable Isolated in Air

Conductor	Temperature Rating of Conductor			
	2001–5000 Volts Ampacity		5001–35,000 Volts Ampacity	
Size				
(AWG	90°C (194°F) Type MV-90	105°C (221°F) Type MV-105	90°C (194°F) Type MV-90	105°C (221°F) Type MV-105
or kcmil)				
8	46	51	—	—
6	61	68	72	80
4	81	90	95	105
2	110	120	125	145
1	125	140	145	165
1/0	145	160	170	185
2/0	170	185	190	215
3/0	195	215	220	245

Conductor	Temperature Rating of Conductor			
	2001–5000 Volts Ampacity		5001–35,000 Volts Ampacity	
Size				
(AWG)	90°C (194°F) Type MV-90	105°C (221°F) Type MV-105	90°C (194°F) Type MV-90	105°C (221°F) Type MV-105
or kcmil)				
4/0	225	250	255	285
250	250	280	280	315
350	310	345	345	385
500	385	430	425	475
750	495	550	540	600
1000	585	650	635	705

Note: Refer to 311.315.60(E) for the basis of ampacities, 311.315.10(A) for conductor maximum operating temperature and application, and 311.315.60(D)(4) for the ampacity correction factors where the ambient air temperature is other than 40°C (104°F).

Table 311.315.60(C)(773) Ampacities of an Insulated Triplexed or Three Single-Conductor Copper Cables in Isolated Conduit in Air

Conductor	Temperature Rating of Conductor			
	2001–5000 Volts Ampacity		5001–35,000 Volts Ampacity	
Size				
(AWG)	90°C (194°F) Type MV-90	105°C (221°F) Type MV-105	90°C (194°F) Type MV-90	105°C (221°F) Type MV-105
or kcmil)				
8	55	61	—	—
6	75	84	83	93
4	97	110	110	120
2	130	145	150	165
1	155	175	170	190
1/0	180	200	195	215
2/0	205	225	225	255
3/0	240	270	260	290
4/0	280	305	295	330
250	315	355	330	365
350	385	430	395	440
500	475	530	480	535

Conductor Size (AWG or kcmil)	Temperature Rating of Conductor			
	2001–5000 Volts Ampacity		5001–35,000 Volts Ampacity	
	90°C (194°F) Type MV-90	105°C (221°F) Type MV-105	90°C (194°F) Type MV-90	105°C (221°F) Type MV-105
750	600	665	585	655
1000	690	770	675	755

Note: Refer to 311.315.60(E) for the basis of ampacities, 311.315.10(A) for conductor maximum operating temperature and application, and 311.315.60(D)(4) for the ampacity correction factors where the ambient air temperature is other than 40°C (104°F).

Table 311.315.60(C)(874) Ampacities of an Insulated Triplexed or Three Single-Conductor Aluminum Cables in Isolated Conduit in Air

Conductor Size (AWG or kcmil)	Temperature Rating of Conductor			
	2001–5000 Volts Ampacity		5001–35,000 Volts Ampacity	
	90°C (194°F) Type MV-90	105°C (221°F) Type MV-105	90°C (194°F) Type MV-90	105°C (221°F) Type MV-105
8	43	48	—	—
6	58	65	65	72
4	76	85	84	94
2	100	115	115	130
1	120	135	130	150
1/0	140	155	150	170
2/0	160	175	175	200
3/0	190	210	200	225
4/0	215	240	230	260
250	250	280	255	290
350	305	340	310	350
500	380	425	385	430
750	490	545	485	540
1000	580	645	565	640

Note: Refer to 311.315.60(E) for the basis of ampacities, 311.315.10(A) for conductor maximum operating temperature and application, and 311.315.60(D)(4) for the ampacity correction factors where the ambient air temperature is other than 40°C (104°F).

Table 311.315.60(C)(975) Ampacities of an Insulated

Three-Conductor Copper Cable in Isolated Conduit in Air

Conductor	Temperature Rating of Conductor			
	2001–5000 Volts Ampacity		5001–35,000 Volts Ampacity	
Size				
(AWG	90°C (194°F) Type MV-90	105°C (221°F) Type MV-105	90°C (194°F) Type MV-90	105°C (221°F) Type MV-105
or kcmil)				
8	52	58	—	—
6	69	77	83	92
4	91	100	105	120
2	125	135	145	165
1	140	155	165	185
1/0	165	185	195	215
2/0	190	210	220	245
3/0	220	245	250	280
4/0	255	285	290	320
250	280	315	315	350
350	350	390	385	430
500	425	475	470	525
750	525	585	570	635
1000	590	660	650	725

Note: Refer to 311.315.60(E) for the basis of ampacities, 311.315.10(A) for conductor maximum operating temperature and application, and 311.315.60(D)(4) for the ampacity correction factors where the ambient air temperature is other than 40°C (104°F).

Table 311.315.60(C)(1076) Ampacities of an Insulated

Three-Conductor Aluminum Cable in Isolated Conduit in Air

Conductor	Temperature Rating of Conductor			
	2001–5000 Volts Ampacity		5001–35,000 Volts Ampacity	
Size				
(AWG	90°C (194°F) Type MV-90	105°C (221°F) Type MV-105	90°C (194°F) Type MV-90	105°C (221°F) Type MV-105
or kcmil)				
8	41	46	—	—
6	53	59	64	71

Conductor	Temperature Rating of Conductor			
	2001–5000 Volts Ampacity		5001–35,000 Volts Ampacity	
Size				
(AWG)	90°C (194°F) Type MV-90	105°C (221°F) Type MV-105	90°C (194°F) Type MV-90	105°C (221°F) Type MV-105
or kcmil)				
4	71	79	84	94
2	96	105	115	125
1	110	125	130	145
1/0	130	145	150	170
2/0	150	165	170	190
3/0	170	190	195	220
4/0	200	225	225	255
250	220	245	250	280
350	275	305	305	340
500	340	380	380	425
750	430	480	470	520
1000	505	560	550	615

Note: Refer to 311.315.60(E) for the basis of ampacities, 311.315.10(A) for conductor maximum operating temperature and application, and 311.315.60(D)(4) for the ampacity correction factors where the ambient air temperature is other than 40°C (104°F).

Table 311.315.60(C)(11.7.7) Ampacities of Three Single-Insulated Copper Conductors in Underground Electrical Ducts

(Three Conductors per Electrical Duct)

Conductor	Temperature Rating of Conductor			
	2001–5000 Volts Ampacity		5001–35,000 Volts Ampacity	
Size				
(AWG)	90°C (194°F) Type MV-90	105°C (221°F) Type MV-105	90°C (194°F) Type MV-90	105°C (221°F) Type MV-105
or kcmil)				
One Circuit [See Figure 311.315.60(D)(3), Detail 1.]				
8	64	69	—	—
6	85	92	90	97

Conductor	Temperature Rating of Conductor			
	2001–5000 Volts Ampacity		5001–35,000 Volts Ampacity	
Size				
(AWG	90°C (194°F) Type MV-90	105°C (221°F) Type MV-105	90°C (194°F) Type MV-90	105°C (221°F) Type MV-105
or kcmil)				
4	110	120	115	125
2	145	155	155	165
1	170	180	175	185
1/0	195	210	200	215
2/0	220	235	230	245
3/0	250	270	260	275
4/0	290	310	295	315
250	320	345	325	345
350	385	415	390	415
500	470	505	465	500
750	585	630	565	610
1000	670	720	640	690
Three Circuits [See Figure 311.15.60(D)(3), Detail 2.]				
8	56	60	—	—
6	73	79	77	83
4	95	100	99	105
2	125	130	130	135
1	140	150	145	155
1/0	160	175	165	175
2/0	185	195	185	200
3/0	210	225	210	225
4/0	235	255	240	255
250	260	280	260	280
350	315	335	310	330
500	375	405	370	395
750	460	495	440	475
1000	525	565	495	535
Six Circuits [See Figure 311.15.60(D)(3), Detail 3.]				
8	48	52	—	—
6	62	67	64	68
4	80	86	82	88

Conductor	Temperature Rating of Conductor			
	2001–5000 Volts Ampacity		5001–35,000 Volts Ampacity	
Size				
(AWG	90°C (194°F) Type MV-90	105°C (221°F) Type MV-105	90°C (194°F) Type MV-90	105°C (221°F) Type MV-105
or kcmil)				
2	105	110	105	115
1	115	125	120	125
1/0	135	145	135	145
2/0	150	160	150	165
3/0	170	185	170	185
4/0	195	210	190	205
250	210	225	210	225
350	250	270	245	265
500	300	325	290	310
750	365	395	350	375
1000	410	445	390	415

Note: Refer to 311.315.60(F) for basis of ampacities and Table 311.315.10(A) for the temperature rating of the conductor.

Table 311.315.60(C)(1278) Ampacities of Three Single-Insulated Aluminum Conductors in Underground Electrical Ducts

(Three Conductors per Electrical Duct)

Conductor	Temperature Rating of Conductor			
	2001–5000 Volts Ampacity		5001–35,000 Volts Ampacity	
Size				
(AWG	90°C (194°F) Type MV-90	105°C (221°F) Type MV-105	90°C (194°F) Type MV-90	105°C (221°F) Type MV-105
or kcmil)				
One Circuit [See Figure 311.315.60(D)(3), Detail 1.]				
8	50	54	—	—
6	66	71	70	75
4	86	93	91	98
2	115	125	120	130

Conductor	Temperature Rating of Conductor			
	2001–5000 Volts Ampacity		5001–35,000 Volts Ampacity	
Size				
(AWG	90°C (194°F) Type MV-90	105°C (221°F) Type MV-105	90°C (194°F) Type MV-90	105°C (221°F) Type MV-105
or kcmil)				
1	130	140	135	145
1/0	150	160	155	165
2/0	170	185	175	190
3/0	195	210	200	215
4/0	225	245	230	245
250	250	270	250	270
350	305	325	305	330
500	370	400	370	400
750	470	505	455	490
1000	545	590	525	565
Three Circuits [See Figure 311.60(D)(3), Detail 2.]				
8	44	47	—	—
6	57	61	60	65
4	74	80	77	83
2	96	105	100	105
1	110	120	110	120
1/0	125	135	125	140
2/0	145	155	145	155
3/0	160	175	165	175
4/0	185	200	185	200
250	205	220	200	220
350	245	265	245	260
500	295	320	290	315
750	370	395	355	385
1000	425	460	405	440
Six Circuits [See Figure 311.60(D)(3), Detail 3.]				
8	38	41	—	—
6	48	52	50	54
4	62	67	64	69
2	80	86	80	88
1	91	98	90	99

Conductor	Temperature Rating of Conductor			
	2001–5000 Volts Ampacity		5001–35,000 Volts Ampacity	
Size				
(AWG	90°C (194°F) Type MV-90	105°C (221°F) Type MV-105	90°C (194°F) Type MV-90	105°C (221°F) Type MV-105
or kcmil)				
1/0	105	110	105	110
2/0	115	125	115	125
3/0	135	145	130	145
4/0	150	165	150	160
250	165	180	165	175
350	195	210	195	210
500	240	255	230	250
750	290	315	280	305
1000	335	360	320	345

Note: Refer to 311.315.60(F) for basis of ampacities and Table 311.315.10(A) for the temperature rating of the conductor.

Table 311.315.60(C)(1379) Ampacities of Three Insulated Copper Conductors Cabled Within an Overall Covering

(Three-Conductor Cable) in Underground Electrical Ducts (One Cable per Electrical Duct)

Conductor	Temperature Rating of Conductor			
	2001–5000 Volts Ampacity		5001–35,000 Volts Ampacity	
Size				
(AWG	90°C (194°F) Type MV-90	105°C (221°F) Type MV-105	90°C (194°F) Type MV-90	105°C (221°F) Type MV-105
or kcmil)				
One Circuit [See Figure 311.315.60(D)(3), Detail 1.]				
8	59	64	—	—
6	78	84	88	95
4	100	110	115	125
2	135	145	150	160
1	155	165	170	185
1/0	175	190	195	210

Conductor	Temperature Rating of Conductor			
	2001–5000 Volts Ampacity		5001–35,000 Volts Ampacity	
Size				
(AWG	90°C (194°F) Type MV-90	105°C (221°F) Type MV-105	90°C (194°F) Type MV-90	105°C (221°F) Type MV-105
or kcmil)				
2/0	200	220	220	235
3/0	230	250	250	270
4/0	265	285	285	305
250	290	315	310	335
350	355	380	375	400
500	430	460	450	485
750	530	570	545	585
1000	600	645	615	660
Three Circuits [See Figure 311.60(D)(3), Detail 2.]				
8	53	57	—	—
6	69	74	75	81
4	89	96	97	105
2	115	125	125	135
1	135	145	140	155
1/0	150	165	160	175
2/0	170	185	185	195
3/0	195	210	205	220
4/0	225	240	230	250
250	245	265	255	270
350	295	315	305	325
500	355	380	360	385
750	430	465	430	465
1000	485	520	485	515
Six Circuits [See Figure 311.60(D)(3), Detail 3.]				
8	46	50	—	—
6	60	65	63	68
4	77	83	81	87
2	98	105	105	110
1	110	120	115	125
1/0	125	135	130	145
2/0	145	155	150	160

Conductor	Temperature Rating of Conductor			
	2001–5000 Volts Ampacity		5001–35,000 Volts Ampacity	
Size				
(AWG	90°C (194°F) Type MV-90	105°C (221°F) Type MV-105	90°C (194°F) Type MV-90	105°C (221°F) Type MV-105
or kcmil)				
3/0	165	175	170	180
4/0	185	200	190	200
250	200	220	205	220
350	240	270	245	275
500	290	310	290	305
750	350	375	340	365
1000	390	420	380	405

Note: Refer to 311.315.60(F) for basis of ampacities and Table 311.315.10(A) for the temperature rating of the conductor.

Table 311.315.60(C)(1488) Ampacities of Three Insulated Aluminum Conductors Cabled Within an Overall Covering

(Three-Conductor Cable) in Underground Electrical Ducts (One Cable per Electrical Duct)

Conductor	Temperature Rating of Conductor			
	2001–5000 Volts Ampacity		5001–35,000 Volts Ampacity	
Size				
(AWG	90°C (194°F) Type MV-90	105°C (221°F) Type MV-105	90°C (194°F) Type MV-90	105°C (221°F) Type MV-105
or kcmil)				
One Circuit [See Figure 311.315.60(D)(3), Detail 1.]				
8	46	50	—	—
6	61	66	69	74
4	80	86	89	96
2	105	110	115	125
1	120	130	135	145
1/0	140	150	150	165
2/0	160	170	170	185
3/0	180	195	195	210

Conductor	Temperature Rating of Conductor			
	2001–5000 Volts Ampacity		5001–35,000 Volts Ampacity	
Size				
(AWG	90°C (194°F) Type MV-90	105°C (221°F) Type MV-105	90°C (194°F) Type MV-90	105°C (221°F) Type MV-105
or kcmil)				
4/0	205	220	220	240
250	230	245	245	265
350	280	310	295	315
500	340	365	355	385
750	425	460	440	475
1000	495	535	510	545
Three Circuits [See Figure 311.15.60(D)(3), Detail 2.]				
8	41	44	—	—
6	54	58	59	64
4	70	75	75	81
2	90	97	100	105
1	105	110	110	120
1/0	120	125	125	135
2/0	135	145	140	155
3/0	155	165	160	175
4/0	175	185	180	195
250	190	205	200	215
350	230	250	240	255
500	280	300	285	305
750	345	375	350	375
1000	400	430	400	430
Six Circuits [See Figure 311.15.60(D)(3), Detail 3.]				
8	36	39	—	—
6	46	50	49	53
4	60	65	63	68
2	77	83	80	86
1	87	94	90	98
1/0	99	105	105	110
2/0	110	120	115	125
3/0	130	140	130	140
4/0	145	155	150	160

Conductor	Temperature Rating of Conductor			
	2001–5000 Volts Ampacity		5001–35,000 Volts Ampacity	
Size				
(AWG	90°C (194°F) Type MV-90	105°C (221°F) Type MV-105	90°C (194°F) Type MV-90	105°C (221°F) Type MV-105
or kcmil)				
250	160	170	160	170
350	190	205	190	205
500	230	245	230	245
750	280	305	275	295
1000	320	345	315	335

Note: Refer to 311.315.60(F) for basis of ampacities and Table 311.315.10(A) for the temperature rating of the conductor.

Table 311.315.60(C)(1581) Ampacities of Single Insulated Copper Conductors Directly Buried in Earth

Conductor	Temperature Rating of Conductor			
	2001–5000 Volts Ampacity		5001–35,000 Volts Ampacity	
Size				
(AWG	90°C (194°F) Type MV-90	105°C (221°F) Type MV-105	90°C (194°F) Type MV-90	105°C (221°F) Type MV-105
or kcmil)				
One Circuit, Three Conductors [See Figure 311.315.60(D)(3), Detail 9.]				
8	110	115	—	—
6	140	150	130	140
4	180	195	170	180
2	230	250	210	225
1	260	280	240	260
1/0	295	320	275	295
2/0	335	365	310	335
3/0	385	415	355	380
4/0	435	465	405	435
250	470	510	440	475
350	570	615	535	575
500	690	745	650	700

Conductor	Temperature Rating of Conductor			
	2001–5000 Volts Ampacity		5001–35,000 Volts Ampacity	
Size				
(AWG	90°C (194°F) Type MV-90	105°C (221°F) Type MV-105	90°C (194°F) Type MV-90	105°C (221°F) Type MV-105
or kcmil)				
750	845	910	805	865
1000	980	1055	930	1005
Two Circuits, Six Conductors [See Figure 311.315.60(D)(3), Detail 10.]				
8	100	110	—	—
6	130	140	120	130
4	165	180	160	170
2	215	230	195	210
1	240	260	225	240
1/0	275	295	255	275
2/0	310	335	290	315
3/0	355	380	330	355
4/0	400	430	375	405
250	435	470	410	440
350	520	560	495	530
500	630	680	600	645
750	775	835	740	795
1000	890	960	855	920

Note: Refer to 311.315.60(F) for basis of ampacities and Table 311.315.10(A) for the temperature rating of the conductor.

Table 311.315.60(C)(1682) Ampacities of Single Insulated Aluminum Conductors Directly Buried in Earth

Conductor	Temperature Rating of Conductor			
	2001–5000 Volts Ampacity		5001–35,000 Volts Ampacity	
Size				
(AWG	90°C (194°F) Type MV-90	105°C (221°F) Type MV-105	90°C (194°F) Type MV-90	105°C (221°F) Type MV-105
or kcmil)				
One Circuit, Three Conductors [See Figure 311.315.60(D)(3), Detail 9.]				

Conductor	Temperature Rating of Conductor			
	2001–5000 Volts Ampacity		5001–35,000 Volts Ampacity	
Size				
(AWG	90°C (194°F) Type MV-90	105°C (221°F) Type MV-105	90°C (194°F) Type MV-90	105°C (221°F) Type MV-105
or kcmil)				
8	85	90	—	—
6	110	115	100	110
4	140	150	130	140
2	180	195	165	175
1	205	220	185	200
1/0	230	250	215	230
2/0	265	285	245	260
3/0	300	320	275	295
4/0	340	365	315	340
250	370	395	345	370
350	445	480	415	450
500	540	580	510	545
750	665	720	635	680
1000	780	840	740	795
Two Circuits, Six Conductors [See Figure 311.315.60(D)(3), Detail 10.]				
8	80	85	—	—
6	100	110	95	100
4	130	140	125	130
2	165	180	155	165
1	190	200	175	190
1/0	215	230	200	215
2/0	245	260	225	245
3/0	275	295	255	275
4/0	310	335	290	315
250	340	365	320	345
350	410	440	385	415
500	495	530	470	505
750	610	655	580	625
1000	710	765	680	730

Note: Refer to 311.315.60(F) for basis of ampacities and Table 311.315.10(A) for the temperature rating of the conductor.

Table 314.315.60(C)(1783) Ampacities of Three Insulated Copper Conductors Cabled Within an Overall Covering

(Three-Conductor Cable), Directly Buried in Earth

Conductor	Temperature Rating of Conductor			
	2001–5000 Volts Ampacity		5001–35,000 Volts Ampacity	
Size	90°C (194°F) Type MV-90	105°C (221°F) Type MV-105	90°C (194°F) Type MV-90	105°C (221°F) Type MV-105
(AWG or kcmil)				
One Circuit [See Figure 314.315.60(D)(3), Detail 5.]				
8	85	89	—	—
6	105	115	115	120
4	135	150	145	155
2	180	190	185	200
1	200	215	210	225
1/0	230	245	240	255
2/0	260	280	270	290
3/0	295	320	305	330
4/0	335	360	350	375
250	365	395	380	410
350	440	475	460	495
500	530	570	550	590
750	650	700	665	720
1000	730	785	750	810
Two Circuits [See Figure 314.315.60(D)(3), Detail 6.]				
8	80	84	—	—
6	100	105	105	115
4	130	140	135	145
2	165	180	170	185
1	185	200	195	210
1/0	215	230	220	235
2/0	240	260	250	270
3/0	275	295	280	305
4/0	310	335	320	345
250	340	365	350	375
350	410	440	420	450
500	490	525	500	535
750	595	640	605	650

Conductor	Temperature Rating of Conductor			
	2001–5000 Volts Ampacity		5001–35,000 Volts Ampacity	
Size	90°C (194°F) Type MV-90	105°C (221°F) Type MV-105	90°C (194°F) Type MV-90	105°C (221°F) Type MV-105
(AWG or kcmil)				
1000	665	715	675	730

Note: Refer to 311.315.60(F) for basis of ampacities and Table 311.315.10(A) for the temperature rating of the conductor.

Table 311.315.60(C)(1884) Ampacities of Three Insulated Aluminum Conductors Cabled Within an Overall Covering

(Three-Conductor Cable), Directly Buried in Earth

Conductor	Temperature Rating of Conductor			
	2001–5000 Volts Ampacity		5001–35,000 Volts Ampacity	
Size	90°C (194°F) Type MV-90	105°C (221°F) Type MV-105	90°C (194°F) Type MV-90	105°C (221°F) Type MV-105
(AWG or kcmil)				
One Circuit [See Figure 311.315.60(D)(3), Detail 5.]				
8	65	70	—	—
6	80	88	90	95
4	105	115	115	125
2	140	150	145	155
1	155	170	165	175
1/0	180	190	185	200
2/0	205	220	210	225
3/0	230	250	240	260
4/0	260	280	270	295
250	285	310	300	320
350	345	375	360	390
500	420	450	435	470
750	520	560	540	580
1000	600	650	620	665
Two Circuits [See Figure 311.315.60(D)(3), Detail 6.]				
8	60	66	—	—

Conductor	Temperature Rating of Conductor			
	2001–5000 Volts Ampacity		5001–35,000 Volts Ampacity	
Size				
(AWG	90°C (194°F) Type MV-90	105°C (221°F) Type MV-105	90°C (194°F) Type MV-90	105°C (221°F) Type MV-105
or kcmil)				
6	75	83	80	95
4	100	110	105	115
2	130	140	135	145
1	145	155	150	165
1/0	165	180	170	185
2/0	190	205	195	210
3/0	215	230	220	240
4/0	245	260	250	270
250	265	285	275	295
350	320	345	330	355
500	385	415	395	425
750	480	515	485	525
1000	550	590	560	600

Note: Refer to 311.315.60(F) for basis of ampacities and Table 311.315.10(A) for the temperature rating of the conductor.

Table 311.315.60(C)(1985) Ampacities of Three Triplexed Single Insulated Copper Conductors Directly Buried in Earth

Conductor	Temperature Rating of Conductor			
	2001–5000 Volts Ampacity		5001–35,000 Volts Ampacity	
Size				
(AWG	90°C (194°F) Type MV-90	105°C (221°F) Type MV-105	90°C (194°F) Type MV-90	105°C (221°F) Type MV-105
or kcmil)				
One Circuit, Three Conductors [See Figure 311.315.60(D)(3), Detail 7.]				
8	90	95	—	—
6	120	130	115	120
4	150	165	150	160
2	195	205	190	205

Conductor	Temperature Rating of Conductor			
	2001–5000 Volts Ampacity		5001–35,000 Volts Ampacity	
Size				
(AWG	90°C (194°F) Type MV-90	105°C (221°F) Type MV-105	90°C (194°F) Type MV-90	105°C (221°F) Type MV-105
or kcmil)				
1	225	240	215	230
1/0	255	270	245	260
2/0	290	310	275	295
3/0	330	360	315	340
4/0	375	405	360	385
250	410	445	390	410
350	490	580	470	505
500	590	635	565	605
750	725	780	685	740
1000	825	885	770	830
Two Circuits, Six Conductors [See Figure 311.315.60(D)(3), Detail 8.]				
8	85	90	—	—
6	110	115	105	115
4	140	150	140	150
2	180	195	175	190
1	205	220	200	215
1/0	235	250	225	240
2/0	265	285	255	275
3/0	300	320	290	315
4/0	340	365	325	350
250	370	395	355	380
350	445	480	425	455
500	535	575	510	545
750	650	700	615	660
1000	740	795	690	745

Note: Refer to 311.315.60(F) for basis of ampacities and Table 311.315.10(A) for the temperature rating of the conductor.

Table 311.315.60(C)(2006) Ampacities of Three Triplexed Single Insulated Aluminum Conductors Directly Buried in Earth

Conductor	Temperature Rating of Conductor			
	2001–5000 Volts Ampacity		5001–35,000 Volts Ampacity	
	90°C (194°F)	105°C (221°F)	90°C (194°F)	105°C (221°F)
Size (AWG or kcmil)	Type MV-90	Type MV-105	Type MV-90	Type MV-105
One Circuit, Three Conductors [See Figure 311.60(D)(3), Detail 7.]				
8	70	75	—	—
6	90	100	90	95
4	120	130	115	125
2	155	165	145	155
1	175	190	165	175
1/0	200	210	190	205
2/0	225	240	215	230
3/0	255	275	245	265
4/0	290	310	280	305
250	320	350	305	325
350	385	420	370	400
500	465	500	445	480
750	580	625	550	590
1000	670	725	635	680
Two Circuits, Six Conductors [See Figure 311.60(D)(3), Detail 8.]				
8	65	70	—	—
6	85	95	85	90
4	110	120	105	115
2	140	150	135	145
1	160	170	155	170
1/0	180	195	175	190
2/0	205	220	200	215
3/0	235	250	225	245
4/0	265	285	255	275
250	290	310	280	300
350	350	375	335	360
500	420	455	405	435
750	520	560	485	525
1000	600	645	565	605

Note: Refer to 311.315.60(F) for basis of ampacities and Table 311.315.10(A) for the temperature rating of the conductor.

(D) Ampacity Adjustment.

(1) Grounded Shields.

Ampacities shown in Table 311.315.60(C)(69), Table 311.315.60(C)(70), Table 311.315.60(C)(81), and Table 311.315.60(C)(82) shall apply for cables with shields grounded at one point only. Where shields for these cables are grounded at more than one point, ampacities shall be adjusted to take into consideration the heating due to shield currents.

Informational Note: Tables other than those listed contain the ampacity of cables with shields grounded at multiple points.

(2) Burial Depth.

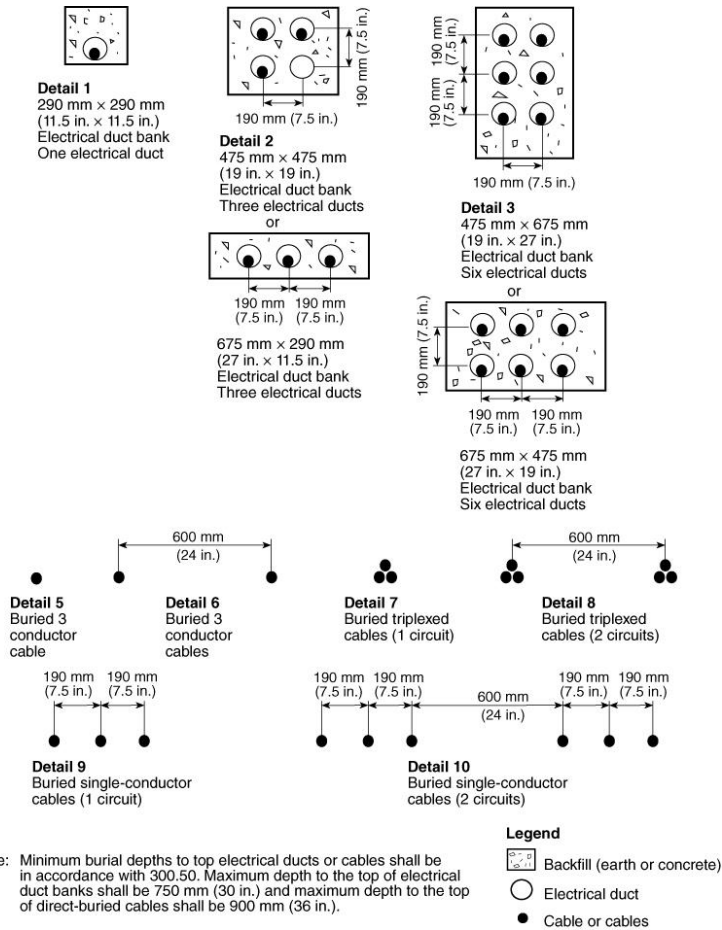
Where the burial depth of direct burial or electrical duct bank circuits is modified from the values shown in a figure or table, ampacities shall be permitted to be modified as indicated in 311.315.60(D)(2)(a) and (D)(2)(b). No ampacity adjustments shall be required where the burial depth is decreased.

- (a) Where burial depths are increased in part(s) of an electrical duct run, a decrease in ampacity of the conductors shall not be required, provided the total length of parts of the duct run increased in depth is less than 25 percent of the total run length.
- (b) Where burial depths are deeper than shown in a specific underground ampacity table or figure, an ampacity derating factor of 6 percent per 300 mm (1 ft) increase in depth for all values of rho shall be permitted.

(3) Electrical Ducts Entering Equipment Enclosures.

At locations where electrical ducts enter equipment enclosures from underground, spacing between such ducts, as shown in Figure 311.315.60(D)(3), shall be permitted to be reduced without requiring the ampacity of conductors therein to be reduced.

Figure 311.315.60(D)(3) Cable Installation Dimensions for Use with Table 311.315.60(C)(77) Through Table 311.315.60(C)(86).



(4) Ambient Temperature Correction.

Ampacities for ambient temperatures other than those specified in the ampacity tables shall be corrected in accordance with Table 315.60(D)(4) or shall be permitted to be calculated using the following equation:

$$I' = I \sqrt{\frac{T_c - T_a'}{T_c - T_a}} \quad [315.60(D)(4)]$$

where:

I' = ampacity corrected for ambient temperature

I = ampacity shown in the table for T_c and T_a

T_c = temperature rating of conductor (°C)
 T_a' = new ambient temperature (°C)
 T_a = ambient temperature used in the table (°C)

Informational Note: See 110.40 for ambient temperature adjustments for terminals.

Commented [CK2]: PROD: Make this separate from (not part of) the “where” list.

Table 311.315.60(D)(4) Ambient Temperature Correction Factors

For ambient temperatures other than 40°C (104°F), multiply the allowable ampacities specified in the ampacity tables by the appropriate factor shown below.			
Ambient Temperature (°C)	Temperature Rating of Conductor		Ambient Temperature (°F)
	90°C	105°C	
10 or less	1.26	1.21	50 or less
11–15	1.22	1.18	51–59
16–20	1.18	1.14	60–68
21–25	1.14	1.11	69–77
26–30	1.10	1.07	78–86
31–35	1.05	1.04	87–95
36–40	1.00	1.00	96–104
41–45	0.95	0.96	105–113
46–50	0.89	0.92	114–122
51–55	0.84	0.88	123–131
56–60	0.77	0.83	132–140
61–65	0.71	0.78	141–149
66–70	0.63	0.73	150–158
71–75	0.55	0.68	159–167
76–80	0.45	0.62	168–176
81–85	0.32	0.55	177–185
86–90	—	0.48	186–194
91–95	—	0.39	195–203
96–100	—	0.28	204–212

(E) Ampacity in Air.

Ampacities for conductors and cables in air shall be as specified in Table 311.315.60(C)(67) through Table 311.315.60(C)(76). Ampacities shall be based on the following:

- (1) Conductor temperatures of 90°C (194°F) and 105°C (221°F)
- (2) Ambient air temperature of 40°C (104°F)

Informational Note: See ~~311~~315.60(D)(4) where the ambient air temperature is other than 40°C (104°F).

(F) Ampacity in Underground Electrical Ducts and Direct Buried in Earth.

Ampacities for conductors and cables in underground electrical ducts and direct buried in earth shall be as specified in Table ~~311~~315.60(C)(77) through Table ~~311~~315.60(C)(86). Ampacities shall be based on the following:

- (1) Ambient earth temperature of 20°C (68°F)
- (2) Arrangement in accordance with Figure 311.60(D)(3)
- (3) 100 percent load factor
- (4) Thermal resistance (Rho) of 90
- (5) Conductor temperatures 90°C (194°F) and 105°C (221°F)
- (6) Minimum burial depths to the top electrical ducts or cables shall be in accordance with 300.50.
- (7) Maximum depth to the top of electrical duct banks shall be 750 mm (30 in.), and maximum depth to the top of direct-buried cables shall be 900 mm (36 in.).



First Revision No. 8562-NFPA 70-2021 [Detail]

Revise the title of Article 337 as follows:

Article 337 Drilling Rig Cable: Type P ~~Cable~~

Submitter Information Verification

Committee: NEC-P06

Submittal Date: Thu Jan 07 15:20:51 EST 2021

Committee Statement

Committee Statement: Change the title of the Article 337 to "Drilling Rig Cable" The title and scope were revised to provide a name for this cable. Code Making Panel 6 refers this recommendation to the Correlating Committee for review .

Response Message: FR-8562-NFPA 70-2021

[Public Input No. 1805-NFPA 70-2020 \[Article 337\]](#)

Ballot Results

✔ **This item has passed ballot**

14 Eligible Voters

0 Not Returned

13 Affirmative All

1 Affirmative with Comments

0 Negative with Comments

0 Abstention

Affirmative All

Crisman, Todd

Cross, Joseph W.

Deacy, Brian

Earl, Timothy

Hunter, Christel K.

Kent, Gerald W.

Lamp, Kelly

Newman Searce, Susan

Nielsen, Dennis A.

Porcaro, Michael Thomas

Riedl, Kenneth

Stene, Susan L.

Watson, Dave

Affirmative with Comment

Graser, Peter

This conductor's use with Drilling Rigs for oil and gas is the primary use of this type of conductor currently, so it is appropriate at this point to use the word "drilling" in its name. However, to limit this cable through name association to drilling would not serve the greater industry long term. These cables are designed for harsh environments, which can exist in other locations beside oil and gas. I would have rather seen a broader name for Type P cable, something to address the properties of the cable rather than its current primary application: to power drilling.



First Revision No. 8430-NFPA 70-2021 [Definition: Copper-Clad Aluminum Conductors.]

Copper-Clad Aluminum Conductors.

Conductors drawn from a copper-clad aluminum rod, with the copper metallurgically bonded to an aluminum core, where the copper forms a minimum of 10 percent of the cross-sectional area of a solid conductor or each strand of a stranded conductor . (CMP-6)

Submitter Information Verification

Committee: NEC-P06

Submittal Date: Wed Jan 06 08:59:42 EST 2021

Committee Statement

Committee Statement: This revision will remove the requirement out of the definition for CCA Conductors and ensure compliance with the Style Manual section 2.3.3.3.

Response Message: FR-8430-NFPA 70-2021

[Public Input No. 2857-NFPA 70-2020 \[Definition: Copper-Clad Aluminum Conductors.\]](#)

Ballot Results

✓ **This item has passed ballot**

14 Eligible Voters

0 Not Returned

14 Affirmative All

0 Affirmative with Comments

0 Negative with Comments

0 Abstention

Affirmative All

Crisman, Todd

Cross, Joseph W.

Deacy, Brian

Earl, Timothy

Graser, Peter

Hunter, Christel K.

Kent, Gerald W.

Lamp, Kelly

Newman Searce, Susan

Nielsen, Dennis A.

Porcaro, Michael Thomas

Riedl, Kenneth

Stene, Susan L.

Watson, Dave



First Revision No. 8623-NFPA 70-2021 [New Definition after Definition: Cable Routing Assembly.]

Cable Termination, Type MV.

A connection consisting of an insulation system and a connector and installed on a Type MV cable to connect from a cable to a device, such as equipment, in a way that is to be chemically, mechanically, and electrically stable. (CMP-6).

Submitter Information Verification

Committee: NEC-P06

Submittal Date: Thu Jan 07 23:32:50 EST 2021

Committee Statement

Committee Statement: These definitions are being added to correlate with the addition of cable joints and cable terminations in Article 315.

Response Message: FR-8623-NFPA 70-2021

Ballot Results

✓ This item has passed ballot

14 Eligible Voters

0 Not Returned

14 Affirmative All

0 Affirmative with Comments

0 Negative with Comments

0 Abstention

Affirmative All

Crisman, Todd

Cross, Joseph W.

Deacy, Brian

Earl, Timothy

Graser, Peter

Hunter, Christel K.

Kent, Gerald W.

Lamp, Kelly

Newman Scarce, Susan

Nielsen, Dennis A.

Porcaro, Michael Thomas

Riedl, Kenneth

Stene, Susan L.

Watson, Dave



First Revision No. 8622-NFPA 70-2021 [New Definition after Definition: Cable, Coaxial.]

Cable Joint, Type MV.

A connection consisting of an insulation system and a connector where two (or more) cables are joined together in a way that is to be chemically, mechanically, and electrically stable. (CMP-6).

Submitter Information Verification

Committee: NEC-P06

Submittal Date: Thu Jan 07 23:29:22 EST 2021

Committee Statement

Committee Statement: These definitions are being added to correlate with the addition of cable joints and cable terminations in Article 315.

Response Message: FR-8622-NFPA 70-2021

Ballot Results

✓ **This item has passed ballot**

14 Eligible Voters

0 Not Returned

14 Affirmative All

0 Affirmative with Comments

0 Negative with Comments

0 Abstention

Affirmative All

Crisman, Todd

Cross, Joseph W.

Deacy, Brian

Earl, Timothy

Graser, Peter

Hunter, Christel K.

Kent, Gerald W.

Lamp, Kelly

Newman Scarce, Susan

Nielsen, Dennis A.

Porcaro, Michael Thomas

Riedl, Kenneth

Stene, Susan L.

Watson, Dave



First Revision No. 8630-NFPA 70-2021 [New Definition after Definition: Cable, Optical Fiber, Nonc...]

Cable, Portable Power Feeder. (Portable Power Feeder Cable)

One or more flexible shielded insulated power conductors enclosed in a flexible covering that provides mechanical protection with voltage rating from 2000 to 25,000 volts. (CMP-6)

Submitter Information Verification

Committee: NEC-P06

Submittal Date: Fri Jan 08 10:21:00 EST 2021

Committee Statement

Committee Statement: These terms are used throughout the code necessitating the need for definitions.

Response Message: FR-8630-NFPA 70-2021

Ballot Results

✓ **This item has passed ballot**

14 Eligible Voters

0 Not Returned

14 Affirmative All

0 Affirmative with Comments

0 Negative with Comments

0 Abstention

Affirmative All

Crisman, Todd

Cross, Joseph W.

Deacy, Brian

Earl, Timothy

Graser, Peter

Hunter, Christel K.

Kent, Gerald W.

Lamp, Kelly

Newman Searce, Susan

Nielsen, Dennis A.

Porcaro, Michael Thomas

Riedl, Kenneth

Stene, Susan L.

Watson, Dave



First Revision No. 8428-NFPA 70-2021 [New Definition after Definition: Communications Equipment.]

Compact (as applied to conductor stranding).

A conductor where each layer of strands is pressed together to the extent that almost all the gaps between the strands are eliminated so that the overall diameter of the finished conductor is less than a concentric stranded conductor and less than a compressed stranded conductor. (CMP-6).

Submitter Information Verification

Committee: NEC-P06

Submittal Date: Wed Jan 06 08:40:09 EST 2021

Committee Statement

Committee Statement: The Definitions for conductor stranding have been relocated to Article 100 and text removed from Chapter 9 Table 8 and Annex C to align with the Style Manual.

Response Message: FR-8428-NFPA 70-2021

Public Input No. 860-NFPA 70-2020 [Global Input]

Ballot Results

✓ **This item has passed ballot**

14 Eligible Voters

0 Not Returned

14 Affirmative All

0 Affirmative with Comments

0 Negative with Comments

0 Abstention

Affirmative All

Crisman, Todd

Cross, Joseph W.

Deacy, Brian

Earl, Timothy

Graser, Peter

Hunter, Christel K.

Kent, Gerald W.

Lamp, Kelly

Newman Scearce, Susan

Nielsen, Dennis A.

Porcaro, Michael Thomas

Riedl, Kenneth

Stene, Susan L.

Watson, Dave



First Revision No. 9024-NFPA 70-2021 [New Definition after Definition: Communications Equipment.]

Compressed (as applied to conductor stranding).

A conductor where the outer layer of strands is pressed together so that the overall diameter of the finished conductor is less than a concentric stranded conductor but greater than a compact stranded conductor. (CMP-6).

Submitter Information Verification

Committee: NEC-P06

Submittal Date: Wed Jan 13 22:07:45 EST 2021

Committee Statement

Committee Statement: The Definitions for conductor stranding have been relocated to Article 100 and text removed from Chapter 9 Table 8 and Annex C to align with the Style Manual.

Response Message: FR-9024-NFPA 70-2021

Ballot Results

✓ This item has passed ballot

14 Eligible Voters

0 Not Returned

14 Affirmative All

0 Affirmative with Comments

0 Negative with Comments

0 Abstention

Affirmative All

Crisman, Todd

Cross, Joseph W.

Deacy, Brian

Earl, Timothy

Graser, Peter

Hunter, Christel K.

Kent, Gerald W.

Lamp, Kelly

Newman Scarce, Susan

Nielsen, Dennis A.

Porcaro, Michael Thomas

Riedl, Kenneth

Stene, Susan L.

Watson, Dave



First Revision No. 8429-NFPA 70-2021 [New Definition after Definition: Concealed.]

Concentric (as applied to conductor stranding).

A conductor consisting of a straight central strand surrounded by one or more layers of strands, helically laid in a geometric pattern. (CMP-6).

Submitter Information Verification

Committee: NEC-P06

Submittal Date: Wed Jan 06 08:56:17 EST 2021

Committee Statement

Committee Statement: The Definitions for conductor stranding have been relocated to Article 100 and text removed from Chapter 9 Table 8 and Annex C to align with the Style Manual.

Response Message: FR-8429-NFPA 70-2021

Ballot Results

✓ This item has passed ballot

14 Eligible Voters

0 Not Returned

14 Affirmative All

0 Affirmative with Comments

0 Negative with Comments

0 Abstention

Affirmative All

Crisman, Todd

Cross, Joseph W.

Deacy, Brian

Earl, Timothy

Graser, Peter

Hunter, Christel K.

Kent, Gerald W.

Lamp, Kelly

Newman Searce, Susan

Nielsen, Dennis A.

Porcaro, Michael Thomas

Riedl, Kenneth

Stene, Susan L.

Watson, Dave



First Revision No. 8543-NFPA 70-2021 [New Definition after Definition:

Coordination, Selective (S...]

Cord Set.

A length of flexible cord having an attachment plug at one end and a cord connector at the other end. (CMP-6)

Submitter Information Verification

Committee: NEC-P06

Submittal Date: Thu Jan 07 12:57:50 EST 2021

Committee Statement

Committee Statement: These terms are used throughout the code necessitating the need for definitions.

Response Message: FR-8543-NFPA 70-2021

Public Input No. 1228-NFPA 70-2020 [New Section after 400.2]

Ballot Results

✓ **This item has passed ballot**

14 Eligible Voters

0 Not Returned

14 Affirmative All

0 Affirmative with Comments

0 Negative with Comments

0 Abstention

Affirmative All

Crisman, Todd

Cross, Joseph W.

Deacy, Brian

Earl, Timothy

Graser, Peter

Hunter, Christel K.

Kent, Gerald W.

Lamp, Kelly

Newman Searce, Susan

Nielsen, Dennis A.

Porcaro, Michael Thomas

Riedl, Kenneth

Stene, Susan L.

Watson, Dave



First Revision No. 8545-NFPA 70-2021 [New Definition after Definition:

Coordination, Selective (S...]

Cord, Flexible. (Flexible Cord)

Two or more flexible insulated conductors enclosed in a flexible covering that provides mechanical protection. [79: 3.3.29] (CMP-6)

Submitter Information Verification

Committee: NEC-P06

Submittal Date: Thu Jan 07 13:00:21 EST 2021

Committee Statement

Committee Statement: These terms are used throughout the code necessitating the need for definitions.

Response Message: FR-8545-NFPA 70-2021

Ballot Results

✓ This item has passed ballot

14 Eligible Voters

0 Not Returned

14 Affirmative All

0 Affirmative with Comments

0 Negative with Comments

0 Abstention

Affirmative All

Crisman, Todd

Cross, Joseph W.

Deacy, Brian

Earl, Timothy

Graser, Peter

Hunter, Christel K.

Kent, Gerald W.

Lamp, Kelly

Newman Searce, Susan

Nielsen, Dennis A.

Porcaro, Michael Thomas

Riedl, Kenneth

Stene, Susan L.

Watson, Dave



First Revision No. 8547-NFPA 70-2021 [New Definition after Definition:

Coordination, Selective (S...]

Cord Connector.

A female contact device that mates with an attachment plug or other male device. (CMP-6)

Submitter Information Verification

Committee: NEC-P06

Submittal Date: Thu Jan 07 13:05:25 EST 2021

Committee Statement

Committee Statement: These terms are used throughout the code necessitating the need for definitions.

Response Message: FR-8547-NFPA 70-2021

Ballot Results

✓ **This item has passed ballot**

14 Eligible Voters

0 Not Returned

14 Affirmative All

0 Affirmative with Comments

0 Negative with Comments

0 Abstention

Affirmative All

Crisman, Todd

Cross, Joseph W.

Deacy, Brian

Earl, Timothy

Graser, Peter

Hunter, Christel K.

Kent, Gerald W.

Lamp, Kelly

Newman Searce, Susan

Nielsen, Dennis A.

Porcaro, Michael Thomas

Riedl, Kenneth

Stene, Susan L.

Watson, Dave



First Revision No. 8546-NFPA 70-2021 [New Definition after Definition: Power Production Equipment.]

Power-Supply Cord.

A length of flexible cord with an attachment plug at one end and individual cord conductors not terminated in a cord connector at the opposite end. (CMP-6).

Submitter Information Verification

Committee: NEC-P06

Submittal Date: Thu Jan 07 13:03:19 EST 2021

Committee Statement

Committee Statement: These terms are used throughout the code necessitating the need for definitions.

Response Message: FR-8546-NFPA 70-2021

Ballot Results

✓ **This item has passed ballot**

14 Eligible Voters

0 Not Returned

14 Affirmative All

0 Affirmative with Comments

0 Negative with Comments

0 Abstention

Affirmative All

Crisman, Todd

Cross, Joseph W.

Deacy, Brian

Earl, Timothy

Graser, Peter

Hunter, Christel K.

Kent, Gerald W.

Lamp, Kelly

Newman Searce, Susan

Nielsen, Dennis A.

Porcaro, Michael Thomas

Riedl, Kenneth

Stene, Susan L.

Watson, Dave



First Revision No. 8373-NFPA 70-2021 [Section No. 310.1]

310.1 Scope.

This article covers general requirements for conductors rated up to and including 2000 volts and their type designations, insulations, markings, mechanical strengths, ampacity ratings, and uses. These requirements do not apply to conductors that form an integral part of equipment, such as motors, motor controllers, and similar equipment, or to conductors specifically provided for elsewhere in this *Code*.

Informational Note: ~~For See Chapter 4 for flexible cords and cables, see Article 400 .~~
~~For fixture wires, see Article 402 , flexible cables, and fixture wires .~~

Submitter Information Verification

Committee: NEC-P06

Submittal Date: Tue Jan 05 10:49:41 EST 2021

Committee Statement

Committee Statement: The revisions made to the informational notes were done to ensure compliance with the Style Manual.

Response Message: FR-8373-NFPA 70-2021

Ballot Results

✓ This item has passed ballot

14 Eligible Voters

0 Not Returned

14 Affirmative All

0 Affirmative with Comments

0 Negative with Comments

0 Abstention

Affirmative All

Crisman, Todd

Cross, Joseph W.

Deacy, Brian

Earl, Timothy

Graser, Peter

Hunter, Christel K.

Kent, Gerald W.

Lamp, Kelly

Newman Searce, Susan

Nielsen, Dennis A.

Porcaro, Michael Thomas

Riedl, Kenneth

Stene, Susan L.

Watson, Dave



First Revision No. 8371-NFPA 70-2021 [Section No. 310.3(A)]

(A) Minimum Size of Conductors.

The minimum size of conductors for voltage ratings up to and including 2000 volts shall be 14 AWG copper or 12 AWG aluminum or copper 16 AWG copper, 14 AWG copper-clad aluminum, or 12 AWG aluminum, except as permitted elsewhere in this *Code*.

Submitter Information Verification

Committee: NEC-P06

Submittal Date: Tue Jan 05 10:22:12 EST 2021

Committee Statement

Committee Statement: The minimum conductor sizes for copper and copper-clad aluminum are being reduced to 16 AWG copper and 14 AWG copper-clad aluminum. These revisions are based on testing submitted in support of the use of copper-clad aluminum conductors for 10 amp circuits, and the decades of successful use of 16 AWG copper conductors in fixture wire, motor wiring, control wiring, and other current-carrying applications as permitted in the NEC.

Response Message: FR-8371-NFPA 70-2021

[Public Input No. 3241-NFPA 70-2020 \[Section No. 310.3\(A\)\]](#)

Ballot Results

✓ **This item has passed ballot**

14 Eligible Voters

0 Not Returned

11 Affirmative All

1 Affirmative with Comments

2 Negative with Comments

0 Abstention

Affirmative All

Crisman, Todd

Cross, Joseph W.

Earl, Timothy

Kent, Gerald W.

Lamp, Kelly

Newman Searce, Susan

Nielsen, Dennis A.

Porcaro, Michael Thomas

Riedl, Kenneth

Stene, Susan L.

Watson, Dave

Affirmative with Comment

Graser, Peter

The bimetallics industry complied with the requirements of CMP-6 from the 2020 NEC cycle by providing test data validating the ampacity and suitability of 14 AWG copper-clad aluminum (CCA). Additional information and test data was submitted as substantiation that resolved several other concerns expressed by members of the Correlating Committee Bimetallics Task Group. Adding 14 AWG CCA as a minimum branch circuit size gives users safe alternatives for small loads for such applications as LED lighting. Over the 2020 and 2023 NEC cycles, 14 AWG CCA has been tested and researched to confirm its safe use at a 60°C rating of 10-Amps for branch circuits, as well as establishing other safe conductor ampacities supported by the test data. 16 AWG copper has also been proven safe for use for decades at 8 amps as evidenced by Table 402.5 for fixture wires, motor branch circuits in 430.22(G), and the ampacity provisions in NFPA 79. The ampacities from NFPA 79 were a significant part of the historical substantiation for introducing 16 AWG copper into the Code. It is noted that the changes for 16 AWG copper added for general branch circuit application, in power cable assemblies, and with 60°C and 75°C ampacities was done without public inputs or submission of specific testing data as was required for 14 AWG CCA.

Negative with Comment

Deacy, Brian

The inclusion of smaller sizes for branch circuits is unwarranted and will lead to a greatly increased opportunity for overloading circuits, overheating terminations, and creating fire hazards.

Hunter, Christel K.

The Aluminum Association does not support the use of smaller conductors for branch circuit wiring due to the risk of improper use and overheating of smaller gauge wire.



First Revision No. 8372-NFPA 70-2021 [Section No. 310.3(B)]

(B) Conductor Material.

Conductors in this article shall be of copper, aluminum, or copper-clad aluminum, or copper unless otherwise specified. Aluminum and copper-clad aluminum shall comply with the following:

~~Solid aluminum conductors 8, 10, and 12 AWG shall be made of an AA-8000 series electrical grade aluminum alloy conductor material. Stranded aluminum conductors 8 AWG through 1000 kcmil marked as Type RHH, RHW, XHHW, THW, THHW, THWN, THHN, service-entrance Type SE Style U, and SE Style R shall be made of an AA-8000 series electrical grade aluminum alloy conductor material.~~

- (1) Solid aluminum conductors 8, 10, and 12 AWG shall be made of an AA-8000 series electrical grade aluminum alloy conductor material.
- (2) Stranded aluminum conductors 8 AWG through 1000 kcmil marked as Type RHH, RHW, XHHW, XHHN, XHWN, THW, THHW, THWN, THHN, service-entrance Type SE Style U, and SE Style R shall be made of an AA-8000 series electrical grade aluminum alloy conductor material.
- (3) For copper-clad aluminum conductors, the copper shall form a minimum 10 percent of the cross-sectional area of a solid conductor or each strand of a stranded conductor. The aluminum core of a copper-clad aluminum conductor shall be made of an AA-8000 series electrical grade aluminum alloy conductor material.
- (4) Copper-clad aluminum conductor material shall be listed.

Submitter Information Verification

Committee: NEC-P06

Submittal Date: Tue Jan 05 10:25:21 EST 2021

Committee Statement

Committee Statement: The composition requirements for copper-clad aluminum were removed from the definition and relocated into this section. The language was reorganized into a list format. Language was added to require that the copper-clad aluminum conductor be listed.

Insulation type XHHN and XHWN were added to the list as they were newly added to the code.

Response Message: FR-8372-NFPA 70-2021

Public Input No. 3243-NFPA 70-2020 [Section No. 310.3(B)]

Ballot Results

✓ **This item has passed ballot**

14 Eligible Voters

0 Not Returned

13 Affirmative All

0 Affirmative with Comments

1 Negative with Comments

0 Abstention

Affirmative All

Crisman, Todd

Cross, Joseph W.

Earl, Timothy

Graser, Peter

Hunter, Christel K.

Kent, Gerald W.

Lamp, Kelly

Newman Searce, Susan

Nielsen, Dennis A.

Porcaro, Michael Thomas

Riedl, Kenneth

Stene, Susan L.

Watson, Dave

Negative with Comment

Deacy, Brian

The inclusion of smaller sizes for branch circuits is unwarranted and will lead to a greatly increased opportunity for overloading circuits, overheating terminations, and creating fire hazards.



First Revision No. 8342-NFPA 70-2021 [Section No. 310.4]

310.4 Conductor Constructions and Applications.

Insulated conductors shall comply with ~~Table 310.4(A)~~ Table 310.4(1) and ~~Table 310.4(B)~~ Table 310.4(2).

Informational Note: Thermoplastic insulation may stiffen at temperatures lower than -10°C ($+14^{\circ}\text{F}$). Thermoplastic insulation may also be deformed at normal temperatures where subjected to pressure, such as at points of support.

Table 310.4(1) Conductor Applications and Insulations Rated 600 Volts⁴

Trade Name	Type Letter	Maximum Operating Temperature	Application Provisions	Insulation	Thickness of Insulation					
					AWG or kcmil		mm		mils	
Fluorinated ethylene propylene	FEP or FEPB	167 90°C (194°F)	Dry and damp locations	Fluorinated ethylene propylene	14–10	0.51		20		
		200°C (392°F)	Dry locations — special applications ^{3 2}	Fluorinated ethylene propylene	8–2	0.76		30		
					14–8	0.36		14		
					6–2	0.36		14		
Mineral insulation (metal sheathed)	MI	90°C (194°F)	Dry and wet locations	Magnesium oxide	18–16 ^{4 3}	0.58		23		
		250°C (482°F)	For special applications ^{3 2}		16–10	0.91		36		
					9–4	1.27		50		
					3–500	1.40		55		
Moisture-, heat-, and oil-resistant thermoplastic	MTW	60°C (140°F)	Machine tool wiring in wet locations	Flame-retardant, moisture-, heat-, and oil-resistant thermoplastic	22–12 10 8 6 4–2 1–4/0 213–500 501–1000	(A)	(B)	(A)	(B)	
		90°C (194°F)	Machine tool wiring in dry locations. Informational Note: See NFPA 79-2021, <i>Electrical Standard for Industrial Machinery</i> .			0.76	0.38	30	15	
						0.76	0.51	30	20	
						1.14	0.76	45	30	
						1.52	0.76	60	30	
						1.52	1.02	60	40	
						2.03	1.27	80	50	
						2.41	1.52	95	60	
						2.79	1.78	110	70	
						Paper	85°C (185°F)	For underground service conductors, or by special permission	Paper	
Perfluoro-alkoxy	PFA	90°C (194°F)	Dry and damp locations	Perfluoro-alkoxy	14–10	0.51		20		
		200°C (392°F)	Dry locations — special applications ^{3 2}		8–2	0.76		30		
					1–4/0	1.14		45		
Perfluoro-alkoxy	PFAH	250°C	Dry locations only. Only for leads within apparatus or within raceways connected to	Perfluoro-alkoxy	14–10	0.51		20		

Trade Name	Type Letter	Maximum Operating Temperature	Application Provisions	Insulation	Thickness of Insulation		
					AWG or kcmil	mm	mils
		(482°F)			8–2 1–4/0	0.76 1.14	30 45
Thermoset	RHH	90°C	Dry and damp locations		14–10	1.14	45
		(194°F)			8–2	1.52	60
					1–4/0	2.03	80
					213–500	2.41	95
					501–1000	2.79	110
					1001–2000	3.18	125
Moisture-resistant thermoset	RHW	75°C (167°F)	Dry and wet locations	Flame-retardant, moisture-resistant thermoset	14–10	1.14	45
	RHW-2	90°C (194°F)			8–2	1.52	60
					1–4/0	2.03	80
					213–500	2.41	95
					501–1000	2.79	110
					1001–2000	3.18	125
Silicone	SA	90°C (194°F)	Dry and damp locations	Silicone rubber	14–10	1.14	45
		200°C (392°F)			For special application ^{3 2}	8–2	1.52
			1–4/0			2.03	80
			213–500			2.41	95
			501–1000			2.79	110
		1001–2000	3.18		125		
Thermoset	SIS	90°C (194°F)	Switchboard and switchgear wiring only	Flame-retardant thermoset	14–10	0.76	30
					8–2	1.14	45
					1–4/0	1.40	55
Thermoplastic and fibrous outer braid	TBS	90°C (194°F)	Switchboard and switchgear wiring only	Thermoplastic	14–10	0.76	30
					8	1.14	45
					6–2	1.52	60
					1–4/0	2.03	80
Extended polytetrafluoroethylene	TFE	250°C	Dry locations only. Only for leads within apparatus or within raceways connected to apparatus, or as open wiring (nickel or nickel-coated copper only)	Extruded polytetrafluoroethylene	14–10	0.51	20
		(482°F)			8–2	0.76	30
					1–4/0	1.14	45
Heat-resistant thermoplastic	THHN	90°C	Dry and damp locations	Flame-retardant, heat-resistant thermoplastic	14–12	0.38	15
		(194°F)			10	0.51	20
					8–6	0.76	30
					4–2	1.02	40
					1–4/0	1.27	50

Trade Name	Type Letter	Maximum Operating Temperature	Application Provisions	Insulation	Thickness of Insulation							
					AWG or kcmil	mm	mils					
					250–500	1.52	60					
					501–1000	1.78	70					
Moisture- and heat-resistant thermoplastic	THHW	75°C	Wet location	Flame-retardant, moisture- and heat-resistant thermoplastic	14–10	0.76	30					
		(167°F)			8	1.14	45					
		90°C			6–2	1.52	60					
		(194°F)	Dry location		1–4/0	2.03	80					
					213–500	2.41	95					
					501–1000	2.79	110					
					1001–2000	3.18	125					
Moisture- and heat-resistant thermoplastic	THW	75°C	Dry and wet locations	Flame-retardant, moisture- and heat-resistant thermoplastic	14–10	0.76	30					
		(167°F)			8	1.14	45					
		90°C			6–2	1.52	60					
		(194°F)	1–4/0		2.03	80						
			213–500		2.41	95						
			501–1000		2.79	110						
	THW-2	90°C (194°F)	Dry and wet locations		1001–2000	3.18	125					
					Moisture- and heat-resistant thermoplastic	THWN	75°C	Dry and wet locations	Flame-retardant, moisture- and heat-resistant thermoplastic	14–12	0.38	15
							(167°F)			10	0.51	20
8–6	0.76	30										
4–2	1.02	40										
THWN-2	90°C	1–4/0	1.27	50								
	(194°F)	250–500	1.52	60								
		501–1000	1.78	70								
Moisture-resistant thermoplastic	TW	60°C	Dry and wet locations	Flame-retardant, moisture-resistant thermoplastic	14–10	0.76	30					
		(140°F)			8	1.14	45					
					6–2	1.52	60					
					1–4/0	2.03	80					
					213–500	2.41	95					
					501–1000	2.79	110					
					1001–2000	3.18	125					
Underground feeder and branch-circuit cable — single conductor (for Type UF	UF	60°C	See Part II of Article 340.	Moisture-resistant	14–10	1.52	60 ^{6 5}					
		(140°F)			8–2	2.03	80 ^{6 5}					
					1–4/0	2.41	95 ^{6 5}					

<u>Trade Name</u>	<u>Type Letter</u>	<u>Maximum Operating Temperature</u>	<u>Application Provisions</u>	<u>Insulation</u>	<u>Thickness of Insulation</u>		
					<u>AWG or kcmil</u>	<u>mm</u>	<u>mils</u>
cable employing more than one conductor, see <u>Part II of Article 340</u>).		75°C (167°F) ^{5 4}		Moisture- and heat-resistant			
Underground service-entrance cable — single conductor (for Type USE cable employing more than one conductor, see <u>Part II of Article 338</u>).	USE	75°C (167°F) ^{5 4}	See <u>Part II of Article 338</u> .	Heat- and moisture-resistant	14–10	1.14	45
					8–2	1.52	60
					1–4/0	2.03	80
					213–500	2.41	95 ^{7 6}
					501–1000	2.79	110
Thermoset	XHH	90°C (194°F)	Dry and damp locations	Flame-retardant thermoset	14–10	0.76	30
					8–2	1.14	45
					1–4/0	1.40	55
					213–500	1.65	65
					501–1000	2.03	80
Thermoset	XHHN	90°C (194°F)	Dry and damp locations	Flame-retardant thermoset	1001–2000	2.41	95
					14–12	0.38	15
					10	0.51	20
					8–6	0.76	30
					4–2	1.02	40
Moisture-resistant thermoset	XHHW	90°C (194°F)	Dry and damp locations	Flame-retardant, moisture-resistant thermoset	1–4/0	1.27	50
					250–500	1.52	60
					501–1000	1.78	70
					14–10	0.76	30
					8–2	1.14	45
Moisture-resistant thermoset	XHHW-2	75°C (167°F)	Wet locations	Flame-retardant, moisture-resistant thermoset	1–4/0	1.40	55
					213–500	1.65	65
					501–1000	2.03	80
					1001–2000	2.41	95
					14–10	0.76	30
Moisture-resistant thermoset	XHHW-2	90°C (194°F)	Dry and wet locations	Flame-retardant, moisture-resistant thermoset	8–2	1.14	45
					1–4/0	1.40	55
					213–500	1.65	65
					501–1000	2.03	80
					1001–2000	2.41	95

<u>Trade Name</u>	<u>Type Letter</u>	<u>Maximum Operating Temperature</u>	<u>Application Provisions</u>	<u>Insulation</u>	<u>Thickness of Insulation</u>		
					<u>AWG or kcmil</u>	<u>mm</u>	<u>mils</u>
Moisture-resistant thermoset	XHWN	75°C (167°F)	Dry and wet locations	Flame-retardant, moisture-resistant thermoset	14–12	0.38	15
					10	0.51	20
					8–6	0.76	30
	XHWN-2	90°C (194°F)			4–2	1.02	40
					1–4/0	1.27	50
					250–500	1.52	60
					501–1000	1.78	70
Modified ethylene tetrafluoro-ethylene	Z	90°C (194°F)	Dry and damp locations	Modified ethylene tetrafluoro-ethylene	14–12	0.38	15
					10	0.51	20
		150°C (302°F)	Dry locations — special applications ³		8–4	0.64	25
			<u>2</u>		3–1	0.89	35
					1/0–4/0	1.14	45
Modified ethylene tetrafluoro-ethylene	ZW	75°C (167°F)	Wet locations	Modified ethylene tetrafluoro-ethylene	14–10	0.76	30
		90°C (194°F)	Dry and damp locations				
		150°C (302°F)	Dry locations — special applications ³		8–2	1.14	45
			<u>2</u>				
	ZW-2	90°C (194°F)	Dry and wet locations				

¹ ~~Conductors~~ Note: Conductors in Table 310.4(1) shall be permitted to be rated up to 1000 volts if listed and marked.

² 1 Outer coverings shall not be required where listed without a covering.

³ 2 Higher temperature rated constructions shall be permitted where design conditions require maximum conductor operating temperatures above 90°C (194°F).

⁴ 3 Conductor sizes shall be permitted for signaling circuits permitting 300-volt insulation.

⁵ 4 The ampacity of Type UF cable shall be limited in accordance with 340.80.

⁶ 5 Type UF insulation thickness shall include the integral jacket.

⁷ 6 Insulation thickness shall be permitted to be 2.03 mm (80 mils) for listed Type USE conductors that have been subjected to special investigations. The nonmetallic covering over individual rubber-covered conductors of aluminum-sheathed cable and of lead-sheathed or multiconductor cable shall not be required to be flame retardant.

Table 310.4(2) Thickness of Insulation for Nonshielded Types RHH and RHW Solid Dielectric Insulated Conductors Rated 2000 Volts

<u>Conductor Size</u> <u>(AWG or kcmil)</u>	<u>Column A¹</u>		<u>Column B²</u>	
	<u>mm</u>	<u>mils</u>	<u>mm</u>	<u>mils</u>
14–10	2.03	80	1.52	60

<u>Conductor Size</u> <u>(AWG or kcmil)</u>	<u>Column A¹</u>		<u>Column B²</u>	
	<u>mm</u>	<u>mils</u>	<u>mm</u>	<u>mils</u>
8	2.03	80	1.78	70
6–2	2.41	95	1.78	70
1–2/0	2.79	110	2.29	90
3/0–4/0	2.79	110	2.29	90
213–500	3.18	125	2.67	105
501–1000	3.56	140	3.05	120
1001–2000	3.56	140	3.56	140

¹Column A insulations shall be limited to natural, SBR, and butyl rubbers.

²Column B insulations shall be materials such as cross-linked polyethylene, ethylene propylene rubber, and composites thereof.

Submitter Information Verification

Committee: NEC-P06

Submittal Date: Mon Jan 04 16:27:11 EST 2021

Committee Statement

Committee Statement: Changes made to comply with style manual.

Response Message: FR-8342-NFPA 70-2021

[Public Input No. 3837-NFPA 70-2020 \[Section No. 310.4\]](#)

Ballot Results

✓ **This item has passed ballot**

14 Eligible Voters

0 Not Returned

14 Affirmative All

0 Affirmative with Comments

0 Negative with Comments

0 Abstention

Affirmative All

Crisman, Todd

Cross, Joseph W.

Deacy, Brian

Earl, Timothy

Graser, Peter

Hunter, Christel K.

Kent, Gerald W.

Lamp, Kelly
Newman Searce, Susan
Nielsen, Dennis A.
Porcaro, Michael Thomas
Riedl, Kenneth
Stene, Susan L.
Watson, Dave



First Revision No. 8344-NFPA 70-2021 [Section No. 310.6(C)]

(C) Ungrounded Conductors.

Conductors that are intended for use as ungrounded conductors, whether used as a single conductor or in multiconductor cables, shall be finished to be clearly distinguishable from grounded conductors and equipment grounding conductors. Distinguishing markings shall not conflict in any manner with the surface markings required by 310.8(B)(1). Branch-circuit ungrounded conductors shall be identified in accordance with 210.5(C). Feeders shall be identified in accordance with 215.12(C).

Exception: Conductor identification shall be permitted in accordance with 200.7.

Submitter Information Verification

Committee: NEC-P06

Submittal Date: Mon Jan 04 16:40:31 EST 2021

Committee Statement

Committee Statement: Adds the reference to the correct section. Provides more clarity.

Response Message: FR-8344-NFPA 70-2021

[Public Input No. 237-NFPA 70-2020 \[Section No. 310.6\(C\)\]](#)

[Public Input No. 1832-NFPA 70-2020 \[Section No. 310.6\(C\)\]](#)

Ballot Results

✓ **This item has passed ballot**

14 Eligible Voters

0 Not Returned

14 Affirmative All

0 Affirmative with Comments

0 Negative with Comments

0 Abstention

Affirmative All

Crisman, Todd

Cross, Joseph W.

Deacy, Brian

Earl, Timothy

Graser, Peter

Hunter, Christel K.

Kent, Gerald W.

Lamp, Kelly

Newman Searce, Susan

Nielsen, Dennis A.

Porcaro, Michael Thomas

Riedl, Kenneth

Stene, Susan L.

Watson, Dave



First Revision No. 8345-NFPA 70-2021 [Section No. 310.8(B)(2)]

(2) Marker Tape.

Metal-covered multiconductor cables shall employ a marker tape located within the cable and running for its complete length.

Exception No. 1: Type MI cable shall not require a marker tape.

Exception No. 2: Type AC cable shall not require a marker tape.

Exception No. 3: The information required in 310.8(A) shall be permitted to be durably marked on the outer nonmetallic covering of Type MC, Type ITC, or Type PLTC cables at intervals not exceeding 1.0 m (40 in.).

Exception No. 4: The information required in 310.8(A) shall be permitted to be durably marked on a nonmetallic covering under the metallic sheath of Type ITC or Type PLTC cable at intervals not exceeding 1.0 m (40 in.).

Informational Note: Included in the group of metal-covered cables are Type AC cable (Article 320), Type MC cable (Article 330), and lead-sheathed cable.

Submitter Information Verification

Committee: NEC-P06

Submittal Date: Mon Jan 04 16:45:30 EST 2021

Committee Statement

Committee Statement: References were not necessary, and referring to the scope is not helpful.

Response Message: FR-8345-NFPA 70-2021

[Public Input No. 3844-NFPA 70-2020 \[Section No. 310.8\(B\)\(2\)\]](#)

Ballot Results

✔ This item has passed ballot

14 Eligible Voters

0 Not Returned

14 Affirmative All

0 Affirmative with Comments

0 Negative with Comments

0 Abstention

Affirmative All

Crisman, Todd

Cross, Joseph W.

Deacy, Brian

Earl, Timothy

Graser, Peter

Hunter, Christel K.

Kent, Gerald W.

Lamp, Kelly

Newman Searce, Susan

Nielsen, Dennis A.

Porcaro, Michael Thomas

Riedl, Kenneth

Stene, Susan L.

Watson, Dave



First Revision No. 8306-NFPA 70-2021 [Section No. 310.10(D)]

(D) Locations Exposed to Direct Sunlight.

Insulated conductors or cables used where exposed to direct rays of the sun shall comply with ~~(D)(1) or (D)(2)~~ one of the following :

- (1) Conductors and cables shall be listed, ~~or listed and marked,~~ as being sunlight resistant.
- (2) Conductors and cables shall be covered with insulating material, such as tape or sleeving, that is ~~listed, or listed and marked,~~ as being sunlight resistant.

Submitter Information Verification

Committee: NEC-P06

Submittal Date: Mon Jan 04 11:45:16 EST 2021

Committee Statement

Committee Statement: The use of "shall be listed, or listed and marked" is superfluous and is not used elsewhere in NEC.

Response Message: FR-8306-NFPA 70-2021

Public Input No. 2294-NFPA 70-2020 [Section No. 310.10(D)]

Ballot Results

✓ **This item has passed ballot**

14 Eligible Voters

0 Not Returned

12 Affirmative All

2 Affirmative with Comments

0 Negative with Comments

0 Abstention

Affirmative All

Crisman, Todd

Cross, Joseph W.

Deacy, Brian

Earl, Timothy

Hunter, Christel K.

Kent, Gerald W.

Lamp, Kelly

Nielsen, Dennis A.

Porcaro, Michael Thomas

Riedl, Kenneth

Stene, Susan L.

Watson, Dave

Affirmative with Comment

Graser, Peter

The goal of any CMP should be to extract confusing or inessential words in those Articles under purview. The language within NFPA 70 should be distilled with every cycle.

Newman Searce, Susan

In an attempt to correct an oversight (from the 2020 NEC) in T310.16 within the purview of CMP6, there was an insertion of XHWN listed in the "Ampacity" Table 310.16 in BOTH 75-degree and 90-degree columns. XHWN should be limited to the 75-degree column and not included in the 90-degree column also.



First Revision No. 8314-NFPA 70-2021 [Section No. 310.10(G)]

(G) Conductors in Parallel.

(1) General.

Aluminum, copper-clad aluminum, or copper conductors for each phase ungrounded, polarity, neutral, or grounded circuit shall be permitted to be connected in parallel (electrically joined at both ends) only in sizes 1/0 AWG and larger where installed in accordance with 310.10(G)(2) through (G)(6).

Exception No. 1: Conductors in sizes smaller than 1/0 AWG shall be permitted to be run in parallel to supply control power to indicating instruments, contactors, relays, solenoids, and similar control devices, or for frequencies of 360 Hz and higher, provided all of the following apply:

- (1) *They are contained within the same raceway or cable.*
- (2) *The ampacity of each individual conductor is sufficient to carry the entire load current shared by the parallel conductors.*
- (3) *The overcurrent protection is such that the ampacity of each individual conductor will not be exceeded if one or more of the parallel conductors become inadvertently disconnected.*

Exception No. 2: Under engineering supervision, 2 AWG and 1 AWG grounded neutral conductors shall be permitted to be installed in parallel for existing installations.

Informational Note: Exception No. 2 can be used to alleviate overheating of neutral conductors in existing installations due to high content of triplen harmonic currents.

(2) Conductor and Installation Characteristics.

The paralleled conductors in each phase, polarity, neutral, grounded circuit conductor, equipment grounding conductor, ~~or~~ equipment bonding jumper, or supply-side bonding jumper shall comply with all of the following:

- (1) Be the same length
- (2) Consist of the same conductor material
- (3) Be the same size in circular mil area
- (4) Have the same insulation type
- (5) Be terminated in the same manner

(3) Separate Cables or Raceways.

Where run in separate cables or raceways, the cables or raceways with conductors shall have the same number of conductors and shall have the same electrical characteristics. Conductors of one phase, polarity, neutral, grounded circuit conductor, ~~or~~ equipment grounding conductor, or supply-side bonding jumper shall not be required to have the same physical characteristics as those of another phase, polarity, neutral, grounded circuit conductor, ~~or~~ equipment grounding conductor, or supply-side bonding jumper.

(4) Ampacity Correction or Adjustment.

Conductors installed in parallel shall comply with the ~~provisions of~~ 310.15(B) or 310.15(C).

(5) Equipment Grounding Conductors.

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

(6) Bonding Jumpers.

Where parallel equipment bonding jumpers or supply-side bonding jumpers are installed in raceways, they shall be sized and installed in accordance with 250.102.

Submitter Information Verification

Committee: NEC-P06

Submittal Date: Mon Jan 04 12:19:54 EST 2021

Committee Statement

Committee Statement: Editorial corrections were made to clarify this section. Equipment grounding conductors and supply-side bonding jumpers are not always required to be 1/0 AWG or larger.

New language on cross sectional area is not needed. New proposed exception adds no value.

Response Message: FR-8314-NFPA 70-2021

[Public Input No. 31-NFPA 70-2019 \[Section No. 310.10\(G\)\(4\)\]](#)

[Public Input No. 230-NFPA 70-2019 \[Section No. 310.10\(G\)\(1\)\]](#)

[Public Input No. 1316-NFPA 70-2020 \[Section No. 310.10\(G\)\]](#)

[Public Input No. 30-NFPA 70-2019 \[Section No. 310.10\(G\)\(1\)\]](#)

Ballot Results

✔ **This item has passed ballot**

14 Eligible Voters

0 Not Returned

14 Affirmative All

0 Affirmative with Comments

0 Negative with Comments

0 Abstention

Affirmative All

Crisman, Todd

Cross, Joseph W.

Deacy, Brian

Earl, Timothy

Graser, Peter

Hunter, Christel K.

Kent, Gerald W.

Lamp, Kelly

Newman Searce, Susan

Nielsen, Dennis A.

Porcaro, Michael Thomas

Riedl, Kenneth

Stene, Susan L.

Watson, Dave

**First Revision No. 8374-NFPA 70-2021 [Section No. 310.12(D)]****(D) Grounded Conductors.**

Grounded conductors shall be permitted to be sized smaller than the ungrounded conductors, if the requirements of 220.61 and 230.42 for service conductors or the requirements of 215.2 and 220.61 for feeder conductors are met.

Where correction or adjustment factors are required by 310.15(B) or (C), they shall be permitted to be applied to the ampacity associated with the temperature rating of the conductor.

Informational Note No. 1: ~~The service or feeder ratings addressed by this section are based on the See 240.6(A) for standard ampere ratings for fuses and inverse time circuit breakers from 240.6(A).~~

Informational Note No. 2: See Example D7 in Annex D.

Table 310.12(A) Single-Phase Dwelling Services and Feeders

<u>Service or Feeder Rating</u> <u>(Amperes)</u>	<u>Conductor</u> <u>(AWG or kcmil)</u>	
	<u>Copper</u>	<u>Aluminum or Copper-Clad Aluminum</u>
100	4	2
110	3	1
125	2	1/0
150	1	2/0
175	1/0	3/0
200	2/0	4/0
225	3/0	250
250	4/0	300
300	250	350
350	350	500
400	400	600

Note: If no adjustment or correction factors are required, this table shall be permitted to be applied.

Submitter Information Verification

Committee: NEC-P06

Submittal Date: Tue Jan 05 11:00:24 EST 2021

Committee Statement

Committee Statement: The revisions made to the informational notes were done to ensure compliance with the Style Manual.

Response

FR-8374-NFPA 70-2021

Message:**Ballot Results** **This item has passed ballot**

14 Eligible Voters

0 Not Returned

14 Affirmative All

0 Affirmative with Comments

0 Negative with Comments

0 Abstention

Affirmative All

Crisman, Todd

Cross, Joseph W.

Deacy, Brian

Earl, Timothy

Graser, Peter

Hunter, Christel K.

Kent, Gerald W.

Lamp, Kelly

Newman Searce, Susan

Nielsen, Dennis A.

Porcaro, Michael Thomas

Riedl, Kenneth

Stene, Susan L.

Watson, Dave



First Revision No. 8377-NFPA 70-2021 [Section No. 310.14(A)]

(A) General.

(1) Tables or Engineering Supervision.

Ampacities for conductors shall be permitted to be determined by tables as provided in 310.15 or under engineering supervision, as provided in 310.14(B).

Informational Note No. 1: ~~Ampacities provided by this section do not take voltage drop into consideration.~~ See 210.19(A), Informational Note No. 4, for voltage drop on branch circuits and that this section does not take into consideration. See 215.2(A), Informational Note No. 2, for voltage drop on feeders that this section does not take into consideration.

Informational Note No. 2: ~~For the allowable ampacities of Type MTW wire, see See Table 12.5.1 in NFPA 79-2018 2021, Electrical Standard for Industrial Machinery, for the allowable ampacities of Type MTW wire.~~

(2) Selection of Ampacity.

Where more than one ampacity applies for a given circuit length, the lowest value shall be used.

Exception: Where different ampacities apply to portions of a circuit, the higher ampacity shall be permitted to be used if the total portion(s) of the circuit with lower ampacity does not exceed the lesser of 3.0 m (10 ft) or 10 percent of the total circuit.

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

(3) Temperature Limitation of Conductors.

No conductor shall be used in such a manner that its operating temperature exceeds that designated for the type of insulated conductor involved. In no case shall conductors be associated together in such a way, with respect to type of circuit, the wiring method employed, or the number of conductors, that the limiting temperature of any conductor is exceeded.

Informational Note No. 1: ~~The temperature rating of a conductor [see See Table 310.4(1) and Table 315.10(A)]~~ for the temperature rating of a conductor that is the maximum temperature, at any location along its length, that the conductor can withstand over a prolonged time period without serious degradation. The ampacity tables of Article 310 and the ampacity tables of Informative Annex B, the ambient temperature correction factors in 310.15(B), and the notes to the tables provide guidance for coordinating conductor sizes, types, ampacities, ambient temperatures, and number of associated conductors. The principal determinants of operating temperature are as follows:

- (1) Ambient temperature — ambient temperature may vary along the conductor length as well as from time to time.
- (2) Heat generated internally in the conductor as the result of load current flow, including fundamental and harmonic currents.
- (3) The rate at which generated heat dissipates into the ambient medium. Thermal insulation that covers or surrounds conductors affects the rate of heat dissipation.
- (4) Adjacent load-carrying conductors — adjacent conductors have the dual effect of raising the ambient temperature and impeding heat dissipation.

Informational Note No. 2: Refer to 110.14(C) for the temperature limitation of terminations.

Submitter Information Verification

Committee: NEC-P06

Submittal Date: Tue Jan 05 11:08:19 EST 2021

Committee Statement

Committee Statement: The revisions made to the informational notes were done to ensure compliance with the Style Manual.

Response Message: FR-8377-NFPA 70-2021

Ballot Results

✔ This item has passed ballot

14 Eligible Voters

0 Not Returned

14 Affirmative All

0 Affirmative with Comments

0 Negative with Comments

0 Abstention

Affirmative All

Crisman, Todd

Cross, Joseph W.

Deacy, Brian

Earl, Timothy

Graser, Peter

Hunter, Christel K.

Kent, Gerald W.

Lamp, Kelly

Newman Searce, Susan

Nielsen, Dennis A.

Porcaro, Michael Thomas

Riedl, Kenneth

Stene, Susan L.

Watson, Dave

**First Revision No. 8336-NFPA 70-2021 [Section No. 310.15]****310.15 Ampacity Tables.****(A) General.**

Ampacities for conductors rated 0 volts to 2000 volts shall be as specified in the Ampacity Table 310.16 through Table 310.21, as modified by 310.15(A) through (F) and 310.12. Under engineering supervision, ampacities of sizes not shown in ampacity tables for conductors meeting the general wiring requirements shall be permitted to be determined by interpolation of the adjacent conductors based on the conductor's circular-mil area.

The temperature correction and adjustment factors shall be permitted to be applied to the ampacity for the temperature rating of the conductor, if the corrected and adjusted ampacity does not exceed the ampacity for the temperature rating of the termination in accordance with the provisions of 110.14(C).

Informational Note No. 1: Table 310.16 through Table 310.19 are application tables for use in determining conductor sizes on loads calculated in accordance with Part II, Part III, Part IV, or Part V of Article 220. Ampacities result from consideration of one or more of the following:

- (1) Temperature compatibility with connected equipment, especially the connection points.
- (2) Coordination with circuit and system overcurrent protection.
- (3) Compliance with the requirements of product listings or certifications. ~~See 410.3(B).~~
- (4) Preservation of the safety benefits of established industry practices and standardized procedures.

Informational Note No. 2: ~~For conductor area see~~ See Chapter 9, Table 8, Conductor Properties, for conductor area. Interpolation is based on the conductor circular-mil area and not the conductor overall area.

Informational Note No. 3: ~~For~~ See 400.5 for the ampacities of flexible cords and cables, ~~see 400.5~~. ~~For~~ See 402.5 for the ampacities of fixture wires, ~~see 402.5~~.

Informational Note No. 4: ~~For~~ See Table 310.4(1) and Table 310.4(2) for explanation of type letters used in tables and for recognized sizes of conductors for the various conductor insulations, ~~see Table 310.4(1) and Table 310.4(2)~~. ~~For installation requirements, see~~ See 310.1 through 310.14 and the various articles of this Code. ~~For flexible cords, see for installation requirements.~~ See Table 400.4, Table 400.5(A)(1), and Table 400.5(A)(2) for flexible cords.

(B) Ambient Temperature Correction Factors.

(1) General.

Ampacities for ambient temperatures other than those shown in the ampacity tables shall be corrected in accordance with Table 310.15(B)(1)(1) or Table 310.15(B)(1)(2), or shall be permitted to be calculated using Equation 310.15(B)(1).

$$I' = I \sqrt{\frac{T_c - T_a'}{T_c - T_a}} \quad [310.15(B)(1)]$$

where:

I' = ampacity corrected for ambient temperature

I = ampacity shown in the tables

T_c = temperature rating of conductor (°C)

T_a' = new ambient temperature (°C)

T_a = ambient temperature used in the table (°C)

(2) Rooftop.

For raceways or cables exposed to direct sunlight on or above rooftops where the distance above the roof to the bottom of the raceway or cable is less than 23 mm ($\frac{7}{8}$ in.) 19 mm ($\frac{3}{4}$ in.), a temperature adder of 33°C (60°F) shall be added to the outdoor temperature to determine the applicable ambient temperature for application of the correction factors in Table 310.15(B)(1)(1) or Table 310.15(B)(1)(2).

Exception: Type XHHW-2 insulated conductors shall not be subject to this ampacity adjustment.

Informational Note: One The *ASHRAE Handbook — Fundamentals* is one source for the ambient temperatures in various locations is the *ASHRAE Handbook — Fundamentals*.

Table 310.15(B)(1)(1) Ambient Temperature Correction Factors Based on 30°C (86°F)

For ambient temperatures other than 30°C (86°F), multiply the ampacities specified in the ampacity tables by the appropriate correction factor shown below.

<u>Ambient Temperature</u> <u>(°C)</u>	<u>Temperature Rating of Conductor</u>			<u>Ambient Temperature</u> <u>(°F)</u>
	<u>60°C</u>	<u>75°C</u>	<u>90°C</u>	
10 or less	1.29	1.20	1.15	50 or less
11–15	1.22	1.15	1.12	51–59
16–20	1.15	1.11	1.08	60–68
21–25	1.08	1.05	1.04	69–77
26–30	1.00	1.00	1.00	78–86
31–35	0.91	0.94	0.96	87–95
36–40	0.82	0.88	0.91	96–104
41–45	0.71	0.82	0.87	105–113
46–50	0.58	0.75	0.82	114–122
51–55	0.41	0.67	0.76	123–131
56–60	—	0.58	0.71	132–140
61–65	—	0.47	0.65	141–149
66–70	—	0.33	0.58	150–158
71–75	—	—	0.50	159–167
76–80	—	—	0.41	168–176
81–85	—	—	0.29	177–185

Note: Table 310.15(B)(1)(1) shall be used with Table 310.16 and Table 310.17 as required.

Table 310.15(B)(1)(2) Ambient Temperature Correction Factors Based on 40°C (104°F)

For ambient temperatures other than 40°C (104°F), multiply the ampacities specified in the ampacity tables by the appropriate correction factor shown below.

<u>Ambient Temperature</u> <u>(°C)</u>	<u>Temperature Rating of Conductor</u>						<u>Ambient Temperature</u> <u>(°F)</u>
	<u>60°C</u>	<u>75°C</u>	<u>90°C</u>	<u>150°C</u>	<u>200°C</u>	<u>250°C</u>	
10 or less	1.58	1.36	1.26	1.13	1.09	1.07	50 or less
11–15	1.50	1.31	1.22	1.11	1.08	1.06	51–59
16–20	1.41	1.25	1.18	1.09	1.06	1.05	60–68
21–25	1.32	1.2	1.14	1.07	1.05	1.04	69–77
26–30	1.22	1.13	1.10	1.04	1.03	1.02	78–86
31–35	1.12	1.07	1.05	1.02	1.02	1.01	87–95

For ambient temperatures other than 40°C (104°F), multiply the ampacities specified in the ampacity tables by the appropriate correction factor shown below.

<u>Ambient Temperature (°C)</u>	<u>Temperature Rating of Conductor</u>						<u>Ambient Temperature (°F)</u>
	<u>60°C</u>	<u>75°C</u>	<u>90°C</u>	<u>150°C</u>	<u>200°C</u>	<u>250°C</u>	
36–40	1.00	1.00	1.00	1.00	1.00	1.00	96–104
41–45	0.87	0.93	0.95	0.98	0.98	0.99	105–113
46–50	0.71	0.85	0.89	0.95	0.97	0.98	114–122
51–55	0.50	0.76	0.84	0.93	0.95	0.96	123–131
56–60	—	0.65	0.77	0.90	0.94	0.95	132–140
61–65	—	0.53	0.71	0.88	0.92	0.94	141–149
66–70	—	0.38	0.63	0.85	0.90	0.93	150–158
71–75	—	—	0.55	0.83	0.88	0.91	159–167
76–80	—	—	0.45	0.80	0.87	0.90	168–176
81–90	—	—	—	0.74	0.83	0.87	177–194
91–100	—	—	—	0.67	0.79	0.85	195–212
101–110	—	—	—	0.60	0.75	0.82	213–230
111–120	—	—	—	0.52	0.71	0.79	231–248
121–130	—	—	—	0.43	0.66	0.76	249–266
131–140	—	—	—	0.30	0.61	0.72	267–284
141–160	—	—	—	—	0.50	0.65	285–320
161–180	—	—	—	—	0.35	0.58	321–356
181–200	—	—	—	—	—	0.49	357–392
201–225	—	—	—	—	—	0.35	393–437

Note: Table 310.15(B)(1)(2) shall be used with Table 310.18, Table 310.19, Table 310.20, and Table 310.21 as required.

(C) Adjustment Factors.

(1) More than Three Current-Carrying Conductors.

The ampacity of each conductor shall be reduced as shown in Table 310.15(C)(1) where the number of current-carrying conductors in a raceway or cable exceeds three, or where single conductors or multiconductor cables not installed in raceways are installed without maintaining spacing for a continuous length longer than 600 mm (24 in.). Each current-carrying conductor of a paralleled set of conductors shall be counted as a current-carrying conductor.

Where conductors of different systems, as provided in 300.3, are installed in a common raceway or cable, the adjustment factors shown in Table 310.15(C)(1) shall apply only to the number of power and lighting conductors ~~(Articles 210, 215, 220, and 230)~~.

Informational Note No. 1: See Annex B for adjustment factors for more than three current-carrying conductors in a raceway or cable with load diversity.

Informational Note No. 2: See 366.23 for adjustment factors for conductors and ampacity for bare copper and aluminum bars in auxiliary gutters and 376.22(B) for adjustment factors for conductors in metal wireways.

(a) Where conductors are installed in cable trays, ~~the provisions of~~ 392.80 shall apply.

(b) Adjustment factors shall not apply to conductors in raceways having a length not exceeding 600 mm (24 in.).

(c) Adjustment factors shall not apply to underground conductors entering or leaving an outdoor trench if those conductors have physical protection in the form of rigid metal conduit, intermediate metal conduit, rigid polyvinyl chloride conduit (PVC), or reinforced thermosetting resin conduit (RTRC) having a length not exceeding 3.05 m (10 ft), and if the number of conductors does not exceed four.

(d) Adjustment factors shall not apply to Type AC cable or to Type MC cable under the following conditions:

- (1) The cables do not have an overall outer jacket.
- (2) Each cable has not more than three current-carrying conductors.
- (3) The conductors are 12 AWG copper.
- (4) Not more than 20 current-carrying conductors are installed without maintaining spacing, are stacked, or are supported on "bridle rings."

Exception to (4): If cables meeting the requirements in 310.15(C)(1)(d)(1) through (C)(1)(d)(3) with more than 20 current-carrying conductors are installed longer than 600 mm (24 in.) without maintaining spacing, are stacked, or are supported on bridle rings, a 60 percent adjustment factor shall be applied.

Table 310.15(C)(1) Adjustment Factors for More Than Three Current-Carrying Conductors

<u>Number of</u> <u>Conductors</u> *	<u>Percent of Values in</u> <u>Table 310.16 Through Table 310.19 as Adjusted for Ambient Temperature</u> <u>if Necessary.</u>
4–6	80
7–9	70
10–20	50
21–30	45
31–40	40
41 and above	35

*Number of conductors is the total number of conductors in the raceway or cable, including spare conductors. The count shall be adjusted in accordance with 310.15(E) and (F). The count shall not include conductors that are connected to electrical components that cannot be simultaneously energized.

(2) Raceway Spacing.

Spacing between raceways shall be maintained.

(D) Bare or Covered Conductors.

Where bare or covered conductors are installed with insulated conductors, the temperature rating of the bare or covered conductor shall be equal to the lowest temperature rating of the insulated conductors for the purpose of determining ampacity.

(E) Neutral Conductor.

Neutral conductors shall be considered current carrying in accordance with any of the following:

- (1) A neutral conductor that carries only the unbalanced current from other conductors of the same circuit shall not be required to be counted when applying the provisions of 310.15(C)(1).
- (2) In a 3-wire circuit consisting of two phase conductors and the neutral conductor of a 4-wire, 3-phase, wye-connected system, ~~a common~~ the neutral conductor carries approximately the same current as the line-to-neutral load currents of the other conductors and shall be counted when applying ~~the provisions of~~ 310.15(C)(1).
- (3) On a 4-wire, 3-phase wye circuit where the major portion of the load consists of nonlinear loads, harmonic currents are present in the neutral conductor; the neutral conductor shall therefore be considered a current-carrying conductor.

(F) Grounding or Bonding Conductor.

A grounding or bonding conductor shall not be counted when applying the provisions of 310.15(C)(1).

Submitter Information Verification

Committee: NEC-P06

Submittal Date: Mon Jan 04 15:43:09 EST 2021

Committee Statement

Committee Statement: Editorial changes have been made throughout 310.15 to align with the style manual and revised to use industry terminology. The circular-mil area clarification could help some avoid confusion. The term insulated conductor is defined in Article 100 and clearly understood to mean the conductor and insulation.

The intent of the requirement in 310.15(B)(2) is to mandate some degree of separation, and the proposed limit accomplishes that without limiting options. The proposed informational note for 310.15(A) may discourage readers from looking at all relevant references. The user needs to understand not just termination limitations but also equipment ratings and any other relevant limitations within the system.

These added table notes will provide clarity to the Code user about the use of these tables.

Response Message: FR-8336-NFPA 70-2021

[Public Input No. 931-NFPA 70-2020 \[Section No. 310.15\(E\)\]](#)

[Public Input No. 4130-NFPA 70-2020 \[Section No. 310.15\(C\)\(1\)\]](#)

[Public Input No. 3430-NFPA 70-2020 \[Section No. 310.15\(A\)\]](#)

[Public Input No. 4128-NFPA 70-2020 \[Section No. 310.15\(A\)\]](#)

[Public Input No. 4427-NFPA 70-2020 \[Section No. 310.15\(B\)\(2\)\]](#)

[Public Input No. 3851-NFPA 70-2020 \[Section No. 310.15\(C\)\(1\)\]](#)

[Public Input No. 4558-NFPA 70-2020 \[Section No. 310.15\(B\)\(2\)\]](#)

[Public Input No. 96-NFPA 70-2019 \[Section No. 310.15\(A\)\]](#)

[Public Input No. 32-NFPA 70-2019 \[Section No. 310.15\(C\)\(1\)\]](#)

[Public Input No. 2037-NFPA 70-2020 \[Section No. 310.15\(E\)\]](#)

Ballot Results

✔ **This item has passed ballot**

14 Eligible Voters

0 Not Returned

14 Affirmative All

0 Affirmative with Comments

0 Negative with Comments

0 Abstention

Affirmative All

Crisman, Todd

Cross, Joseph W.

Deacy, Brian

Earl, Timothy

Graser, Peter

Hunter, Christel K.

Kent, Gerald W.

Lamp, Kelly

Newman Searce, Susan

Nielsen, Dennis A.

Porcaro, Michael Thomas

Riedl, Kenneth

Stene, Susan L.

Watson, Dave



First Revision No. 8427-NFPA 70-2021 [Section No. 310.21]

310.21 Ampacities of Bare or Covered Conductors in Free Air.

The ampacities shall be as specified in Table 310.21 where all of the following conditions apply:

- (1) Wind velocity is 610 mm/sec (2 ft/sec).
- (2) Conductors are 80°C (176°F) total conductor temperature.
- (3) Wiring is installed in a 40°C (104°F) ambient temperature.

Table 310.16 Ampacities of Insulated Conductors with Not More Than Three Current-Carrying Conductors in Raceway, Cable, or Earth (Directly Buried)

<u>Size AWG or kcmil</u>	<u>Temperature Rating of Conductor [See Table 310.4(A 1)]</u>						<u>Size AWG or kcmil</u>
	<u>60°C (140°F)</u>	<u>75°C (167°F)</u>	<u>90°C (194°F)</u>	<u>60°C (140°F)</u>	<u>75°C (167°F)</u>	<u>90°C (194°F)</u>	
	<u>Types TW, UF</u>	<u>Types RHW, THHW, THW, THWN, XHHW, XHWN, USE, ZW</u>	<u>Types TBS, SA, SIS, FEP, FEPB, MI, PFA, RHH, RHW-2, THHN, THHW, THW-2, THWN-2, USE-2, XHH, XHHW, XHHW-2, XHWN, XHWN-2, XHHN, Z, ZW-2</u>	<u>Types TW, UF</u>	<u>Types RHW, THHW, THW, THWN, XHHW, XHWN, USE</u>	<u>Types TBS, SA, SIS, THHN, THHW, THW-2, THWN-2, RHH, RHW-2, USE-2, XHH, XHHW, XHHW-2, XHWN, XHWN-2, XHHN</u>	
	<u>COPPER</u>			<u>ALUMINUM OR COPPER-CLAD ALUMINUM</u>			
18*	—	—	14	—	—	—	—
16*	— <u>10</u>	— <u>15</u>	18 <u>20</u>	—	—	—	—
14*	15	20	25	— <u>10</u> †	— <u>15</u> †	— <u>20</u> †	— <u>14</u> *
12*	20	25	30	15	20	25	12*
10*	30	35	40	25	30	35	10*
8	40	50	55	35	40	45	8
6	55	65	75	40	50	55	6
4	70	85	95	55	65	75	4
3	85	100	115	65	75	85	3
2	95	115	130	75	90	100	2
1	110	130	145	85	100	115	1
1/0	125	150	170	100	120	135	1/0
2/0	145	175	195	115	135	150	2/0
3/0	165	200	225	130	155	175	3/0
4/0	195	230	260	150	180	205	4/0
250	215	255	290	170	205	230	250
300	240	285	320	195	230	260	300
350	260	310	350	210	250	280	350
400	280	335	380	225	270	305	400
500	320	380	430	260	310	350	500
600	350	420	475	285	340	385	600
700	385	460	520	315	375	425	700

750	400	475	535	320	385	435	750
800	410	490	555	330	395	445	800
900	435	520	585	355	425	480	900
1000	455	545	615	375	445	500	1000
1250	495	590	665	405	485	545	1250
1500	525	625	705	435	520	585	1500
1750	545	650	735	455	545	615	1750
2000	555	665	750	470	560	630	2000

Notes:

1. Section 310.15(B) shall be referenced for ampacity correction factors where the ambient temperature is other than 30°C (86°F).
2. Section 310.15(C)(1) shall be referenced for more than three current-carrying conductors.
3. Section 310.16 shall be referenced for conditions of use.

*Section 240.4(D) shall be referenced for conductor overcurrent protection limitations, except as modified elsewhere in the *Code*.

†. Applicable only to copper-clad aluminum conductors.

Table 310.17 Ampacities of Single-Insulated Conductors in Free Air

Size AWG or kcmil	Temperature Rating of Conductor [See Table 310.4(A 1)]						Size AWG or kcmil
	60°C (140°F)	75°C (167°F)	90°C (194°F)	60°C (140°F)	75°C (167°F)	90°C (194°F)	
	Types TW, UF	Types RHW, THHW, THW, THWN, XHHW, XHWN, ZW	Types TBS, SA, SIS, FEP, FEPB, MI, PFA, RHH, RHW-2, THHN, THHW, THW-2, THWN-2, USE-2, XHH, XHHW, XHHW-2, XHWN, XHWN-2, XHHN, Z, ZW-2	Types TW, UF	Types RHW, THHW, THW, THWN, XHHW, XHWN	Types TBS, SA, SIS, THHN, THHW, THW-2, THWN-2, RHH, RHW-2, USE-2, XHH, XHHW, XHHW-2, XHWN, XHWN-2, XHHN	
	COPPER			ALUMINUM OR COPPER-CLAD ALUMINUM			
18	—	—	18	—	—	—	—
16	— 20	— 25	24 30	—	—	—	—
14*	25	30	35	— 20 †	— 25 †	— 30 †	— 14*
12*	30	35	40	25	30	35	12*
10*	40	50	55	35	40	45	10*
8	60	70	80	45	55	60	8
6	80	95	105	60	75	85	6
4	105	125	140	80	100	115	4
3	120	145	165	95	115	130	3
2	140	170	190	110	135	150	2
1	165	195	220	130	155	175	1
1/0	195	230	260	150	180	205	1/0
2/0	225	265	300	175	210	235	2/0

3/0	260	310	350	200	240	270	3/0
4/0	300	360	405	235	280	315	4/0
250	340	405	455	265	315	355	250
300	375	445	500	290	350	395	300
350	420	505	570	330	395	445	350
400	455	545	615	355	425	480	400
500	515	620	700	405	485	545	500
600	575	690	780	455	545	615	600
700	630	755	850	500	595	670	700
750	655	785	885	515	620	700	750
800	680	815	920	535	645	725	800
900	730	870	980	580	700	790	900
1000	780	935	1055	625	750	845	1000
1250	890	1065	1200	710	855	965	1250
1500	980	1175	1325	795	950	1070	1500
1750	1070	1280	1445	875	1050	1185	1750
2000	1155	1385	1560	960	1150	1295	2000

Notes:

1. Section 310.15(B) shall be referenced for ampacity correction factors where the ambient temperature is other than 30°C (86°F).

2. Section 310.17 shall be referenced for conditions of use.

*Section 240.4(D) shall be referenced for conductor overcurrent protection limitations, except as modified elsewhere in the *Code*.

†. Applicable only to copper-clad aluminum.

Table 310.18 Ampacities of Insulated Conductors with Not More Than Three Current-Carrying Conductors in Raceway or Cable

<u>Size AWG or kcmil</u>	<u>Temperature Rating of Conductor [See Table 310.4(A 1)]</u>				<u>Size AWG or kcmil</u>
	<u>150°C (302°F)</u>	<u>200°C (392°F)</u>	<u>250°C (482°F)</u>	<u>150°C (302°F)</u>	
	<u>Type Z</u>	<u>Types FEP, FEPB, PFA, SA</u>	<u>Types PFAH, TFE</u>	<u>Type Z</u>	
	<u>COPPER</u>		<u>NICKEL OR NICKEL-COATED COPPER</u>	<u>ALUMINUM OR COPPER-CLAD ALUMINUM</u>	
14	34	36	39	—	14
12	43	45	54	30	12
10	55	60	73	44	10
8	76	83	93	57	8
6	96	110	117	75	6
4	120	125	148	94	4
3	143	152	166	109	3
2	160	171	191	124	2
1	186	197	215	145	1
1/0	215	229	244	169	1/0

<u>Size AWG or kcmil</u>	<u>Temperature Rating of Conductor [See Table 310.4(A 1)]</u>				<u>Size AWG or kcmil</u>
	<u>150°C (302°F)</u>	<u>200°C (392°F)</u>	<u>250°C (482°F)</u>	<u>150°C (302°F)</u>	
	<u>Type Z</u>	<u>Types FEP, FEPB, PFA, SA</u>	<u>Types PFAH, TFE</u>	<u>Type Z</u>	
	<u>COPPER</u>		<u>NICKEL OR NICKEL-COATED COPPER</u>	<u>ALUMINUM OR COPPER-CLAD ALUMINUM</u>	
2/0	251	260	273	198	2/0
3/0	288	297	308	227	3/0
4/0	332	346	361	260	4/0

Notes:

1. Section 310.15(B) shall be referenced for ampacity correction factors where the ambient temperature is other than 40°C (104°F).
2. Section 310.15(C)(1) shall be referenced for more than three current-carrying conductors.
3. Section 310.18 shall be referenced for conditions of use.

Table 310.19 Ampacities of Single-Insulated Conductors in Free Air

<u>Size AWG or kcmil</u>	<u>Temperature Rating of Conductor [See Table 310.4(A 1)]</u>				<u>Size AWG or kcmil</u>
	<u>150°C (302°F)</u>	<u>200°C (392°F)</u>	<u>250°C (482°F)</u>	<u>150°C (302°F)</u>	
	<u>Type Z</u>	<u>Types FEP, FEPB, PFA, SA</u>	<u>Types PFAH, TFE</u>	<u>Type Z</u>	
	<u>COPPER</u>		<u>NICKEL, OR NICKEL-COATED COPPER</u>	<u>ALUMINUM OR COPPER-CLAD ALUMINUM</u>	
14	46	54	59	—	14
12	60	68	78	47	12
10	80	90	107	63	10
8	106	124	142	83	8
6	155	165	205	112	6
4	190	220	278	148	4
3	214	252	327	170	3
2	255	293	381	198	2
1	293	344	440	228	1
1/0	339	399	532	263	1/0
2/0	390	467	591	305	2/0
3/0	451	546	708	351	3/0
4/0	529	629	830	411	4/0

Notes:

1. Section 310.15(B) shall be referenced for ampacity correction factors where the ambient temperature is other than 40°C (104°F).
2. Section 310.19 shall be referenced for conditions of use.

Table 310.20 Ampacities of Conductors on a Messenger

Size AWG or kcmil	Temperature Rating of Conductor [See Table 310.4(A 1)]				Size AWG or kcmil
	75°C (167°F)	90°C (194°F)	75°C (167°F)	90°C (194°F)	
	Types RHW, THHW, THW, THWN, XHHW, XHWN, ZW	Types MI, THHN, THHW, THW-2, THWN-2, RHH, RHW-2, USE-2, XHHW, XHHW-2, XHWN, XHWN-2, ZW-2	Types RHW, THW, THWN, THHW, XHHW, XHWN	Types THHN, THHW, RHH, XHHW, RHW-2, XHHW-2, THW-2, THWN-2, XHWN, XHWN-2, USE-2, ZW-2	
	COPPER		ALUMINUM OR COPPER-CLAD ALUMINUM		
8	57	66	44	51	8
6	76	89	59	69	6
4	101	117	78	91	4
3	118	138	92	107	3
2	135	158	106	123	2
1	158	185	123	144	1
1/0	183	214	143	167	1/0
2/0	212	247	165	193	2/0
3/0	245	287	192	224	3/0
4/0	287	335	224	262	4/0
250	320	374	251	292	250
300	359	419	282	328	300
350	397	464	312	364	350
400	430	503	339	395	400
500	496	580	392	458	500
600	553	647	440	514	600
700	610	714	488	570	700
750	638	747	512	598	750
800	660	773	532	622	800
900	704	826	572	669	900
1000	748	879	612	716	1000

Notes:

1. Section 310.15(B) shall be referenced for ampacity correction factors where the ambient temperature is other than 40°C (104°F).
2. Section 310.15(C)(1) shall be referenced for more than three current-carrying conductors.
3. Section 310.20 shall be referenced for conditions of use.

Table 310.21 Ampacities of Bare or Covered Conductors in Free Air

<u>Copper Conductors</u>				<u>AAC Aluminum Conductors</u>			
<u>Bare</u>		<u>Covered</u>		<u>Bare</u>		<u>Covered</u>	
<u>AWG or kcmil</u>	<u>Amperes</u>	<u>AWG or kcmil</u>	<u>Amperes</u>	<u>AWG or kcmil</u>	<u>Amperes</u>	<u>AWG or kcmil</u>	<u>Amperes</u>
8	98	8	103	8	76	8	80
6	124	6	130	6	96	6	101

<u>Copper Conductors</u>				<u>AAC Aluminum Conductors</u>			
<u>Bare</u>		<u>Covered</u>		<u>Bare</u>		<u>Covered</u>	
<u>AWG or kcmil</u>	<u>Amperes</u>	<u>AWG or kcmil</u>	<u>Amperes</u>	<u>AWG or kcmil</u>	<u>Amperes</u>	<u>AWG or kcmil</u>	<u>Amperes</u>
4	155	4	163	4	121	4	127
2	209	2	219	2	163	2	171
1/0	282	1/0	297	1/0	220	1/0	231
2/0	329	2/0	344	2/0	255	2/0	268
3/0	382	3/0	401	3/0	297	3/0	312
4/0	444	4/0	466	4/0	346	4/0	364
250	494	250	519	266.8	403	266.8	423
300	556	300	584	336.4	468	336.4	492
500	773	500	812	397.5	522	397.5	548
750	1000	750	1050	477.0	588	477.0	617
1000	1193	1000	1253	556.5	650	556.5	682
—	—	—	—	636.0	709	636.0	744
—	—	—	—	795.0	819	795.0	860
—	—	—	—	954.0	920	—	—
—	—	—	—	1033.5	968	1033.5	1017
—	—	—	—	1272	1103	1272	1201
—	—	—	—	1590	1267	1590	1381
—	—	—	—	2000	1454	2000	1527

Note: Section 310.21 shall be referenced for conditions of use.

Supplemental Information

<u>File Name</u>	<u>Description</u>	<u>Approved</u>
Table_310.16_and_310.17.docx	See Table 310.16 and 310.17 For Changes - Staff Use Only	

Submitter Information Verification

Committee: NEC-P06

Submittal Date: Wed Jan 06 08:20:39 EST 2021

Committee Statement

Committee Statement: The minimum conductor sizes for copper and copper-clad aluminum are being reduced to 16 AWG copper and 14 AWG copper-clad aluminum. These revisions are based on testing submitted in support of the use of copper-clad aluminum conductors for 10 amp circuits, and the decades of successful use of 16 AWG copper conductors in fixture wire, motor wiring, control wiring, and other current-carrying applications as permitted in the NEC.

Response Message: FR-8427-NFPA 70-2021

[Public Input No. 3960-NFPA 70-2020 \[Section No. 310.21\]](#)

[Public Input No. 3974-NFPA 70-2020 \[Section No. 310.21\]](#)

Ballot Results

✓ This item has passed ballot

14 Eligible Voters

0 Not Returned

9 Affirmative All

3 Affirmative with Comments

2 Negative with Comments

0 Abstention

Affirmative All

Cross, Joseph W.

Earl, Timothy

Kent, Gerald W.

Lamp, Kelly

Nielsen, Dennis A.

Porcaro, Michael Thomas

Riedl, Kenneth

Stene, Susan L.

Watson, Dave

Affirmative with Comment

Crisman, Todd

I agree with the panel's decision to move forward with lowering the minimum CCA conductor size to 14 awg. There was a task group that was developed to address the concerns of lowering the minimum conductor size of CCA to 14 awg. The smaller conductor size could then be used with a 10 amp circuit. Part of that process was providing recommendations on changes that would need to occur to give CMP-6 the confidence moving forward with introducing a 14awg CCA conductor into the NEC. Some of the recommended changes included adding 10 amps as a standard ampere rating, and addressing concerns with devices and branch circuits. Through our task group work, we proposed, and in our meeting that followed, voted to additionally lower the minimum size of copper to 16 awg that could also be used with a 10amp circuit. This move was driven by NEC 240.4(D)2- small conductors-"16 awg copper" which states that under prescribed conditions a 16 awg copper conductor could have an ampacity of 10 amps. I don't agree with the panel's decision to add 16 awg copper for general use branch circuits at this time. I'm aware that this allowance has been in the NEC for years. My concern is if we open it up for general branch circuit use that there may be applications where problems could occur. This may not be a problem, however, without testing that mirrors what was performed for 14 awg CCA and 14 awg Copper, this can not be validated. One of the driving arguments was that a 16 awg copper conductor is the equivalent of a 14 awg CCA conductor. Based on that statement - the Panel voted to change the 90 degree ampacity in Table 310.16 for 16 awg copper from 18 amps to 20 amps to match what was proposed for 14 awg CCA. After reviewing the test results comparing 14 awg CCA to 14 awg Copper, I question whether or not the 16 awg copper conductor would be an equivalent when it comes to elongation, heat rise, and providing the same margin of safety. My other concern would be the reliability of the connections to devices with a smaller conductor. This could all be validated with testing.

Graser, Peter

Refer to affirmative statement in FR 8371

Newman Searce, Susan

In an attempt to correct an oversight (from the 2020 NEC) in T310.16 within the purview of CMP6, there was an insertion of XHWN listed in the "Ampacity" Table 310.16 in BOTH 75-degree and 90-degree columns. XHWN should be limited to the 75-degree column and not included in the 90-degree column also.

Negative with Comment

Deacy, Brian

The inclusion of smaller sizes for branch circuits is unwarranted and will lead to a greatly increased opportunity for overloading circuits, overheating terminations, and creating fire hazards.

Hunter, Christel K.

The Aluminum Association does not support the use of smaller conductors for branch circuit wiring due to the risk of improper use and overheating of smaller gauge wire.



First Revision No. 8453-NFPA 70-2021 [Section No. 320.23(A)]

(A) Cables Run Across the Top of Floor Joists.

Where run across the top of floor joists, or across the face of rafters or studding within 2.1 m (7 ft) of the floor or floor joists ~~across the face of rafters or studding~~, the cable shall be protected by guard strips that are at least as high as the cable. Where this space is not accessible by permanently installed stairs or ladders, protection shall only be required within 1.8 m (6 ft) of the nearest edge of the scuttle hole or attic entrance.

Submitter Information Verification

Committee: NEC-P06

Submittal Date: Wed Jan 06 13:39:39 EST 2021

Committee Statement

Committee Statement: The term "floor" has been removed to provide clarity when enforcing this requirement.

Response Message: FR-8453-NFPA 70-2021

Public Input No. 736-NFPA 70-2020 [Section No. 320.23(A)]

Ballot Results

✓ **This item has passed ballot**

14 Eligible Voters

0 Not Returned

14 Affirmative All

0 Affirmative with Comments

0 Negative with Comments

0 Abstention

Affirmative All

Crisman, Todd

Cross, Joseph W.

Deacy, Brian

Earl, Timothy

Graser, Peter

Hunter, Christel K.

Kent, Gerald W.

Lamp, Kelly

Newman Scearce, Susan

Nielsen, Dennis A.

Porcaro, Michael Thomas

Riedl, Kenneth

Stene, Susan L.

Watson, Dave

**First Revision No. 8405-NFPA 70-2021 [Section No. 320.30]****320.30** Securing and Supporting.**(A)** General.

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

Type AC cable fittings shall be permitted as a means of cable support.

(B) Securing.

Unless otherwise permitted, Type AC cable shall be secured within 300 mm (12 in.) of every outlet box, junction box, cabinet, or fitting and at intervals not exceeding 1.4 m (4½ ft).

(C) Supporting.

Unless otherwise permitted, Type AC cable shall be supported at intervals not exceeding 1.4 m (4½ ft).

Horizontal runs of Type AC cable installed in wooden or metal framing members or similar supporting means shall be considered supported and secured where such support does not exceed 1.4 m (4½ ft) intervals.

(D) Unsupported Cables.

Type AC cable shall be permitted to be unsupported and unsecured where the cable complies with any of the following:

- (1) Is fished between access points through concealed spaces in finished buildings or structures and supporting is impracticable
- (2) Is not more than 600 mm (2 ft) in length at terminals where flexibility is necessary
- (3) Is not more than 1.8 m (6 ft) in length from the last point of cable support to the point of connection to a luminaire(s) or other electrical equipment and the cable and point of connection are within an accessible ceiling

~~For the purposes of this section, Type AC cable fittings shall be permitted as a means of cable support.~~

Submitter Information Verification

Committee: NEC-P06

Submittal Date: Tue Jan 05 16:52:42 EST 2021

Committee Statement

Committee Statement: Providing the sentence -“Type AC cable fittings shall be used as a means of cable support” is more appropriately located in 320.30(A) as it applies to all sections. When establishing a measurement- the support at the box with the fitting is the starting point.

This first revision relocates and revises the last sentence of 320.30(D) to the last sentence of 320.30(A).

Type AC cable fittings shall be permitted as a means of cable support.

Response FR-8405-NFPA 70-2021

Message:

[Public Input No. 2579-NFPA 70-2020 \[Section No. 320.30\(D\)\]](#)

Ballot Results

✔ **This item has passed ballot**

14 Eligible Voters

0 Not Returned

14 Affirmative All

0 Affirmative with Comments

0 Negative with Comments

0 Abstention

Affirmative All

Crisman, Todd

Cross, Joseph W.

Deacy, Brian

Earl, Timothy

Graser, Peter

Hunter, Christel K.

Kent, Gerald W.

Lamp, Kelly

Newman Searce, Susan

Nielsen, Dennis A.

Porcaro, Michael Thomas

Riedl, Kenneth

Stene, Susan L.

Watson, Dave



First Revision No. 8629-NFPA 70-2021 [Section No. 322.56(B)]

(B) Taps.

Taps shall be made between any phase conductor and the grounded conductor or any other phase conductor by means of devices and fittings identified for the use. Tap devices shall be rated at not less than 15 amperes, or more than 300 volts to ground, and shall be color-coded in accordance with ~~the requirements of 322.120(C).~~

Submitter Information Verification

Committee: NEC-P06

Submittal Date: Fri Jan 08 10:14:21 EST 2021

Committee Statement

Committee Statement: Deleting the words "the requirements of" does not change the meaning of the section.

Response Message: FR-8629-NFPA 70-2021

Public Input No. 4061-NFPA 70-2020 [Section No. 322.56(B)]

Ballot Results

✓ **This item has passed ballot**

14 Eligible Voters

0 Not Returned

14 Affirmative All

0 Affirmative with Comments

0 Negative with Comments

0 Abstention

Affirmative All

Crisman, Todd

Cross, Joseph W.

Deacy, Brian

Earl, Timothy

Graser, Peter

Hunter, Christel K.

Kent, Gerald W.

Lamp, Kelly

Newman Scarce, Susan

Nielsen, Dennis A.

Porcaro, Michael Thomas

Riedl, Kenneth

Stene, Susan L.

Watson, Dave



First Revision No. 8407-NFPA 70-2021 [Section No. 330.10(A)]

(A) General Uses.

Type MC cable shall be permitted as follows:

- (1) For services, feeders, and branch circuits.
- (2) For power, lighting, control, and signal circuits.
- (3) Indoors or outdoors.
- (4) Exposed or concealed.
- (5) To be direct buried where identified for such use.
- (6) In cable tray where identified for such use.
- (7) In any raceway.
- (8) As aerial cable on a messenger.
- (9) In hazardous (classified) locations where specifically permitted by other articles in this *Code*.
- (10) In dry locations and embedded in plaster finish on brick or other masonry except in damp or wet locations.
- (11) In damp or wet locations where a corrosion-resistant jacket is provided over the metallic covering and any of the following conditions are met:
 - a. The metallic covering is impervious to moisture.
 - b. A jacket resistant to moisture is provided under the metal covering.
 - c. The insulated conductors under the metallic covering are listed for use in wet locations.
- (12) Where single-conductor cables are used, all phase conductors and, where used, the grounded conductor shall be grouped together to minimize induced voltage on the sheath.

Submitter Information Verification

Committee: NEC-P06

Submittal Date: Tue Jan 05 17:22:26 EST 2021

Committee Statement

Committee Statement: This revision will provide requirements for the installation of MC cable in damp locations to be the same as wet locations.

Response Message: FR-8407-NFPA 70-2021

[Public Input No. 149-NFPA 70-2019 \[Section No. 330.10\(A\)\]](#)

Ballot Results

✔ This item has passed ballot

14 Eligible Voters

0 Not Returned

13 Affirmative All

1 Affirmative with Comments

0 Negative with Comments

0 Abstention

Affirmative All

Crisman, Todd

Cross, Joseph W.

Deacy, Brian

Earl, Timothy

Hunter, Christel K.

Kent, Gerald W.

Lamp, Kelly

Newman Searce, Susan

Nielsen, Dennis A.

Porcaro, Michael Thomas

Riedl, Kenneth

Stene, Susan L.

Watson, Dave

Affirmative with Comment

Graser, Peter

The change to list # 11 gives clearer guidance for MC cable's use in locations where moisture is present. "Damp," a defined term in the NEC, is no longer neglected by this section.

**First Revision No. 8411-NFPA 70-2021 [Section No. 330.30]****330.30** Securing and Supporting.**(A)** General.

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

Type MC cable fittings shall be permitted as a means of cable support.

(B) Securing.

Unless otherwise ~~provided~~ permitted in this Code, cables shall be secured at intervals not exceeding 1.8 m (6 ft). Cables containing four or fewer conductors sized no larger than 10 AWG shall be secured within 300 mm (12 in.) of every box, cabinet, fitting, or other cable termination. In vertical installations, listed cables with ungrounded conductors 250 kcmil and larger shall be permitted to be secured at intervals not exceeding 3 m (10 ft).

(C) Supporting.

Unless otherwise ~~provided~~ permitted in this Code, cables shall be supported at intervals not exceeding 1.8 m (6 ft).

Horizontal runs of Type MC cable installed in wooden or metal framing members or similar supporting means shall be considered supported and secured where such support does not exceed 1.8-m (6-ft) intervals.

(D) Unsupported Cables.

Type MC cable shall be permitted to be unsupported and unsecured where the cable complies with any of the following:

- (1) Is fished between access points through concealed spaces in finished buildings or structures and supporting is impractical.
- (2) Is not more than 1.8 m (6 ft) in length from the last point of cable support to the point of connection to luminaires or other electrical equipment and the cable and point of connection are within an accessible ceiling.
- (3) Is Type MC of the interlocked armor type in lengths not exceeding 900 mm (3 ft) from the last point where it is securely fastened and is used to connect equipment where flexibility is necessary to minimize the transmission of vibration from equipment or to provide flexibility for equipment that requires movement after installation.

~~For the purpose of this section, Type MC cable fittings shall be permitted as a means of cable support.~~

Submitter Information Verification

Committee: NEC-P06

Submittal Date: Tue Jan 05 17:48:24 EST 2021

Committee Statement

Committee Statement: Changing the word "provided" to "permitted in this Code" in this section provides consistency with section 320.30(B) and (C) .

Providing the sentence -“Type MC cable fittings shall be used as a means of cable support” is more appropriately located in 330.30(A) as it applies to all sections. When establishing a measurement- the support at the box with the fitting is the starting point.

This first revision relocates and revises the last sentence of 330.30(D) to the last sentence of 330.30(A).

Response FR-8411-NFPA 70-2021
Message:

[Public Input No. 2580-NFPA 70-2020 \[Section No. 330.30\(D\)\]](#)

[Public Input No. 4266-NFPA 70-2020 \[Sections 330.30\(B\), 330.30\(C\)\]](#)

Ballot Results

✔ **This item has passed ballot**

14 Eligible Voters

0 Not Returned

14 Affirmative All

0 Affirmative with Comments

0 Negative with Comments

0 Abstention

Affirmative All

Crisman, Todd

Cross, Joseph W.

Deacy, Brian

Earl, Timothy

Graser, Peter

Hunter, Christel K.

Kent, Gerald W.

Lamp, Kelly

Newman Searce, Susan

Nielsen, Dennis A.

Porcaro, Michael Thomas

Riedl, Kenneth

Stene, Susan L.

Watson, Dave



First Revision No. 8420-NFPA 70-2021 [Section No. 330.104]

330.104 Conductors.

For ungrounded, grounded, and equipment grounding conductors, the minimum conductor sizes shall be 16 AWG copper, 14 AWG nickel, or nickel-coated copper and 12 AWG aluminum, or copper-clad aluminum, and 12 AWG aluminum.

For control and signal conductors, minimum conductor sizes shall be 18 AWG copper, nickel, or nickel-coated copper, 14 AWG copper-clad aluminum, and 12 AWG aluminum.

Submitter Information Verification

Committee: NEC-P06

Submittal Date: Tue Jan 05 18:24:41 EST 2021

Committee Statement

Committee Statement: The minimum conductor sizes for copper and copper-clad aluminum are being reduced to 16 AWG copper and 14 AWG copper-clad aluminum. These revisions are based on testing submitted in support of the use of copper-clad aluminum conductors for 10 amp circuits, and the decades of successful use of 16 AWG copper conductors in fixture wire, motor wiring, control wiring, and other current-carrying applications as permitted in the NEC.

The ampacities are based on laboratory testing and equivalent conductivity of conductors.

Response Message: FR-8420-NFPA 70-2021

[Public Input No. 3247-NFPA 70-2020 \[Section No. 330.104\]](#)

Ballot Results

✓ **This item has passed ballot**

14 Eligible Voters

0 Not Returned

9 Affirmative All

3 Affirmative with Comments

2 Negative with Comments

0 Abstention

Affirmative All

Cross, Joseph W.

Earl, Timothy

Kent, Gerald W.

Lamp, Kelly
Newman Searce, Susan
Porcaro, Michael Thomas
Riedl, Kenneth
Stene, Susan L.
Watson, Dave

Affirmative with Comment

Crisman, Todd

I agree with the panel's decision to move forward with lowering the minimum CCA conductor size to 14 awg. There was a task group that was developed to address the concerns of lowering the minimum conductor size of CCA to 14 awg. The smaller conductor size could then be used with a 10 amp circuit. Part of that process was providing recommendations on changes that would need to occur to give CMP-6 the confidence moving forward with introducing a 14awg CCA conductor into the NEC. Some of the recommended changes included adding 10 amps as a standard ampere rating, and addressing concerns with devices and branch circuits. Through our task group work, we proposed, and in our meeting that followed, voted to additionally lower the minimum size of copper to 16 awg that could also be used with a 10amp circuit. This move was driven by NEC 240.4(D)2- small conductors-"16 awg copper" which states that under prescribed conditions a 16 awg copper conductor could have an ampacity of 10 amps. I don't agree with the panel's decision to add 16 awg copper for general use branch circuits at this time. I'm aware that this allowance has been in the NEC for years. My concern is if we open it up for general branch circuit use that there may be applications where problems could occur. This may not be a problem, however, without testing that mirrors what was performed for 14 awg CCA and 14 awg Copper, this can not be validated. One of the driving arguments was that a 16 awg copper conductor is the equivalent of a 14 awg CCA conductor. Based on that statement - the Panel voted to change the 90 degree ampacity in Table 310.16 for 16 awg copper from 18 amps to 20 amps to match what was proposed for 14 awg CCA. After reviewing the test results comparing 14 awg CCA to 14 awg Copper, I question whether or not the 16 awg copper conductor would be an equivalent when it comes to elongation, heat rise, and providing the same margin of safety. My other concern would be the reliability of the connections to devices with a smaller conductor. This could all be validated with testing.

Graser, Peter

Refer to affirmative statement in FR 8371

Nielsen, Dennis A.

Note that Table 250.122 requires that the minimum size for EGC (copper) is #14.

Negative with Comment

Deacy, Brian

The inclusion of smaller sizes for branch circuits is unwarranted and will lead to a greatly increased opportunity for overloading circuits, overheating terminations, and creating fire hazards.

Hunter, Christel K.

The Aluminum Association does not support the use of smaller conductors for branch circuit wiring due to the risk of improper use and overheating of smaller gauge wire.



First Revision No. 8434-NFPA 70-2021 [Section No. 334.10(B)]

(B) Type NMC.

Type NMC cable shall be permitted as follows:

- (1) For both exposed and concealed work in dry, ~~moist~~ wet, damp, or corrosive locations, except as prohibited by 334.10(3)
- (2) In outside and inside walls of masonry block or tile
- (3) In a shallow chase in masonry, concrete, or adobe protected against nails or screws by a steel plate at least 1.59 mm ($\frac{1}{16}$ in.) thick and covered with plaster, adobe, or similar finish

Submitter Information Verification

Committee: NEC-P06

Submittal Date: Wed Jan 06 11:13:32 EST 2021

Committee Statement

Committee Statement: We agree with removal of “moist” and replacing with “wet”. UL 719 standard would need to be modified to be rated for wet locations.

Response Message: FR-8434-NFPA 70-2021

[Public Input No. 3410-NFPA 70-2020 \[Section No. 334.10\(B\)\]](#)

Ballot Results

✓ **This item has passed ballot**

14 Eligible Voters

0 Not Returned

13 Affirmative All

1 Affirmative with Comments

0 Negative with Comments

0 Abstention

Affirmative All

Crisman, Todd

Cross, Joseph W.

Deacy, Brian

Earl, Timothy

Hunter, Christel K.

Kent, Gerald W.

Lamp, Kelly

Newman Searce, Susan

Nielsen, Dennis A.

Porcaro, Michael Thomas

Riedl, Kenneth

Stene, Susan L.

Watson, Dave

Affirmative with Comment

Graser, Peter

The term "wet" is a defined term by the NEC. The term "Moist" is not defined, whereas Dry, Damp and Wet are defined terms.



First Revision No. 8432-NFPA 70-2021 [Section No. 334.10 [Excluding any Sub-Sections]]

Type NM and Type NMC cables shall be permitted to be used in the following, except as prohibited in 334.12:

- (1) One- and two-family dwellings and their attached or detached garages, and their storage buildings.
- (2) Multi-family dwellings and their detached garages permitted to be of Types III, IV, and V construction.
- (3) Other structures permitted to be of Types III, IV, and V construction. Cables shall be concealed within walls, floors, or ceilings that provide a thermal barrier of material that has at least a 15-minute finish rating as identified in listings of fire-rated assemblies.

Informational Note No. 1: ~~Types of building construction and occupancy classifications are defined in~~ See NFPA 220-2018 2021 , *Standard on Types of Building Construction*, or the applicable building code, or both for types of building construction and occupancy classification definitions .

Informational Note No. 2: See Informative Annex E for determination of building types. ~~[NFPA 220, Table 4.1.1]~~

- (4) Cable trays in structures permitted to be Types III, IV, or V where the cables are identified for the use.

Informational Note: See 310.14(A)(3) for temperature limitation of conductors.

- (5) Types I and II construction where installed within raceways permitted to be installed in Types I and II construction.

Submitter Information Verification

Committee: NEC-P06

Submittal Date: Wed Jan 06 11:00:58 EST 2021

Committee Statement

Committee Statement: The allowance for detached garages was added since this was a similar construction and installation type. The informational note was revised to align with the Style Manual.

Response Message: FR-8432-NFPA 70-2021

[Public Input No. 3428-NFPA 70-2020 \[Section No. 334.10 \[Excluding any Sub-Sections\]\]](#)

[Public Input No. 2618-NFPA 70-2020 \[Section No. 334.10 \[Excluding any Sub-Sections\]\]](#)

Ballot Results

✓ This item has passed ballot

14 Eligible Voters

0 Not Returned

13 Affirmative All

0 Affirmative with Comments

1 Negative with Comments

0 Abstention

Affirmative All

Crisman, Todd

Cross, Joseph W.

Deacy, Brian

Earl, Timothy

Graser, Peter

Hunter, Christel K.

Kent, Gerald W.

Newman Searce, Susan

Nielsen, Dennis A.

Porcaro, Michael Thomas

Riedl, Kenneth

Stene, Susan L.

Watson, Dave

Negative with Comment

Lamp, Kelly

The use of nonmetallic sheathed cable in multifamily detached garages raises concern about the protection of property from hazards from the use of electricity, especially where it would be installed without a 15-minute finish rating as applicable in 334.10 (3). This finish rating would offer protection of the wiring method located behind and potentially limit the physical damage and degradation to the wiring method exposed in vehicle garages.

**First Revision No. 8438-NFPA 70-2021 [Section No. 334.12]****334.12** Uses Not Permitted.**(A)** Types NM and NMC.

Types NM and NMC cables shall not be permitted as follows:

- (1) In any dwelling or structure not specifically permitted in 334.10(1), [334.10 \(2\)](#), [334.10 \(3\)](#), and [334.10 \(5\)](#)
- (2) Exposed within a dropped or suspended ceiling cavity in other than one- and two-family and multifamily dwellings
- (3) As service-entrance cable
- (4) In commercial garages having hazardous (classified) locations as defined in 511.3
- (5) In theaters and similar locations, except where permitted in 518.4(C)
- (6) In motion picture studios
- (7) In storage battery rooms
- (8) In hoistways or on elevators or escalators
- (9) Embedded in poured cement, concrete, or aggregate
- (10) In hazardous (classified) locations, except where specifically permitted by other articles in this *Code*
- (11) [Where subject to physical damage except as permitted by 334.15](#)
- (12) [For direct burial](#)

(B) Type NM.

Type NM cables shall not be used under the following conditions or in the following locations:

- (1) Where exposed to corrosive fumes or vapors
- (2) Where embedded in masonry, concrete, adobe, fill, or plaster
- (3) In a shallow chase in masonry, concrete, or adobe and covered with plaster, adobe, or similar finish
- (4) In wet or damp locations

Submitter Information Verification

Committee: NEC-P06

Submittal Date: Wed Jan 06 11:44:30 EST 2021

Committee Statement

Committee Statement: Nonmetallic-Sheathed Cable is to be protected and not subject to physical damage. NM cable is not suitable for direct burial and is therefore prohibited from being directly buried.

Response Message: FR-8438-NFPA 70-2021

[Public Input No. 1270-NFPA 70-2020 \[Section No. 334.12\]](#)

Ballot Results

✔ This item has passed ballot

14 Eligible Voters

0 Not Returned

14 Affirmative All

0 Affirmative with Comments

0 Negative with Comments

0 Abstention

Affirmative All

Crisman, Todd

Cross, Joseph W.

Deacy, Brian

Earl, Timothy

Graser, Peter

Hunter, Christel K.

Kent, Gerald W.

Lamp, Kelly

Newman Searce, Susan

Nielsen, Dennis A.

Porcaro, Michael Thomas

Riedl, Kenneth

Stene, Susan L.

Watson, Dave



First Revision No. 8439-NFPA 70-2021 [Section No. 334.15(B)]

(B) Protection from Physical Damage.

Cable shall be protected from physical damage where necessary by rigid metal conduit, intermediate metal conduit, electrical metallic tubing, Schedule 80 PVC conduit, Type RTRC marked with the suffix -XW, or other approved means. Where passing through a floor, the cable shall be enclosed in rigid metal conduit, intermediate metal conduit, electrical metallic tubing, Schedule 80 PVC conduit, Type RTRC marked with the suffix -XW, or other approved means extending at least 150 mm (6 in.) above the floor. Conduit or tubing shall be provided with a bushing or adapter that provides protection from abrasion at the point the cable enters and exits the raceway.

Type NMC cable installed in shallow chases or grooves in masonry, concrete, or adobe shall be protected in accordance with the requirements in 300.4(F) and covered with plaster, adobe, or similar finish.

Submitter Information Verification

Committee: NEC-P06

Submittal Date: Wed Jan 06 11:53:17 EST 2021

Committee Statement

Committee Statement: The change will provide consistency with other abrasion protection requirements when cable is installed in conduit or tubing.

Response Message: FR-8439-NFPA 70-2021

Public Input No. 1219-NFPA 70-2020 [Section No. 334.15(B)]

Ballot Results

✓ **This item has passed ballot**

14 Eligible Voters

0 Not Returned

14 Affirmative All

0 Affirmative with Comments

0 Negative with Comments

0 Abstention

Affirmative All

Crisman, Todd

Cross, Joseph W.

Deacy, Brian

Earl, Timothy

Graser, Peter

Hunter, Christel K.

Kent, Gerald W.

Lamp, Kelly

Newman Searce, Susan

Nielsen, Dennis A.

Porcaro, Michael Thomas

Riedl, Kenneth

Stene, Susan L.

Watson, Dave



First Revision No. 8443-NFPA 70-2021 [Section No. 334.15(C)]

(C) In Unfinished Basements and Crawl Spaces.

Where cable is run at angles with joists in unfinished basements and crawl spaces, it shall be permissible to secure cables not smaller than two 6 AWG or three 8 AWG conductors directly to the lower edges of the joists. Smaller cables shall be run either through bored holes in joists or on running boards. Nonmetallic-sheathed cable installed on the wall of an unfinished basement shall be permitted to be installed in a listed conduit or tubing or shall be protected in accordance with 300.4. Conduit or tubing shall be provided with a ~~suitable insulating~~ bushing or adapter that provides protection from abrasion at the point the cable enters and exits the raceway. The sheath of the nonmetallic-sheathed cable shall extend through the conduit or tubing and into the outlet, device, or device junction box not less than 6 mm (¼ in.). The cable shall be secured within 300 mm (12 in.) of the point where the cable enters the conduit or tubing. Metal conduit, tubing, and metal outlet boxes shall be connected to an equipment grounding conductor complying with ~~the provisions of~~ 250.86 and 250.148.

Submitter Information Verification

Committee: NEC-P06

Submittal Date: Wed Jan 06 12:12:53 EST 2021

Committee Statement

Committee Statement: The change will provide consistency with other abrasion protection requirements when cable is installed in conduit or tubing. Other changes were made to follow the NEC Style Manual 4.1.3 Reference Structure.

Response Message: FR-8443-NFPA 70-2021

[Public Input No. 1220-NFPA 70-2020 \[Section No. 334.15\(C\)\]](#)

[Public Input No. 4140-NFPA 70-2020 \[Section No. 334.15\(C\)\]](#)

Ballot Results

✓ **This item has passed ballot**

14 Eligible Voters

0 Not Returned

14 Affirmative All

0 Affirmative with Comments

0 Negative with Comments

0 Abstention

Affirmative All

Crisman, Todd

Cross, Joseph W.

Deacy, Brian
Earl, Timothy
Graser, Peter
Hunter, Christel K.
Kent, Gerald W.
Lamp, Kelly
Newman Searce, Susan
Nielsen, Dennis A.
Porcaro, Michael Thomas
Riedl, Kenneth
Stene, Susan L.
Watson, Dave



First Revision No. 8481-NFPA 70-2021 [New Section after 334.17]

334.19 Cable Entries.

The sheath on nonmetallic-sheathed cable shall extend not less than 6 mm ($\frac{1}{4}$ in.) beyond any cable clamp or cable entry.

Submitter Information Verification

Committee: NEC-P06

Submittal Date: Wed Jan 06 17:27:23 EST 2021

Committee Statement

Committee Statement: This requirement was added to ensure protection of the insulated conductors when they enter any type of electrical component.

Response Message: FR-8481-NFPA 70-2021

[Public Input No. 2026-NFPA 70-2020 \[Section No. 334.30\]](#)

Ballot Results

✓ **This item has passed ballot**

14 Eligible Voters

0 Not Returned

14 Affirmative All

0 Affirmative with Comments

0 Negative with Comments

0 Abstention

Affirmative All

Crisman, Todd

Cross, Joseph W.

Deacy, Brian

Earl, Timothy

Graser, Peter

Hunter, Christel K.

Kent, Gerald W.

Lamp, Kelly

Newman Searce, Susan

Nielsen, Dennis A.

Porcaro, Michael Thomas

Riedl, Kenneth

Stene, Susan L.

Watson, Dave



First Revision No. 8519-NFPA 70-2021 [Section No. 334.24]

334.24 Bending Radius.

Bends in Types NM and NMC cable shall be so made that the cable will not be damaged. The radius of the curve of the inner edge of any bend during or after installation shall not be less than five times the diameter of the cable. For flat cables, the major diameter dimension of the cable shall be used to determine the bending radius.

Submitter Information Verification

Committee: NEC-P06

Submittal Date: Thu Jan 07 09:05:23 EST 2021

Committee Statement

Committee Statement: The change in wording provides the minimal clarity for description pertaining to minor and major diameters per the axis of the flat cable.

To be consistent with other Sections the language submitted should be the same and include the word “major” for clarity to using the diameter dimension to determine the radius of the bend. The change in wording provides the minimal clarity for description pertaining to minor and major diameters.

Response Message: FR-8519-NFPA 70-2021

Public Input No. 1501-NFPA 70-2020 [Section No. 334.24]

Ballot Results

✓ **This item has passed ballot**

14 Eligible Voters

0 Not Returned

14 Affirmative All

0 Affirmative with Comments

0 Negative with Comments

0 Abstention

Affirmative All

Crisman, Todd

Cross, Joseph W.

Deacy, Brian

Earl, Timothy

Graser, Peter

Hunter, Christel K.

Kent, Gerald W.

Lamp, Kelly

Newman Searce, Susan

Nielsen, Dennis A.

Porcaro, Michael Thomas

Riedl, Kenneth

Stene, Susan L.

Watson, Dave



First Revision No. 8520-NFPA 70-2021 [Section No. 334.40(B)]

(B) Devices of Insulating Material.

Self-contained switches, self-contained receptacles, and nonmetallic-sheathed cable interconnector devices of insulating material that are listed for the purpose shall be permitted to be used without boxes in exposed cable wiring and for ~~repair~~ wiring in existing and new buildings where the cable is concealed. Openings in such devices shall form a close fit around the outer covering of the cable, and the device shall fully enclose the part of the cable from which any part of the covering has been removed. Where connections to conductors are by binding-screw terminals, there shall be available as many terminals as conductors.

Submitter Information Verification

Committee: NEC-P06

Submittal Date: Thu Jan 07 09:12:52 EST 2021

Committee Statement

Committee Statement: The existing language already permits repairs in one-and-two family dwellings as it simply refers to “buildings.” The change would now allow for use of these listed devices in both existing and new buildings and is not limited to repair wiring.

Response Message: FR-8520-NFPA 70-2021

[Public Input No. 3591-NFPA 70-2020 \[Section No. 334.40\(B\)\]](#)

Ballot Results

✓ **This item has passed ballot**

14 Eligible Voters

0 Not Returned

12 Affirmative All

0 Affirmative with Comments

2 Negative with Comments

0 Abstention

Affirmative All

Cross, Joseph W.

Deacy, Brian

Earl, Timothy

Graser, Peter

Hunter, Christel K.

Kent, Gerald W.

Newman Scearce, Susan

Nielsen, Dennis A.

Porcaro, Michael Thomas

Riedl, Kenneth

Stene, Susan L.

Watson, Dave

Negative with Comment

Crisman, Todd

I don't agree with the panels decision to allow these interconnector devices to be used in new construction. It's my understanding these devices have a good track record for the repair of NM cables in existing installations with the device installed in a concealed location. In the substantiation, the submitter had also mentioned an allowance in NEC section 545.13 that would allow for these concealed connectors to be used to connect panelized walls and panels. These applications are good examples of the type of allowances I would be open to with adequate substantiation. In the meantime, providing an allowance to use the devices in new construction could result in installation practices that are not in line with the high standards set by the NEC. This becomes a greater concern as the industry pushes for expanded allowances for the use of NM cable outside of the standard one to two family dwellings.

Lamp, Kelly

The need for insulated devices has a justification in modular construction such as in NEC Section 545.13 and applicable to similar construction of panelized or kitted walls of residential construction. I do not believe the revised text fulfills that need without unintended consequences. The installer of nonmetallic cable could use this insulated device when cables are damaged during construction instead of replacing the damaged cable or use an insulating device to extend the length of nonmetallic cable when the cable supply is of insufficient length resulting in concealed splices routinely, which would have a higher likelihood of failure than cable runs without a splice.



First Revision No. 8521-NFPA 70-2021 [Section No. 334.80]

334.80 Ampacity.

The ampacity of Types NM and NMC cable shall be determined in accordance with 310.14. The ampacity shall not exceed that of a 60°C (140°F) rated conductor. The 90°C (194°F) rating shall be permitted to be used for ampacity adjustment and correction calculations, provided the final calculated ampacity does not exceed that of a 60°C (140°F) rated conductor. The ampacity of Types NM and NMC cable installed in cable trays shall be determined in accordance with 392.80(A).

Where more than two NM cables containing two or more current-carrying conductors are installed, without maintaining spacing between the cables, through the same opening in wood framing that is to be sealed with thermal insulation, caulk, or sealing foam, the ampacity of each conductor shall be adjusted in accordance with Table 310.15(C)(1) ~~and the provisions of 310.14(A)(2)~~, Exception, shall not apply.

Where more than two NM cables containing two or more current-carrying conductors are installed in contact with thermal insulation without maintaining spacing between cables, the ampacity of each conductor shall be adjusted in accordance with Table 310.15(C)(1) and 310.14(A)(2), Exception shall not apply.

Submitter Information Verification

Committee: NEC-P06

Submittal Date: Thu Jan 07 09:36:34 EST 2021

Committee Statement

Committee Statement: A limitation was added to prohibit the use of the exception in 310.14(A)(2) and this will require all ungrounded and grounded conductors in thermal insulation (e.g. foam, caulk, etc.) to be considered current carrying for the purpose of ampacity adjustment. The removal of "the provisions of" is in accordance with the NEC style manual.

Response Message: FR-8521-NFPA 70-2021

[Public Input No. 170-NFPA 70-2019 \[Section No. 334.80\]](#)

[Public Input No. 4141-NFPA 70-2020 \[Section No. 334.80\]](#)

Ballot Results

✓ **This item has passed ballot**

14 Eligible Voters

0 Not Returned

14 Affirmative All

0 Affirmative with Comments

0 Negative with Comments

0 Abstention

Affirmative All

Crisman, Todd

Cross, Joseph W.

Deacy, Brian

Earl, Timothy

Graser, Peter

Hunter, Christel K.

Kent, Gerald W.

Lamp, Kelly

Newman Searce, Susan

Nielsen, Dennis A.

Porcaro, Michael Thomas

Riedl, Kenneth

Stene, Susan L.

Watson, Dave

**First Revision No. 8435-NFPA 70-2021 [Section No. 334.104]****334.104** Conductors.

~~The 600-volt insulated power conductors shall be sizes~~ For ungrounded, grounded, and equipment grounding conductors, the conductor sizes shall be 16 AWG through 2 AWG copper, 14 AWG through 2 AWG copper- conductors or sizes clad aluminum, or 12 AWG through 2 AWG aluminum or copper-clad aluminum conductors. ~~Control and signaling conductors shall be no smaller than 18 AWG copper.~~

~~Control~~ For control and signaling conductors, the minimum conductor sizes shall be no smaller than 18 AWG copper, 14 AWG copper-clad aluminum, and 12 AWG aluminum .

Submitter Information Verification

Committee: NEC-P06

Submittal Date: Wed Jan 06 11:19:08 EST 2021

Committee Statement

Committee Statement: The minimum conductor sizes for copper and copper-clad aluminum are being reduced to 16 AWG copper and 14 AWG copper-clad aluminum. These revisions are based on testing submitted in support of the use of copper-clad aluminum conductors for 10 amp circuits, and the decades of successful use of 16 AWG copper conductors in fixture wire, motor wiring, control wiring, and other current-carrying applications as permitted in the NEC. For clarity and consistency edits were incorporated to reflect other code articles for conductor types.

Response Message: FR-8435-NFPA 70-2021

Public Input No. 3248-NFPA 70-2020 [Section No. 334.104]

Ballot Results

✔ **This item has passed ballot**

14 Eligible Voters

0 Not Returned

10 Affirmative All

2 Affirmative with Comments

2 Negative with Comments

0 Abstention

Affirmative All

Crisman, Todd

Cross, Joseph W.

Earl, Timothy

Kent, Gerald W.

Lamp, Kelly
Newman Searce, Susan
Porcaro, Michael Thomas
Riedl, Kenneth
Stene, Susan L.
Watson, Dave

Affirmative with Comment

Graser, Peter

Refer to affirmative statement in FR 8371

Nielsen, Dennis A.

Note that Table 250.122 requires that the minimum size for EGC (copper) is #14.

Negative with Comment

Deacy, Brian

The inclusion of smaller sizes for branch circuits is unwarranted and will lead to a greatly increased opportunity for overloading circuits, overheating terminations, and creating fire hazards.

Hunter, Christel K.

The Aluminum Association does not support the use of smaller conductors for branch circuit wiring due to the risk of improper use and overheating of smaller gauge wire.



First Revision No. 8437-NFPA 70-2021 [Section No. 334.112]

334.112 Insulation.

The insulated power conductors shall be one of the types listed in Table 310.4(1) that are suitable for branch-circuit wiring or one that is identified for use in these cables. Conductor insulation shall be rated at 90°C (194°F).

Informational Note: Types NM, ~~NMC~~, and ~~NMS~~ NMC cable identified by the markings NM-B, ~~NMC-B~~, and ~~NMS~~ NMC -B meet this requirement.

Submitter Information Verification

Committee: NEC-P06

Submittal Date: Wed Jan 06 11:38:01 EST 2021

Committee Statement

Committee Statement: The reference to Type NMS and NMS-B have been removed since these types no longer exist in Article 334.

Response Message: FR-8437-NFPA 70-2021

Public Input No. 171-NFPA 70-2019 [Section No. 334.112]

Ballot Results

✔ This item has passed ballot

14 Eligible Voters

0 Not Returned

14 Affirmative All

0 Affirmative with Comments

0 Negative with Comments

0 Abstention

Affirmative All

Crisman, Todd

Cross, Joseph W.

Deacy, Brian

Earl, Timothy

Graser, Peter

Hunter, Christel K.

Kent, Gerald W.

Lamp, Kelly

Newman Searce, Susan

Nielsen, Dennis A.

Porcaro, Michael Thomas

Riedl, Kenneth

Stene, Susan L.

Watson, Dave



First Revision No. 8524-NFPA 70-2021 [Section No. 336.10]

336.10 Uses Permitted.

Type TC cable shall be permitted to be used as follows:

- (1) For power, lighting, control, and signal circuits.
- (2) In cable trays, including those with mechanically discontinuous segments up to 300 mm (1 ft).
- (3) In raceways.
- (4) In outdoor locations supported by a messenger wire.
- (5) For Class 1 circuits as permitted in Parts II and III of Article 725.
- (6) For non-power-limited fire alarm circuits if conductors comply with the requirements of 760.49.
- (7) Between a cable tray and the utilization equipment or device(s), provided all of the following apply:
 - a. The cable is Type TC-ER.
 - b. The cable is installed in industrial establishments where the conditions of maintenance and supervision ensure that only qualified persons service the installation.
 - c. The cable is continuously supported and protected against physical damage using mechanical protection such as struts, angles, or channels.
 - d. The cable complies with the crush and impact requirements of Type MC cable and is identified with the marking "TC-ER."
 - e. The cable is secured at intervals not exceeding 1.8 m (6 ft).
 - f. Equipment grounding for the utilization equipment is provided by an equipment grounding conductor within the cable. In cables containing conductors sized 6 AWG or smaller, the equipment grounding conductor shall be provided within the cable or, at the time of installation, one or more insulated conductors shall be permanently identified as an equipment grounding conductor in accordance with 250.119(C).

Exception to (7): Where not subject to physical damage, Type TC-ER shall be permitted to transition between cable trays and between cable trays and equipment or devices for a distance not to exceed 1.8 m (6 ft) without continuous support. The cable shall be mechanically supported where exiting the cable tray to ensure that the minimum bending radius is not exceeded.

- (8) Type TC cable shall be resistant to moisture and corrosive agents where installed in wet locations.
- (9) ~~In~~ For one- and two-family dwelling units, Type TC-ER-JP cable containing ~~conductors for both power and control conductors~~ circuits shall be permitted for branch circuits and feeders. Type TC-ER-JP cable used as interior wiring shall be installed per the requirements of Part II of Article 334 and where installed as exterior wiring shall be installed per the requirements of Part II of Article 340.

Exception: Where used to connect a generator and associated equipment having terminals rated 75°C (140°F) or higher, the cable shall not be limited in ampacity by 334.80 or 340.80.

Informational Note No. 1: See 725.136 for limitations on Class 2 or 3 circuits contained within the same cable with conductors of electric light, power, or Class 1 circuits.

- (10) Direct buried, where identified for such use.
- (11) In hazardous (classified) locations where specifically permitted by other articles in this Code.
- (12) For service-entrance conductors where identified for such use and marked Type TC-ER.

Informational Note No. 2: See 310.14(A)(3) for temperature limitation of conductors.

Supplemental Information

<u>File Name</u>	<u>Description</u>	<u>Approved</u>
Revised_336.10.docx	Revised 336.10 - For Staff Use Only	

Submitter Information Verification

Committee: NEC-P06

Submittal Date: Thu Jan 07 10:52:39 EST 2021

Committee Statement

Committee Statement: The term “In” was changed to “For” for clarity and consistency.

A list item (12) was added for permitted uses for Type TC-ER cable to correlate with 230.43 and 230.44. This will also initiate appropriate listing requirements to ensure that the cable is suitable for use as service conductors.

The language was modified to clarify that the control conductors are being used for control circuits.

Response Message: FR-8524-NFPA 70-2021

[Public Input No. 4320-NFPA 70-2020 \[New Section after 336.10\]](#)

[Public Input No. 4009-NFPA 70-2020 \[Section No. 336.10\]](#)

[Public Input No. 4017-NFPA 70-2020 \[Section No. 336.10\]](#)

Ballot Results

✔ **This item has passed ballot**

14 Eligible Voters

0 Not Returned

14 Affirmative All

0 Affirmative with Comments

0 Negative with Comments

0 Abstention

Affirmative All

Crisman, Todd

Cross, Joseph W.

Deacy, Brian

Earl, Timothy

Graser, Peter

Hunter, Christel K.

Kent, Gerald W.

Lamp, Kelly

Newman Searce, Susan

Nielsen, Dennis A.

Porcaro, Michael Thomas

Riedl, Kenneth

Stene, Susan L.

Watson, Dave



First Revision No. 8613-NFPA 70-2021 [Section No. 336.104 [Excluding any Sub-Sections]]

For ungrounded, grounded, and equipment grounding conductors, the conductor sizes shall be 16 AWG through 1000 kcmil copper, 14 AWG through 1000 kcmil copper-clad aluminum, nickel, or nickel-coated copper, or and 12 AWG through 1000 kcmil aluminum or copper-clad aluminum. Insulation types shall be one of the types listed in Table 310.4(1) or Table 310.4(2) that is suitable for branch circuit and feeder circuits or one that is identified for such use.

For control and signal conductors, the minimum conductor sizes shall be 18 AWG copper, nickel, or nickel-coated copper, 14 AWG copper-clad aluminum, and 12 AWG aluminum.

Submitter Information Verification

Committee: NEC-P06

Submittal Date: Thu Jan 07 21:25:21 EST 2021

Committee Statement

Committee Statement: Added allowance for 14 AWG Copper-Clad Aluminum and 16 AWG copper for grounded, ungrounded and equipment grounding conductors. First revisions are being made in other parts of the Code for correlation.

Response Message: FR-8613-NFPA 70-2021

Public Input No. 3249-NFPA 70-2020 [Section No. 336.104 [Excluding any Sub-Sections]]

Ballot Results

✓ **This item has passed ballot**

14 Eligible Voters

0 Not Returned

10 Affirmative All

2 Affirmative with Comments

2 Negative with Comments

0 Abstention

Affirmative All

Crisman, Todd

Cross, Joseph W.

Earl, Timothy

Kent, Gerald W.

Lamp, Kelly

Newman Scearce, Susan

Porcaro, Michael Thomas

Riedl, Kenneth
Stene, Susan L.
Watson, Dave

Affirmative with Comment

Graser, Peter

Refer to affirmative statement in FR 8371

Nielsen, Dennis A.

Note that Table 250.122 requires that the minimum size for EGC (copper) is #14.

Negative with Comment

Deacy, Brian

The inclusion of smaller sizes for branch circuits is unwarranted and will lead to a greatly increased opportunity for overloading circuits, overheating terminations, and creating fire hazards.

Hunter, Christel K.

The Aluminum Association does not support the use of smaller conductors for branch circuit wiring due to the risk of improper use and overheating of smaller gauge wire.



First Revision No. 8614-NFPA 70-2021 [Section No. 337.1]

337.1 Scope.

This article covers the use, installation, and construction specifications for up through 2000 volt drilling rig cable, ~~Type P cable~~ (armored and unarmored).

Submitter Information Verification

Committee: NEC-P06

Submittal Date: Thu Jan 07 21:33:46 EST 2021

Committee Statement

Committee Statement: Change the title of the Article 337 to "Drilling Rig Cable" The title and scope were revised to provide a name for this cable. Code Making Panel 6 refers this recommendation to the Correlating Committee for review.

Response Message: FR-8614-NFPA 70-2021

Ballot Results

✔ This item has passed ballot

14 Eligible Voters

0 Not Returned

14 Affirmative All

0 Affirmative with Comments

0 Negative with Comments

0 Abstention

Affirmative All

Crisman, Todd

Cross, Joseph W.

Deacy, Brian

Earl, Timothy

Graser, Peter

Hunter, Christel K.

Kent, Gerald W.

Lamp, Kelly

Newman Searce, Susan

Nielsen, Dennis A.

Porcaro, Michael Thomas

Riedl, Kenneth

Stene, Susan L.

Watson, Dave



First Revision No. 8567-NFPA 70-2021 [Section No. 337.80]

337.80 Ampacity.

The ampacity of Type P cable shall be determined in accordance with 310.14(A) or 310.14(B) for 14 AWG and larger conductors. For 18 AWG and 16 AWG conductors, the ampacities shall be determined in accordance with Table 402.5 or 310.14(B). When installed in cable tray, the ampacities shall be permitted to be determined in accordance with 392.80. The installation shall not exceed the temperature ratings of terminations and equipment.

Submitter Information Verification

Committee: NEC-P06

Submittal Date: Thu Jan 07 15:44:18 EST 2021

Committee Statement

Committee Statement: The reference to 310.14(B) was added to permit calculated ampacities for 18 AWG and 16 AWG conductors.

Response Message: FR-8567-NFPA 70-2021

[Public Input No. 2938-NFPA 70-2020 \[Section No. 337.80\]](#)

[Public Input No. 3505-NFPA 70-2020 \[Section No. 337.80\]](#)

Ballot Results

✔ This item has passed ballot

14 Eligible Voters

0 Not Returned

13 Affirmative All

1 Affirmative with Comments

0 Negative with Comments

0 Abstention

Affirmative All

Crisman, Todd

Cross, Joseph W.

Deacy, Brian

Earl, Timothy

Hunter, Christel K.

Kent, Gerald W.

Lamp, Kelly

Newman Scearce, Susan

Nielsen, Dennis A.

Porcaro, Michael Thomas

Riedl, Kenneth

Stene, Susan L.

Watson, Dave

Affirmative with Comment

Graser, Peter

Guidance for 16 AWG and 18 AWG Copper wire for decades has properly used table 402.5 for ampacity guidance. 16 AWG copper is properly rated at 8 Amps, whereas 18 AWG copper is properly rated at 6 amps.



First Revision No. 8568-NFPA 70-2021 [Section No. 337.108]

337.108 Equipment Grounding Conductor.

An equipment grounding conductor complying with 250.122 shall be provided within the multiconductor Type P cable.

Submitter Information Verification

Committee: NEC-P06

Submittal Date: Thu Jan 07 15:46:50 EST 2021

Committee Statement

Committee Statement: Equipment grounding conductors are not required within a single conductor Type P cable. The text was revised to clarify that equipment grounding conductors are only required in multiconductor cables.

Response Message: FR-8568-NFPA 70-2021

Public Input No. 3380-NFPA 70-2020 [Section No. 337.108]

Ballot Results

✓ **This item has passed ballot**

14 Eligible Voters

0 Not Returned

14 Affirmative All

0 Affirmative with Comments

0 Negative with Comments

0 Abstention

Affirmative All

Crisman, Todd

Cross, Joseph W.

Deacy, Brian

Earl, Timothy

Graser, Peter

Hunter, Christel K.

Kent, Gerald W.

Lamp, Kelly

Newman Searce, Susan

Nielsen, Dennis A.

Porcaro, Michael Thomas

Riedl, Kenneth

Stene, Susan L.

Watson, Dave



First Revision No. 8570-NFPA 70-2021 [Section No. 337.115]

337.115 Jacket.

~~Single conductor cables and multiconductor cables~~ Multiconductor cables shall have an overall nonmetallic jacket that is impervious to moisture, corrosion resistant, and sunlight resistant. When installed external to an enclosure or industrial machinery, single conductor cables shall have an overall nonmetallic jacket that is impervious to moisture, corrosion resistant, and sunlight resistant. Single conductor cables rated 2000 volts with conductor sizes equal to or larger than 4/0 AWG shall be permitted to use an increased insulation thickness in lieu of using a separate cable jacket. When the increased insulation thickness is used, the insulation material shall be sunlight resistant.

Submitter Information Verification

Committee: NEC-P06

Submittal Date: Thu Jan 07 15:48:30 EST 2021

Committee Statement

Committee Statement: Revisions were made to permit single conductor cables without an overall jacket for installation in enclosures or machinery, or larger conductors with increased insulation thickness. Additional requirements were established for these applications.

Response Message: FR-8570-NFPA 70-2021

[Public Input No. 4701-NFPA 70-2020 \[Section No. 337.115\]](#)

[Public Input No. 4659-NFPA 70-2020 \[Section No. 337.115\]](#)

[Public Input No. 3493-NFPA 70-2020 \[Section No. 337.115\]](#)

Ballot Results

✔ This item has passed ballot

14 Eligible Voters

0 Not Returned

14 Affirmative All

0 Affirmative with Comments

0 Negative with Comments

0 Abstention

Affirmative All

Crisman, Todd

Cross, Joseph W.

Deacy, Brian

Earl, Timothy

Graser, Peter

Hunter, Christel K.

Kent, Gerald W.

Lamp, Kelly

Newman Searce, Susan

Nielsen, Dennis A.

Porcaro, Michael Thomas

Riedl, Kenneth

Stene, Susan L.

Watson, Dave



First Revision No. 8572-NFPA 70-2021 [Section No. 337.116]

337.116 Armor.

Armor shall be permitted over the jacket. If provided, the armor or metallic covering shall be a braided basket weave type consisting of wire laid closely together, flat and parallel, and forming a basket weave that shall firmly grip the cable. The wire shall be commercial bronze, tinned copper, stainless steel, or aluminum . The armor shall not be used as a current-carrying conductor or as an equipment grounding conductor. A nonmetallic jacket that conforms to 337.115 shall be provided over the armor.

Submitter Information Verification

Committee: NEC-P06

Submittal Date: Thu Jan 07 15:54:42 EST 2021

Committee Statement

Committee Statement: Additional armor metal options were added to recognize industry practices.

Response Message: FR-8572-NFPA 70-2021

Public Input No. 2936-NFPA 70-2020 [Section No. 337.116]

Ballot Results

✓ **This item has passed ballot**

14 Eligible Voters

0 Not Returned

14 Affirmative All

0 Affirmative with Comments

0 Negative with Comments

0 Abstention

Affirmative All

Crisman, Todd

Cross, Joseph W.

Deacy, Brian

Earl, Timothy

Graser, Peter

Hunter, Christel K.

Kent, Gerald W.

Lamp, Kelly

Newman Scearce, Susan

Nielsen, Dennis A.

Porcaro, Michael Thomas

Riedl, Kenneth

Stene, Susan L.

Watson, Dave



First Revision No. 8604-NFPA 70-2021 [Section No. 338.10(B)(4)]

(4) Installation Methods for Branch Circuits and Feeders.

~~Informational Note No. 1: See 310.14(A)(3) for temperature limitation of conductors.~~

~~Informational Note No. 2: For the installation of main power feeder conductors in dwelling units refer to 310.12.~~

(a) *Interior Installations.* Interior installations shall comply with the following:

- (1) In addition to the provisions of this article, Type SE service-entrance cable used for interior wiring shall comply with the installation requirements of Part II of Article 334, excluding 334.80.
- (2) Where more than two Type SE cables containing two or more current-carrying conductors in each cable are installed in contact with thermal insulation, caulk, or sealing foam without maintaining spacing between cables, the ampacity of each conductor shall be adjusted in accordance with Table 310.15(C)(1).
- (3) For Type SE cable with ungrounded conductor sizes 10 AWG and smaller, where installed in contact with thermal insulation, the ampacity shall be in accordance with 60°C (140°F) conductor temperature rating. The maximum conductor temperature rating shall be permitted to be used for ampacity adjustment and correction purposes, if the final ampacity does not exceed that for a 60°C (140°F) rated conductor.

(b) *Exterior Installations.* Exterior installations shall comply with the following:

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

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

Submitter Information Verification

Committee: NEC-P06

Submittal Date: Thu Jan 07 19:01:02 EST 2021

Committee Statement

Committee Statement: CMP6 agrees with following the text where applicable per NEC Style Manual 3.1.3. For clarity the informational notes do not add significant value in applying the other article sections referenced. Therefore, they are being deleted.

Response Message: FR-8604-NFPA 70-2021

Public Input No. 3905-NFPA 70-2020 [Section No. 338.10(B)(4)]

Ballot Results

✔ **This item has passed ballot**

14 Eligible Voters

0 Not Returned

14 Affirmative All

0 Affirmative with Comments

0 Negative with Comments

0 Abstention

Affirmative All

Crisman, Todd

Cross, Joseph W.

Deacy, Brian

Earl, Timothy

Graser, Peter

Hunter, Christel K.

Kent, Gerald W.

Lamp, Kelly

Newman Searce, Susan

Nielsen, Dennis A.

Porcaro, Michael Thomas

Riedl, Kenneth

Stene, Susan L.

Watson, Dave



First Revision No. 8458-NFPA 70-2021 [Section No. 338.12(A)]

(A) Service-Entrance Cable.

~~Service-entrance cable (SE)~~ Type SE cable shall not be used under the following conditions or in the following locations:

- (1) Where subject to physical damage unless protected in accordance with 230.50(B)
- (2) Underground with or without a raceway
- (3) For exterior branch circuits and feeder wiring unless the installation complies with ~~the provisions of~~ Part I of Article 225 and is supported in accordance with 334.30 or is used as messenger-supported wiring as permitted in Part II of Article 396

Submitter Information Verification

Committee: NEC-P06

Submittal Date: Wed Jan 06 14:58:12 EST 2021

Committee Statement

Committee Statement: Editorial revision to align with the Style Manual.

Response Message: FR-8458-NFPA 70-2021

Public Input No. 4142-NFPA 70-2020 [Section No. 338.12(A)]

Ballot Results

✓ **This item has passed ballot**

14 Eligible Voters

0 Not Returned

14 Affirmative All

0 Affirmative with Comments

0 Negative with Comments

0 Abstention

Affirmative All

Crisman, Todd

Cross, Joseph W.

Deacy, Brian

Earl, Timothy

Graser, Peter

Hunter, Christel K.

Kent, Gerald W.

Lamp, Kelly

Newman Searce, Susan

Nielsen, Dennis A.

Porcaro, Michael Thomas

Riedl, Kenneth

Stene, Susan L.

Watson, Dave



First Revision No. 8605-NFPA 70-2021 [Section No. 338.24]

338.24 Bending Radius.

Bends in Types USE and SE cable shall be so made that the cable will not be damaged. The radius of the curve of the inner edge of any bend, during or after installation, shall not be less than five times the diameter of the cable. For flat cables, the major diameter dimension of the cable shall be used to determine the bending radius.

Submitter Information Verification

Committee: NEC-P06

Submittal Date: Thu Jan 07 19:09:46 EST 2021

Committee Statement

Committee Statement: The change in wording provides the minimal clarity for description pertaining to minor and major diameters per the axis of the flat cable.

To be consistent with other Sections the language submitted should be the same and include the word “major” for clarity to using the diameter dimension to determine the radius of the bend. The change in wording provides the minimal clarity for description pertaining to minor and major diameters.

Response Message: FR-8605-NFPA 70-2021

[Public Input No. 1503-NFPA 70-2020 \[Section No. 338.24\]](#)

Ballot Results

✓ **This item has passed ballot**

14 Eligible Voters

0 Not Returned

14 Affirmative All

0 Affirmative with Comments

0 Negative with Comments

0 Abstention

Affirmative All

Crisman, Todd

Cross, Joseph W.

Deacy, Brian

Earl, Timothy

Graser, Peter

Hunter, Christel K.

Kent, Gerald W.

Lamp, Kelly

Newman Searce, Susan

Nielsen, Dennis A.

Porcaro, Michael Thomas

Riedl, Kenneth

Stene, Susan L.

Watson, Dave



First Revision No. 8608-NFPA 70-2021 [Section No. 340.24]

340.24 Bending Radius.

Bends in Type UF cable shall be so made that the cable is not damaged. The radius of the curve of the inner edge of any bend shall not be less than five times the diameter of the cable. For flat cables, the major diameter dimension of the cable shall be used to determine the bending radius.

Submitter Information Verification

Committee: NEC-P06

Submittal Date: Thu Jan 07 19:29:02 EST 2021

Committee Statement

Committee Statement: The change in wording provides the minimal clarity for description pertaining to minor and major diameters per the axis of the flat cable.

To be consistent with other Sections the language submitted should be the same and include the word “major” for clarity to using the diameter dimension to determine the radius of the bend. The change in wording provides the minimal clarity for description pertaining to minor and major diameters.

Response Message: FR-8608-NFPA 70-2021

Public Input No. 1502-NFPA 70-2020 [Section No. 340.24]

Ballot Results

✓ **This item has passed ballot**

14 Eligible Voters

0 Not Returned

14 Affirmative All

0 Affirmative with Comments

0 Negative with Comments

0 Abstention

Affirmative All

Crisman, Todd

Cross, Joseph W.

Deacy, Brian

Earl, Timothy

Graser, Peter

Hunter, Christel K.

Kent, Gerald W.

Lamp, Kelly

Newman Searce, Susan

Nielsen, Dennis A.

Porcaro, Michael Thomas

Riedl, Kenneth

Stene, Susan L.

Watson, Dave



First Revision No. 8606-NFPA 70-2021 [Section No. 340.104]

340.104 Conductors.

~~The conductors shall be sizes 14 AWG copper or 12 AWG aluminum or~~ For ungrounded, grounded, and equipment grounding conductors, the conductor sizes shall be 16 AWG through 4/0 AWG copper, or 14 AWG through 4/0 AWG copper-clad aluminum, or 12 AWG through 4/0 AWG aluminum .

Submitter Information Verification

Committee: NEC-P06

Submittal Date: Thu Jan 07 19:21:53 EST 2021

Committee Statement

Committee Statement: The minimum conductor sizes for copper and copper-clad aluminum are being reduced to 16 AWG copper and 14 AWG copper-clad aluminum. These revisions are based on testing submitted in support of the use of copper-clad aluminum conductors for 10 amp circuits, and the decades of successful use of 16 AWG copper conductors in fixture wire, motor wiring, control wiring, and other current-carrying applications as permitted in the NEC. For clarity and consistency edits were incorporated to reflect other code articles for conductor types.

Response Message: FR-8606-NFPA 70-2021

[Public Input No. 3251-NFPA 70-2020 \[Section No. 340.104\]](#)

Ballot Results

✓ **This item has passed ballot**

14 Eligible Voters

0 Not Returned

10 Affirmative All

2 Affirmative with Comments

2 Negative with Comments

0 Abstention

Affirmative All

Crisman, Todd

Cross, Joseph W.

Earl, Timothy

Kent, Gerald W.

Lamp, Kelly

Newman Searce, Susan

Porcaro, Michael Thomas

Riedl, Kenneth

Stene, Susan L.

Watson, Dave

Affirmative with Comment

Graser, Peter

Refer to affirmative statement in FR 8371

Nielsen, Dennis A.

Note that Table 250.122 requires that the minimum size for EGC (copper) is #14.

Negative with Comment

Deacy, Brian

The inclusion of smaller sizes for branch circuits is unwarranted and will lead to a greatly increased opportunity for overloading circuits, overheating terminations, and creating fire hazards.

Hunter, Christel K.

The Aluminum Association does not support the use of smaller conductors for branch circuit wiring due to the risk of improper use and overheating of smaller gauge wire.



First Revision No. 8627-NFPA 70-2021 [Section No. 382.10(C)]

(C) Residential or Offices.

For nonmetallic surface extensions mounted directly on the surface of walls or ceilings, the building shall be occupied for residential or office purposes and shall not exceed three floors ~~abovegrade~~ above grade . Where identified for the use, concealable nonmetallic extensions shall be permitted more than three floors ~~abovegrade~~ above grade .

Informational Note No. 1: See 310.14(A)(3) for temperature limitation of conductors.

Informational Note No. 2: See 362.10 for definition of *First Floor*.

Submitter Information Verification

Committee: NEC-P06

Submittal Date: Fri Jan 08 10:10:07 EST 2021

Committee Statement

Committee Statement: The term "abovegrade" has been changed to "above grade" In section 382.10(C)

Response Message: FR-8627-NFPA 70-2021

Ballot Results

✔ This item has passed ballot

14 Eligible Voters

0 Not Returned

14 Affirmative All

0 Affirmative with Comments

0 Negative with Comments

0 Abstention

Affirmative All

Crisman, Todd

Cross, Joseph W.

Deacy, Brian

Earl, Timothy

Graser, Peter

Hunter, Christel K.

Kent, Gerald W.

Lamp, Kelly

Newman Searce, Susan

Nielsen, Dennis A.

Porcaro, Michael Thomas

Riedl, Kenneth

Stene, Susan L.

Watson, Dave



First Revision No. 8628-NFPA 70-2021 [Section No. 382.26]

382.24 Bends.

(A) Nonmetallic Extensions.

A bend that reduces the normal spacing between the conductors shall be covered with a cap to protect the assembly from physical damage.

(B) Concealable Nonmetallic Extensions.

Concealable extensions shall be permitted to be folded back over themselves and flattened as required for installation.

Submitter Information Verification

Committee: NEC-P06

Submittal Date: Fri Jan 08 10:12:42 EST 2021

Committee Statement

Committee Statement: Renumber Section 382.26 to 382.24 for consistency with the other raceway articles. The renumbering will improve clarity and usability.

Response Message: FR-8628-NFPA 70-2021

[Public Input No. 1271-NFPA 70-2020 \[Section No. 382.26\]](#)

Ballot Results

✔ **This item has passed ballot**

14 Eligible Voters

0 Not Returned

14 Affirmative All

0 Affirmative with Comments

0 Negative with Comments

0 Abstention

Affirmative All

Crisman, Todd

Cross, Joseph W.

Deacy, Brian

Earl, Timothy

Graser, Peter

Hunter, Christel K.

Kent, Gerald W.

Lamp, Kelly
Newman Searce, Susan
Nielsen, Dennis A.
Porcaro, Michael Thomas
Riedl, Kenneth
Stene, Susan L.
Watson, Dave



First Revision No. 8529-NFPA 70-2021 [Section No. 394.104]

394.104 Conductors.

Conductors shall be of a type ~~specified by Article 310~~ identified in Table 310.4(1) .

Submitter Information Verification

Committee: NEC-P06

Submittal Date: Thu Jan 07 11:28:46 EST 2021

Committee Statement

Committee Statement: The text was revised to remove the reference to a whole article to comply with the NEC style manual section 4.1.4.

Response Message: FR-8529-NFPA 70-2021

[Public Input No. 3872-NFPA 70-2020 \[Section No. 394.104\]](#)

Ballot Results

✓ **This item has passed ballot**

14 Eligible Voters

0 Not Returned

14 Affirmative All

0 Affirmative with Comments

0 Negative with Comments

0 Abstention

Affirmative All

Crisman, Todd

Cross, Joseph W.

Deacy, Brian

Earl, Timothy

Graser, Peter

Hunter, Christel K.

Kent, Gerald W.

Lamp, Kelly

Newman Searce, Susan

Nielsen, Dennis A.

Porcaro, Michael Thomas

Riedl, Kenneth

Stene, Susan L.

Watson, Dave

**First Revision No. 8533-NFPA 70-2021 [Section No. 398.15(C)]****(C) Exposed to Physical Damage.**

Conductors within 2.1 m (7 ft) from the floor shall be considered exposed to physical damage. Where open conductors cross ceiling joists and wall studs and are exposed to physical damage, they shall be protected by one of the following methods:

- (1) Guard strips shall not be less than 25 mm (1 in.) nominal in thickness and at least as high as the insulating supports, placed on each side of and close to the wiring.
- (2) A substantial running board at least 13 mm (½ in.) thick in back of the conductors with side protections. Running boards shall extend at least 25 mm (1 in.) outside the conductors, but not more than 50 mm (2 in.), and the protecting sides shall be at least 50 mm (2 in.) high and at least 25 mm (1 in.), nominal, in thickness.
- (3) Boxing made in accordance with 398.15(C)(1) or (C)(2) and furnished with a cover kept at least 25 mm (1 in.) away from the conductors within. Where protecting vertical conductors on side walls, the boxing shall be closed at the top and the holes through which the conductors pass shall be bushed.
- (4) Rigid metal conduit (RMC), intermediate metal conduit (IMC), rigid ~~nonmetallic polyvinyl chloride~~ conduit (PVC), ~~or electrical metallic tubing reinforced thermosetting resin conduit (RTRC), high density polyethylene conduit (HDPE), or electrical metallic tubing (EMT)~~. When installed in metal piping, the conductors shall be encased in continuous lengths of approved flexible tubing.

Submitter Information Verification

Committee: NEC-P06

Submittal Date: Thu Jan 07 11:46:50 EST 2021

Committee Statement

Committee Statement: The reference to “nonmetallic conduit” was deleted and replaced with the specific types of nonmetallic conduits, rigid polyvinyl chloride conduit (PVC), reinforced thermosetting resin conduit (RTRC), and high density polyethylene conduit (HDPE) as identified in the respective raceway articles. The acronyms for the other raceways were added for clarity and consistency.

Response Message: FR-8533-NFPA 70-2021

Public Input No. 4557-NFPA 70-2020 [Section No. 398.15(C)]

Ballot Results

✔ **This item has passed ballot**

14 Eligible Voters

0 Not Returned

14 Affirmative All

0 Affirmative with Comments

0 Negative with Comments

0 Abstention

Affirmative All

Crisman, Todd

Cross, Joseph W.

Deacy, Brian

Earl, Timothy

Graser, Peter

Hunter, Christel K.

Kent, Gerald W.

Lamp, Kelly

Newman Searce, Susan

Nielsen, Dennis A.

Porcaro, Michael Thomas

Riedl, Kenneth

Stene, Susan L.

Watson, Dave



First Revision No. 8534-NFPA 70-2021 [Section No. 398.104]

398.104 Conductors.

Conductors shall be of a type ~~specified by Article 310~~ identified in Table 310.4(1) .

Submitter Information Verification

Committee: NEC-P06

Submittal Date: Thu Jan 07 11:50:27 EST 2021

Committee Statement

Committee Statement: The text was revised to reference Table 310.4(A) and remove the reference to a whole article to comply with section 4.1.4 of the NEC Style Manual.

Response Message: FR-8534-NFPA 70-2021

[Public Input No. 3875-NFPA 70-2020 \[Section No. 398.104\]](#)

Ballot Results

✓ **This item has passed ballot**

14 Eligible Voters

0 Not Returned

14 Affirmative All

0 Affirmative with Comments

0 Negative with Comments

0 Abstention

Affirmative All

Crisman, Todd

Cross, Joseph W.

Deacy, Brian

Earl, Timothy

Graser, Peter

Hunter, Christel K.

Kent, Gerald W.

Lamp, Kelly

Newman Searce, Susan

Nielsen, Dennis A.

Porcaro, Michael Thomas

Riedl, Kenneth

Stene, Susan L.

Watson, Dave



First Revision No. 8559-NFPA 70-2021 [Section No. 399.10]

395.10 Uses Permitted.

Outdoor overhead conductors over 1000 volts, nominal, shall be permitted only for systems rated over 1000 volts, nominal, as follows:

- (1) Outdoors in free air
- (2) For service conductors, feeders, or branch circuits

~~Informational Note: For additional information on outdoor overhead conductors over 1000 volts, see See IEEE C2, National Electrical Safety Code, and ANSI/IEEE 3001.2, Recommended Practice for Evaluating the Electrical Service Requirements of Industrial and Commercial Power Systems, for additional information on outdoor overhead conductors over 1000 volts .~~

Submitter Information Verification

Committee: NEC-P06

Submittal Date: Thu Jan 07 15:07:32 EST 2021

Committee Statement

Committee Statement: The revisions made to the informational notes were done to ensure compliance with the Style Manual.

Response Message: FR-8559-NFPA 70-2021

Ballot Results

✓ **This item has passed ballot**

14 Eligible Voters

0 Not Returned

14 Affirmative All

0 Affirmative with Comments

0 Negative with Comments

0 Abstention

Affirmative All

Crisman, Todd

Cross, Joseph W.

Deacy, Brian

Earl, Timothy

Graser, Peter

Hunter, Christel K.

Kent, Gerald W.

Lamp, Kelly

Newman Searce, Susan

Nielsen, Dennis A.

Porcaro, Michael Thomas

Riedl, Kenneth

Stene, Susan L.

Watson, Dave



First Revision No. 8612-NFPA 70-2021 [Section No. 400.4]

400.4 Types.

Flexible cords and flexible cables shall conform to the description in Table 400.4. The use of flexible cords and flexible cables other than those in Table 400.4 shall require permission by the authority having jurisdiction.

Table 400.4 Flexible Cords and Flexible Cables

<u>Trade Name</u>	<u>Type Letter</u>	<u>Voltage</u>	<u>AWG or kcmil</u>	<u>Number of Conductors</u>	<u>Insulation</u>	<u>AWG or kcmil</u>	<u>Nominal Insulation Thickness</u>	
							<u>mm</u>	<u>mils</u>
Lamp cord	C	300 600	18–16 15–10	2 or more	Thermoset or thermoplastic	18–16 15–10	0.76 1.14	30 45
Elevator cable	E 1,2,3,4	300 or 600	20–2	2 or more	Thermoset	20–16	0.51	20
						15–12	0.76	30
						12–10	1.14	45
						8–2	1.52	60
Elevator cable	EO 1,2,4	300 or 600	20–2	2 or more	Thermoset	20–16	0.51	20
						15–12	0.76	30
						12–10	1.14	45
						8–2	1.52	60
Elevator cable	ETP 2,4	300 or 600						
	ETT 2,4	300 or 600						
Electric vehicle cable	EV 5,6	1000	18–500	2 or more plus equipment grounding conductor(s), plus optional hybrid data, signal	Thermoset with optional nylon	18–15	0.76 (0.51)	30 (20)
						14–10	1.14 (0.76)	45 (30)

<u>Trade Name</u>	<u>- Type Letter</u>	<u>- Voltage</u>	<u>- AWG or kcmil</u>	<u>- Number of Conductors</u>	<u>- Insulation</u>	<u>- AWG or kcmil</u>	<u>Nominal Insulation Thickness</u>	
							<u>mm</u>	<u>mils</u>
				communica- tions, and optical fiber cables		8–2	1.52 (1.14)	60 (45)
						1–4/0	2.03 (1.52)	80 (60)
						250–500	2.41 (1.90)	95 (75)
						18–12	0.76 (0.51)	30 (20)
	EVJ 5,6	300	18–12	2 or more plus equipment grounding conductor(s), plus optional hybrid data, signal communica- tions, and optical fiber cables	Thermoplastic elastomer with optional nylon	18–15	0.76 (0.51)	30 (20)
						14–10	1.14 (0.76)	45 (30)
						8–2	1.52 (1.14)	60 (45)
						1–4/0	2.03 (1.52)	80 (60)
						250– 500	2.41 (1.90)	95 (75)
	EVJE 5,6	300	18–12			18–12	0.76 (0.51)	30 (20)
	EVT 5,6	1000	18–500	2 or more plus equipment grounding conductor(s), plus optional hybrid data, signal communica- tions, and optical fiber cables	Thermoplastic with optional nylon	18–15	0.76 (0.51)	30 (20)
						14–10	1.14 (0.76)	45 (30)
						8–2	1.52 (1.14)	60 (45)
						1–4/0	2.03 (1.52)	80 (60)
						250– 500	2.41 (1.90)	95 (75)
						EVJT 5,6	300	18–12
Portable power cable	G	2000	12–500	2–6 plus equipment grounding conductor(s)	Thermoset	12–2 1–4/0 250–500	1.52 2.03 2.41	60 80 95

<u>Trade Name</u>	<u>Type Letter</u>	<u>Voltage</u>	<u>AWG or kcmil</u>	<u>Number of Conductors</u>	<u>Insulation</u>	<u>AWG or kcmil</u>	<u>Nominal Insulation Thickness</u>	
							<u>mm</u>	<u>mils</u>
	G-GC ⁷	2000	12–500	3–6 plus equipment grounding conductors and 1 ground check conductor	Thermoset	12–2 1–4/0 250–500	1.52 2.03 2.41	60 80 95
Heater cord	HPD	300	18–12	2, 3, or 4	Thermoset	18–16 15–12	0.38 0.76	15 30
Parallel heater cord	HPN ⁸	300	18–12	2 or 3	Oil-resistant thermoset	18–16 15 14 12	1.14 1.52 2.41	45 60 95
Thermoset jacketed heater cords	HSJ	300	18–12	2, 3, or 4	Thermoset	18–16 15–12	0.76 1.14	30 45
	HSJW	300	18–12		Thermoset			
	HSJO	300	18–12					
	HSJOW ⁹	300	18–12					
	HSJOO	300	18–12		Oil-resistant thermoset			
	HSJOOW ⁹	300	18–12					
Non-integral parallel cords	NISP-1	300	20–18	2 or 3	Thermoset	20–18	0.38	15
	NISP-2	300	18–16			18–16	0.76	30
	NISPE-1 ⁸	300	20–18		Thermoplastic elastomer	20–18	0.38	15
	NISPE-2 ⁸	300	18–16			18–16	0.76	30
	NISPT-1 ⁸	300	20–18		Thermoplastic	20–18	0.38	15
	NISPT-2 ⁸	300	18–16			18–16	0.76	30
Twisted portable cord	PD	300 600	18–16 14–10	2 or more	Thermoset or thermoplastic	18–16 15–10	0.76 1.14	30 45

<u>Trade Name</u>	<u>Type Letter</u>	<u>Voltage</u>	<u>AWG or kcmil</u>	<u>Number of Conductors</u>	<u>Insulation</u>	<u>AWG or kcmil</u>	<u>Nominal Insulation Thickness</u>	
							<u>mm</u>	<u>mils</u>
Portable power cable	PPE ⁷	2000	12–500	1–6 plus optional equipment grounding conductor(s)	Thermoplastic elastomer	12–2 1–4/0 250–500	1.52 2.03 2.41	60 80 95
Hard service cord	S ⁷	600	18–2	2 or more	Thermoset	18–15 14–10 8–2	0.76 1.14 1.52	30 45 60
Flexible stage and lighting power cable	SC ^{7,10}	600	8–250	1 or more	Thermoset	8–2 1–4/0 250	1.52 2.03 2.41	60 80 95
	SCE ^{7,10}	600			Thermoplastic elastomer			
	SCT ^{7,10}	600			Thermoplastic			
Hard service cord	SE ⁷	600	18–2	2 or more	Thermoplastic elastomer	18–15 14–9 8–2	0.76 1.14 1.52	30 45 60
	SEW ^{7,9}	600						
	SEO ⁷	600						
	SEOW ^{7,9}	600						
	SEOO ⁷	600						
	SEOOW ^{7,9}	600			Oil-resistant thermoplastic elastomer			
Junior hard service cord	SJ	300	18–10	2–6	Thermoset	18–11 10	0.76 1.14	30 45
	SJE	300			Thermoplastic elastomer			

<u>Trade Name</u>	<u>Type Letter</u>	<u>Voltage</u>	<u>AWG or kcmil</u>	<u>Number of Conductors</u>	<u>Insulation</u>	<u>AWG or kcmil</u>	<u>Nominal Insulation Thickness</u>	
							<u>mm</u>	<u>mils</u>
	SJEW ⁹	300						
	SJEO	300						
	SJEOW ⁹	300						
	SJEOO	300			Oil-resistant thermoplastic elastomer			
	SJEOOW ⁹	300						
	SJO	300			Thermoset			
	SJOW ⁹	300						
	SJOO	300			Oil-resistant thermoset			
	SJOOW ⁹	300						
	SJT	300			Thermoplastic			
	SJTW ⁹	300						
	SJTO	300				18–12 10	0.76 1.14	30 45
	SJTOW ⁹	300						
	SJTOO	300			Oil-resistant thermoplastic			

<u>Trade Name</u>	<u>Type Letter</u>	<u>Voltage</u>	<u>AWG or kcmil</u>	<u>Number of Conductors</u>	<u>Insulation</u>	<u>AWG or kcmil</u>	<u>Nominal Insulation Thickness</u>	
							<u>mm</u>	<u>mils</u>
	SJTOOW ⁹	300	-	-	-	-		
Hard service cord	SO ⁷	600	18–2	2 or more	Thermoset	18–15	0.76	30
	SOW ^{7,9}	600						
	SOO ⁷	600			Oil-resistant thermoset	14–9 8–2	1.14 1.52	45 60
	SOOW ^{7,9}	600						
All thermoset parallel cord	SP-1	300	20–18	2 or 3	Thermoset	20–18	0.76	30
	SP-2	300	18–16			18–16	1.14	45
	SP-3	300	18–10			18–16	1.52	60
						15–14 12 10	2.03 2.41 2.80	80 95 110
All elastomer (thermo-plastic) parallel cord	SPE-1 ⁸	300	20-18	2 or 3	Thermoplastic elastomer	20–18	0.76	30
	SPE-2 ⁸	300	18–16			18–16	1.14	45
	SPE-3 ⁸	300	18–10			18–16	1.52	60
						15–14 12 10	2.03 2.41 2.80	80 95 110

<u>Trade Name</u>	<u>-</u> <u>Type Letter</u>	<u>-</u> <u>Voltage</u>	<u>-</u> <u>AWG or kcmil</u>	<u>-</u> <u>Number of Conductors</u>	<u>-</u> <u>Insulation</u>	<u>-</u> <u>AWG or kcmil</u>	<u>Nominal Insulation Thickness</u>	
							<u>mm</u>	<u>mils</u>
All thermoplastic parallel cord	SPT-1	300	20–18	2 or 3	Thermoplastic	20–18	0.76	30
	SPT-1W ⁹	300		2				
	SPT-2	300	18–16	2 or 3		18–16	1.14	45
	SPT-2W ⁹	300		2				
	SPT-3	300	18–10	2 or 3		18–16 15–14 12 10	1.52 2.03 2.41 2.80	60 80 95 110
Range, dryer cable	SRD	300	10–4	3 or 4	Thermoset	10–4	1.14	45
	SRDE	300	10–4	3 or 4	Thermoplastic elastomer			
	SRDT	300	10–4	3 or 4	Thermoplastic			
Hard service cord	ST ⁷	600	18–2	2 or more	Thermoplastic	18–15 14–9 8–2	0.76 1.14 1.52	30 45 60
	STW ^{7,9}	600						
	STO ⁷	600						
	STOW ^{7, 9}	600						
	STOO ⁷	600			Oil-resistant thermoplastic			

<u>Trade Name</u>	<u>Type Letter</u>	<u>Voltage</u>	<u>AWG or kcmil</u>	<u>Number of Conductors</u>	<u>Insulation</u>	<u>AWG or kcmil</u>	<u>Nominal Insulation Thickness</u>	
							<u>mm</u>	<u>mils</u>
	STOOW ⁷	600	-	-	-	-		
Vacuum cleaner cord	SV	300	18–16	2 or 3	Thermoset	18–16	0.38	15
	SVE	300			Thermoplastic elastomer			
	SVEO	300						
	SVEOO	300			Oil-resistant thermoplastic elastomer			
	SVO	300			Thermoset			
	SVOO	300			Oil-resistant thermoset			
	SVT	300			Thermoplastic			
	SVTO	300			Thermoplastic			
	SVTOO	300			Oil-resistant thermoplastic			
Parallel tinsel cord	TPT ¹¹	300	27	2	Thermoplastic	27	0.76	30
Jacketed tinsel cord	TST ¹¹	300	27	2	Thermoplastic	27	0.38	15
Portable power cable	W ⁷	2000	12–500 501–1000	1–6 1	Thermoset	12–2	1.52	60
						1–4/0	2.03	80
						250–500	2.41	95
						501–1000	2.80	110

Notes:

All types listed in Table 400.4 shall have individual conductors twisted together, except for Types HPN, SP-1, SP-2, SP-3, SPE-1, SPE-2, SPE-3, SPT-1, SPT-2, SPT-3, SPT-1W, SPT-2W, TPT, NISP-1, NISP-2, NISPT-1, NISPT-2, NISPE-1, NISPE-2, and three-conductor parallel versions of SRD, SRDE, and SRDT.

The individual conductors of all cords, except those of heat-resistant cords, shall have a thermoset or thermoplastic insulation, except that the equipment grounding conductor, where used, shall be in accordance with 400.23(B).

¹Rubber-filled or varnished cambric tapes shall be permitted as a substitute for the inner braids.

²Elevator traveling cables for operating control and signal circuits shall contain nonmetallic fillers as necessary to maintain concentricity. Cables shall have steel supporting members as required for suspension by 620.41. In locations subject to excessive moisture or corrosive vapors or gases, supporting members of other materials shall be permitted. Where steel supporting members are used, they shall run straight through the center of the cable assembly and shall not be cabled with the copper strands of any conductor.

In addition to conductors used for control and signaling circuits, Types E, EO, ETP, and ETT elevator cables shall be permitted to incorporate in the construction one or more 20 AWG telephone conductor pairs, one or more coaxial cables, ~~or~~ one or more optical fibers, or one or more communications cables. The 20 AWG conductor pairs shall be permitted to be covered with suitable shielding for telephone, audio, data transfer, or higher frequency communications circuits; the coaxial cables shall consist of a center conductor, insulation, and a shield for use in video or other radio frequency communications circuits. The optical fiber shall be suitably covered with flame-retardant thermoplastic. The insulation of the conductors shall be rubber or thermoplastic of a thickness not less than specified for the other conductors of the particular type of cable. Metallic shields shall have their own protective covering. Where used, these components shall be permitted to be incorporated in any layer of the cable assembly but shall not run straight through the center.

³Insulations and outer coverings that meet the requirements as flame retardant, limited smoke, and are so listed, shall be permitted to be marked for limited smoke after the *Code* type designation.

⁴Elevator cables in sizes 20 AWG through 14 AWG are rated 300 volts, and sizes 10 AWG through 2 AWG are rated 600 volts. 12 AWG is rated 300 volts with a 0.76 mm (30 mil) insulation thickness and 600 volts with a 1.14 mm (45 mil) insulation thickness.

⁵Conductor size for Types EV, EVJ, EVE, EVJE, EVT, and EVJT cables apply to nonpower-limited circuits only. Conductors of power-limited (data, signal, or communications) circuits may extend beyond the stated AWG size range. All conductors shall be insulated for the same cable voltage rating.

⁶Insulation thickness for Types EV, EVJ, EVEJE, EVT, and EVJT cables of nylon construction is indicated in parentheses.

⁷Types G, G-GC, S, SC, SCE, SCT, SE, SEO, SEOO, SEW, SEOW, SEOOW, SO, SOO, SOW, SOOW, ST, STO, STOO, STW, STOW, STOOW, PPE, and W shall be permitted for use on theater stages, in garages, and elsewhere where flexible cords are permitted by this *Code*.

⁸The third conductor in Type HPN shall be used as an equipment grounding conductor only. The insulation of the equipment grounding conductor for Types SPE-1, SPE-2, SPE-3, SPT-1, SPT-2, SPT-3, NISPT-1, NISPT-2, NISPE-1, and NISPE-2 shall be permitted to be thermoset polymer.

⁹Cords that comply with the requirements for outdoor cords and are so listed shall be permitted to be designated as weather and water resistant with the suffix "W" after the *Code* type designation. Cords with the "W" suffix are suitable for use in wet locations and are sunlight resistant.

¹⁰The required outer covering on some single-conductor cables may be integral with the insulation.

¹¹Types TPT and TST shall be permitted in lengths not exceeding 2.5 m (8 ft) where attached directly, or by means of a special type of plug, to a portable appliance rated at 50 watts or less and of such nature that extreme flexibility of the cord is essential.

Submitter Information Verification

Committee: NEC-P06

Submittal Date: Thu Jan 07 20:31:11 EST 2021

Committee Statement

Committee Statement: This change is found in the notes of the table. To address the need for data transfer in elevator installations an allowance for communications cable was added and the term data transfer was added to the note below the table.

Response Message: FR-8612-NFPA 70-2021

Public Input No. 3040-NFPA 70-2020 [Section No. 400.4]

Ballot Results

✔ **This item has passed ballot**

14 Eligible Voters

0 Not Returned

14 Affirmative All

0 Affirmative with Comments

0 Negative with Comments

0 Abstention

Affirmative All

Crisman, Todd

Cross, Joseph W.

Deacy, Brian

Earl, Timothy

Graser, Peter

Hunter, Christel K.

Kent, Gerald W.

Lamp, Kelly

Newman Searce, Susan

Nielsen, Dennis A.

Porcaro, Michael Thomas

Riedl, Kenneth

Stene, Susan L.

Watson, Dave



First Revision No. 8471-NFPA 70-2021 [Section No. 400.5(A)]

(A) Ampacity Tables.

Table 400.5(A)(1) provides the ampacities for flexible cords and flexible cables, and Table 400.5(A)(2) provides the ampacities for flexible cords and flexible cables with not more than three current-carrying conductors. These tables shall be used in conjunction with applicable end-use product standards to ensure selection of the proper size and type. Where cords and cables are used in ambient temperatures other than 30°C (86°F), the temperature correction factors from Table 310.15(B)(1)(1) that correspond to the temperature rating of the cord or cable shall be applied to the ampacity in Table 400.5(A)(1) and Table 400.5(A)(2). Cords and cables rated 105°C shall use correction factors in the 90°C column of Table 310.15(B)(1)(1) for temperature correction. Where the number of current-carrying conductors exceeds three, the ampacity of each conductor shall be reduced from the three-conductor rating as shown in Table 400.5(A)(3).

Informational Note: See Informative Annex B, Table B.2(11), for adjustment factors for more than three current-carrying conductors in a raceway or cable with load diversity.

Table 400.5(A)(1) Ampacity for Flexible Cords and Flexible Cables

[Based on Ambient Temperature of 30°C (86°F). See 400.13 and Table 400.4.]

<u>Copper Conductor Size (AWG)</u>	<u>-</u> <u>Thermoplastic Types TPT, TST</u>	<u>Thermoset Types C, E, EO, PD, S, SJ, SJO, SJOW, SJOO, SJOOW, SO, SOW, SOO, SOOW, SP-1, SP-2, SP-3, SRD, SV, SVO, SVOO, NISP-1, NISP-2</u>	<u>-</u>
		<u>Thermoplastic Types ETP, ETT, NISPE-1, NISPE-2, NISPT-1, NISPT-2, SE, SEW, SEO, SEOO, SEOW, SEOOW, SJE, SJEW, SJEQ, SJEQO, SJEOW, SJEQOW, SJT, SJTW, SJTO, SJTOW, SJTOO, SJTOOW, SPE-1, SPE-2, SPE-3, SPT-1, SPT-1W, SPT-2, SPT-2W, SPT-3, ST, STW, SRDE, SRDT, STO, STOW, STOO, STOOW, SVE, SVEO, SVEOO, SVT, SVTO, SVTOO</u>	<u>Types HPD, HPN, HSJ, HSJO, HSJOW, HSJOO, HSJOOW</u>
		Column A¹	Column B²
27 ³	0.5	—	—
20	—	5 ⁴	5
18	—	7	10
17	—	9	12
16	—	10	13
15	—	12	16
14	—	15	18
13	—	17	21
12	—	20	25
11	—	23	27
10	—	25	30
9	—	29	34
8	—	35	40
7	—	40	47
6	—	45	55
5	—	52	62
4	—	60	70
3	—	70	82
2	—	80	95

¹The currents under Column A apply to three-conductor cords and other multiconductor cords

connected to utilization equipment so that only three conductors are current-carrying.

²The currents under Column B apply to two-conductor cords and other multiconductor cords connected to utilization equipment so that only two conductors are current-carrying.

³Tinsel cord.

⁴Elevator cables only.

⁵7 amperes for elevator cables only; 2 amperes for other types.

Table 400.5(A)(2) Ampacity of Cable Types SC, SCE, SCT, PPE, G, G-GC, and W
[Based on Ambient Temperature of 30°C (86°F). See Table 400.4.]

<u>Copper Conductor</u> <u>Size</u> <u>(AWG or kcmil)</u>	<u>Temperature Rating of Cable</u>								
	<u>60°C (140°F)</u>			<u>75°C (167°F)</u>			<u>90°C (194°F)</u>		
	<u>D¹</u>	<u>E²</u>	<u>F³</u>	<u>D¹</u>	<u>E²</u>	<u>F³</u>	<u>D¹</u>	<u>E²</u>	<u>F³</u>
12	—	31	26	—	37	31	—	42	35
10	—	44	37	—	52	43	—	59	49
8	60	55	48	70	65	57	80	74	65
6	80	72	63	95	88	77	105	99	87
4	105	96	84	125	115	101	140	130	114
3	120	113	99	145	135	118	165	152	133
2	140	128	112	170	152	133	190	174	152
1	165	150	131	195	178	156	220	202	177
1/0	195	173	151	230	207	181	260	234	205
2/0	225	199	174	265	238	208	300	271	237
3/0	260	230	201	310	275	241	350	313	274
4/0	300	265	232	360	317	277	405	361	316
250	340	296	259	405	354	310	455	402	352
300	375	330	289	445	395	346	505	449	393
350	420	363	318	505	435	381	570	495	433
400	455	392	343	545	469	410	615	535	468
500	515	448	392	620	537	470	700	613	536
600	575	—	—	690	—	—	780	—	—
700	630	—	—	755	—	—	855	—	—
750	655	—	—	785	—	—	885	—	—
800	680	—	—	815	—	—	920	—	—
900	730	—	—	870	—	—	985	—	—
1000	780	—	—	935	—	—	1055	—	—

¹The ampacities under subheading D shall be permitted for single-conductor Types SC, SCE, SCT, PPE, and W cable only where the individual conductors are not installed in raceways and are not in physical contact with each other except in lengths not to exceed 600 mm (24 in.) where passing through the wall of an enclosure.

²The ampacities under subheading E apply to two-conductor cables and other multiconductor cables connected to utilization equipment so that only two conductors are current-carrying.

³The ampacities under subheading F apply to three-conductor cables and other multiconductor cables connected to utilization equipment so that only three conductors are

current-carrying.

Table 400.5(A)(3) Adjustment Factors for More Than Three Current-Carrying Conductors in a Flexible Cord or Flexible Cable

<u>Number of Conductors</u>	<u>Percent of Value in Table 400.5(A)(1) and Table 400.5(A)(2)</u>
4–6	80
7–9	70
10–20	50
21–30	45
31–40	40
41 and above	35

A neutral conductor that carries only the unbalanced current from other conductors of the same circuit shall not be required to meet the requirements of a current-carrying conductor.

In a 3-wire circuit consisting of two phase conductors and the neutral conductor of a 4-wire, 3-phase, wye-connected system, a common conductor carries approximately the same current as the line-to-neutral currents of the other conductors and shall be considered to be a current-carrying conductor.

On a 4-wire, 3-phase, wye circuit where more than 50 percent of the load consists of nonlinear loads, there are harmonic currents present in the neutral conductor and the neutral conductor shall be considered to be a current-carrying conductor.

An equipment grounding conductor shall not be considered a current-carrying conductor.

Where a single conductor is used for both equipment grounding and to carry unbalanced current from other conductors, as provided for in 250.140 for electric ranges and electric clothes dryers, it shall not be considered as a current-carrying conductor.

Submitter Information Verification

Committee: NEC-P06

Submittal Date: Wed Jan 06 16:53:23 EST 2021

Committee Statement

Committee Statement: The proposed “for flexible cords and flexible cables” addition clarifies what the ampacity is for and coincides with the table title.

Response Message: FR-8471-NFPA 70-2021

[Public Input No. 1788-NFPA 70-2020 \[Section No. 400.5\(A\)\]](#)

Ballot Results

✔ This item has passed ballot

14 Eligible Voters

0 Not Returned

14 Affirmative All

0 Affirmative with Comments

0 Negative with Comments

0 Abstention

Affirmative All

Crisman, Todd

Cross, Joseph W.

Deacy, Brian

Earl, Timothy

Graser, Peter

Hunter, Christel K.

Kent, Gerald W.

Lamp, Kelly

Newman Searce, Susan

Nielsen, Dennis A.

Porcaro, Michael Thomas

Riedl, Kenneth

Stene, Susan L.

Watson, Dave



First Revision No. 8477-NFPA 70-2021 [Section No. 400.12]

400.12 Uses Not Permitted.

Unless specifically permitted in 400.10, flexible cords, flexible cables, cord sets, and power supply cords shall not be used for the following:

- (1) As a substitute for the fixed wiring of a structure
- (2) Where run through holes in walls, structural ceilings, suspended ceilings, dropped ceilings, or floors
- (3) Where run through doorways, windows, or similar openings
- (4) Where attached to building surfaces

Exception to (4): Flexible cord and flexible cable shall be permitted to be attached to building surfaces in accordance with 368.56(B) and 590.4.

- (5) Where concealed by walls, floors, or ceilings or located above suspended or dropped ceilings

Exception to (5): Flexible cords, flexible cables, and power supply cords shall be permitted if contained within an enclosure for use in other spaces used for environmental air as permitted by 300.22(C)(3).

- (6) Where installed in raceways, except as otherwise permitted in this Code
- (7) Where subject to physical damage

Informational Note: ~~For proper application see~~ See UL 817, *Cord Sets and Power-Supply Cords*, and UL 62, *Flexible Cords and Cables*, for proper application.

Submitter Information Verification

Committee: NEC-P06

Submittal Date: Wed Jan 06 17:14:03 EST 2021

Committee Statement

Committee Statement: The revisions made to the informational notes were done to ensure compliance with the Style Manual

Response Message: FR-8477-NFPA 70-2021

Ballot Results

✔ This item has passed ballot

14 Eligible Voters

0 Not Returned

14 Affirmative All

0 Affirmative with Comments

0 Negative with Comments

0 Abstention

Affirmative All

Crisman, Todd

Cross, Joseph W.

Deacy, Brian

Earl, Timothy

Graser, Peter

Hunter, Christel K.

Kent, Gerald W.

Lamp, Kelly

Newman Searce, Susan

Nielsen, Dennis A.

Porcaro, Michael Thomas

Riedl, Kenneth

Stene, Susan L.

Watson, Dave



First Revision No. 8473-NFPA 70-2021 [Section No. 400.30]

400.30 Scope General .

Part III applies to single and multiconductor portable cables used to connect mobile equipment and machinery.

Submitter Information Verification

Committee: NEC-P06

Submittal Date: Wed Jan 06 17:06:36 EST 2021

Committee Statement

Committee Statement: Revised heading in accordance with the Style Manual.

Response Message: FR-8473-NFPA 70-2021

Public Input No. 994-NFPA 70-2020 [Section No. 400.30]

Ballot Results

✓ **This item has passed ballot**

14 Eligible Voters

0 Not Returned

14 Affirmative All

0 Affirmative with Comments

0 Negative with Comments

0 Abstention

Affirmative All

Crisman, Todd

Cross, Joseph W.

Deacy, Brian

Earl, Timothy

Graser, Peter

Hunter, Christel K.

Kent, Gerald W.

Lamp, Kelly

Newman Searce, Susan

Nielsen, Dennis A.

Porcaro, Michael Thomas

Riedl, Kenneth

Stene, Susan L.

Watson, Dave



First Revision No. 8468-NFPA 70-2021 [Section No. 400.35]

400.35 Fittings.

Connectors used to connect lengths of cable in a run shall be of a type that locks or latches firmly together. Provisions shall be made to prevent opening or closing these connectors while energized. Suitable means shall be used to eliminate tension at connectors and terminations.

Submitter Information Verification

Committee: NEC-P06

Submittal Date: Wed Jan 06 16:44:32 EST 2021

Committee Statement

Committee Statement: Addition of "latches" clarifies that it does not have to only "lock" together.

Response Message: FR-8468-NFPA 70-2021

Public Input No. 3046-NFPA 70-2020 [Section No. 400.35]

Ballot Results

✓ **This item has passed ballot**

14 Eligible Voters

0 Not Returned

13 Affirmative All

1 Affirmative with Comments

0 Negative with Comments

0 Abstention

Affirmative All

Crisman, Todd

Cross, Joseph W.

Deacy, Brian

Earl, Timothy

Hunter, Christel K.

Kent, Gerald W.

Lamp, Kelly

Newman Searce, Susan

Nielsen, Dennis A.

Porcaro, Michael Thomas

Riedl, Kenneth

Stene, Susan L.

Watson, Dave

Affirmative with Comment

Graser, Peter

Having concise and descriptive text is essential to effective code making. Too many descriptive words can often cause confusion for the reader.



First Revision No. 8465-NFPA 70-2021 [New Section after 400.36]

Part IV. Portable Power Feeder Cables Over 2000 Volts, Nominal

400.40 General.

Part IV applies to single and multiconductor portable power feeder cables over 2000 volts nominal used to connect portable equipment and machinery.

400.41 Portable Power Feeder Cables.

Portable power feeder cables rated greater than 2000 volts shall comply with 400.14, 400.17, and 400.23 and with the following sections.

Informational Note: See ANSI/NEMA WC 58/ ICEA S-75-381, *Portable and Power Feeder Cables for Use in Mines and Similar Applications*, for information on construction, testing, and marking of portable power feeder cables.

400.42 Uses Permitted.

Portable power feeder cables over 2000 volts shall be used for the following:

- (1) Connection of portable equipment and machinery or for wiring of cranes and hoists
- (2) Temporary services and installations

400.43 Uses Not Permitted.

Portable power feeder cables over 2000 volts shall not be used for the following:

- (1) As a substitute for the fixed wiring of a structure
- (2) Where run through holes in walls, ceilings, or floors
- (3) Where run through doorways, windows, or similar openings
- (4) Where attached to building surfaces
- (5) Where concealed by walls, floors, or ceilings
- (6) Where installed in raceways, except as otherwise permitted in this Code
- (7) Where subject to physical damage

400.44 Construction.

(A) Conductors.

The conductors shall be 6 AWG copper or larger and shall employ flexible stranding.

(B) Nominal Insulation Thickness.

The nominal thickness of insulation for portable power feeder cables shall not be less than specified in Tables 400.44(B)(1) through (B)(4).

Table 400.44(B)(1) Thickness of Insulation for Three-Conductor Type G Portable Power Feeder Cables Rated 2000 Volts to 5000 Volts and Equipment Grounding Conductor Size

<u>Copper Conductor Size (AWG) or kcmil</u>	<u>Nominal Insulation Thickness of Power Conductors</u>		<u>Equipment Grounding Conductor</u>
	<u>mils</u>	<u>mm</u>	<u>Size AWG</u>
-			
6	110	2.79	10
4-2	110	2.79	8
1	110	2.79	7
1/0	110	2.79	6
2/0	110	2.79	5
3/0	110	2.79	4
4/0	110	2.79	3

Table 400.44(B)(2) Thickness of Insulation for Single Conductor Type SH Portable Power Feeder Cables Rated 2000 Volts to 25,000 Volts for 100 Percent Insulation Level

<u>Copper Conductor Size (AWG) or kcmil</u>	<u>Nominal Insulation Thickness of Power Conductors</u>	
	<u>mils</u>	<u>mm</u>
-		
	<u>2001 to 5000 volts</u>	
6-4/0	110	2.79
250-500	120	3.05
	<u>5001 to 8000 volts</u>	
4-500	150	3.81
	<u>8001 to 15,000 volts</u>	
2-500	210	5.33
	<u>15,001 to 25,000 volts</u>	
1-500	295	7.49

Table 400.44(B)(3) Thickness of Insulation for Three-Conductor Type SHD and SHD-GC Portable Power Feeder Cables Rated 2000 Volts to 25,000 Volts for 100 Percent Insulation Level and Grounding Conductor Size

<u>Copper Conductor Size (AWG) or kcmil</u>	<u>Nominal Insulation Thickness of Power Conductors</u>		<u>Grounding Conductor</u>
	<u>mils</u>	<u>mm</u>	<u>Size AWG</u>
-			
	<u>2000 to 5000 volts</u>		
6-4/0	110	2.79	8
250-500	120	3.05	8
	<u>5001 to 8000 volts</u>		
4-500	150	3.81	8
	<u>8001 to 15,000 volts</u>		
2-4/0	210	5.33	8
	<u>15,001 to 25,000 volts</u>		
1-4/0	295	7.49	8

Table 400.44(B)(4) Thickness of Insulation for Three-Conductor Type SHD-CGC Portable Power Feeder Cables Rated 2000 Volts to 5000 Volts for 100 Percent Insulation Level and Grounding Conductor Size

<u>Copper Conductor Size (AWG) or kcmil</u>	<u>Nominal Insulation Thickness of Power Conductors</u>		<u>Equipment Grounding Conductor</u>
	<u>mils</u>	<u>mm</u>	<u>Size AWG</u>
-			
<u>6</u>	<u>110</u>	<u>2.79</u>	<u>10</u>
<u>4-2</u>	<u>110</u>	<u>2.79</u>	<u>8</u>
<u>1</u>	<u>110</u>	<u>2.79</u>	<u>7</u>
<u>1/0</u>	<u>110</u>	<u>2.79</u>	<u>6</u>
<u>2/0</u>	<u>110</u>	<u>2.79</u>	<u>5</u>
<u>3/0</u>	<u>110</u>	<u>2.79</u>	<u>4</u>
<u>4/0</u>	<u>110</u>	<u>2.79</u>	<u>3</u>
<u>250</u>	<u>120</u>	<u>3.05</u>	<u>2</u>
<u>300-350</u>	<u>120</u>	<u>3.05</u>	<u>1</u>
<u>500</u>	<u>120</u>	<u>3.05</u>	<u>2/0</u>

(C) Equipment Grounding Conductor(s).

An equipment grounding conductor(s) shall be provided in cables with three or more conductors. The total area shall not be less than that of the size of the equipment grounding conductor required in 250.122 .

400.45 Shielding.

All shields shall be grounded at least at one end.

400.46 Equipment Grounding Conductors.

Equipment grounding conductors shall be connected in accordance with Parts VI and VII of Article 250 .

400.47 Minimum Bending Radii.

The minimum bending radii for portable power feeder cables from 2000 volts to 5000 volts shall not exceed six times the overall cable outer diameter. The minimum bending radii for portable cables from 5001 volts to 25,000 volts shall not exceed eight times the overall cable outer diameter.

400.48 Fittings.

The use of connectors and couplers to connect lengths of cable together in a run shall not be permitted.

400.49 Splices and Terminations.

Portable power feeder cables shall not contain splices. Connectors, couplers, lugs, elbows, and terminations for portable power feeder cables rated over 2000 volts, nominal, shall be accessible only to authorized and qualified personnel. Suitable means shall be used to eliminate tension at connectors, couplers, lugs, elbows, and terminations.

400.50 Types.

Portable power feeder cables rated greater than 2000 volts shall conform to the description in Table 400.50. Types G, SHD-PCG, and SHD-CGC shall be used only from 2000 volts to 5000 volts. Types SH, SHD, and SHD-GC shall be used from 2000 volts to 25,000 volts.

Where a Type designation for portable power feeder cables over 2000 volts conflicts with a designation description in Table 400.4, the description in Table 400.50 shall apply. The use of portable power feeder cables other than those in Table 400.50 shall require permission by the authority having jurisdiction.

Table 400.50 Portable Power Feeder Cables

<u>Trade Name</u>	<u>Type Letter</u>	<u>Voltage</u>	<u>AWG or kcmil</u>	<u>Insulation</u>	<u>Outer Covering</u>	<u>Ground Check Conductor</u>	<u>Grounding Conductor</u>	<u>Shielded</u>
<u>Portable Power Feeder Cables</u>	<u>G</u>	<u>2001– 5000</u>	<u>8–4/0</u>	<u>Thermoset</u>	<u>Heavy duty or extra heavy duty Thermoset</u>	<u>No</u>	<u>Yes</u>	<u>Yes</u>
	<u>SHD-PCG</u>	<u>2001 – 5000</u>	<u>3–4/0</u>	<u>Thermoset</u>	<u>Heavy duty or extra heavy duty Thermoset</u>	<u>No</u>	<u>Yes</u>	<u>Individual shielded power conductor</u>
-	<u>SH</u>	<u>2001–25,000</u>	<u>6–500</u>	<u>Thermoset</u>	<u>Heavy duty or extra heavy duty Thermoset</u>	<u>No</u>	<u>No</u>	<u>Yes</u>
-	<u>SHD</u>	<u>2001–25,000</u>	<u>6–500</u>	<u>Thermoset</u>	<u>Heavy duty or extra heavy duty Thermoset</u>	<u>No</u>	<u>Yes</u>	<u>Individual shielded power conductor and grounding conductor</u>
-	<u>SHD-GC</u>	<u>2001–25,000</u>	<u>6–500</u>	<u>Thermoset</u>	<u>Heavy duty or extra heavy duty Thermoset</u>	<u>Yes</u>	<u>Yes</u>	<u>Individual shielded power and grounding conductor</u>

<u>Trade Name</u>	<u>Type Letter</u>	<u>Voltage</u>	<u>AWG or kcmil</u>	<u>Insulation</u>	<u>Outer Covering</u>	<u>Ground Check Conductor</u>	<u>Grounding Conductor</u>	<u>Shielded</u>
-	<u>SHD- CGC</u>	<u>2001-5000</u>	<u>8-500</u>	<u>Thermoset</u>	<u>Heavy duty or extra heavy duty Thermoset</u>	<u>Yes</u>	<u>Yes</u>	<u>Individual shielded power conductor grounding conductor and one ground- check conductor in center</u>

400.51 Ampacities for Portable Power Feeder Cables Rated Greater Than 2000 Volts.

(A)_ Ampacity Tables.

Table 400.51(A)(1) provides the ampacities for single and three-conductor portable power feeder cables rated greater than 2000 volts. Where portable power feeder cables are used in ambient temperatures other than 30°C (86°F), the temperature correction factors from Table 400.51(A)(2) that correspond to the differing ambient temperature shall be applied to the ampacity in Table 400.51(A)(1). Where the cable will not be completely unwound from the cord reel, the ampacity correction factor based on the number of layers remaining wound on a reel shall be applied as shown in Table 400.51(A)(3).

Table 400.51(A)(1) Ampacity for Portable Power Feeder Cables Over 2000 Volts [Based on Ambient Temperature of 30°C (86°F)]

<u>Copper Conductor Size (AWG) or kcmil</u>	<u>Single Conductor*</u>			<u>Three Conductor</u>			<u>C</u> (
	<u>2001–8000 Volts Shielded</u>	<u>8001–15,000 Volts Shielded</u>	<u>15,001–25,000 Volts Shielded</u>	<u>2001–8000 Volts Shielded</u>	<u>8001–15,000 Volts Shielded</u>	<u>8001–15,000 Volts Shielded</u>	
<u>6</u>	<u>123</u>	<u>—</u>	<u>—</u>	<u>102</u>	<u>—</u>	<u>—</u>	
<u>4</u>	<u>163</u>	<u>—</u>	<u>—</u>	<u>134</u>	<u>—</u>	<u>—</u>	
<u>3</u>	<u>188</u>	<u>—</u>	<u>—</u>	<u>154</u>	<u>—</u>	<u>—</u>	
<u>2</u>	<u>214</u>	<u>214</u>	<u>—</u>	<u>175</u>	<u>180</u>	<u>196</u>	
<u>1</u>	<u>247</u>	<u>247</u>	<u>244</u>	<u>202</u>	<u>205</u>	<u>210</u>	
<u>1/0</u>	<u>286</u>	<u>285</u>	<u>280</u>	<u>232</u>	<u>236</u>	<u>240</u>	
<u>2/0</u>	<u>329</u>	<u>328</u>	<u>322</u>	<u>267</u>	<u>270</u>	<u>274</u>	
<u>3/0</u>	<u>379</u>	<u>377</u>	<u>371</u>	<u>307</u>	<u>311</u>	<u>315</u>	
<u>4/0</u>	<u>440</u>	<u>437</u>	<u>428</u>	<u>353</u>	<u>357</u>	<u>360</u>	
<u>250</u>	<u>488</u>	<u>484</u>	<u>473</u>	<u>390</u>	<u>395</u>	<u>396</u>	
<u>300</u>	<u>545</u>	<u>540</u>	<u>528</u>	<u>438</u>	<u>—</u>	<u>—</u>	
<u>350</u>	<u>604</u>	<u>597</u>	<u>582</u>	<u>478</u>	<u>—</u>	<u>—</u>	
<u>400</u>	<u>656</u>	<u>649</u>	<u>629</u>	<u>470</u>	<u>—</u>	<u>—</u>	
<u>450</u>	<u>704</u>	<u>696</u>	<u>676</u>	<u>503</u>	<u>—</u>	<u>—</u>	
<u>500</u>	<u>757</u>	<u>746</u>	<u>725</u>	<u>536</u>	<u>—</u>	<u>—</u>	

Note: Ampacities are based on a conductor temperature of 90°C (194°F) and an ambient air temperature of 30°C (86°F).

*Ampacities are based on single isolated cable in air operated with open-circuited shield.

Table 400.51(A)(2) Adjustment Factors for Different Ambient Temperatures

<u>Ambient Temperature, Degrees</u>		<u>Multiplying Correction Factor</u>
<u>°C</u>	<u>°F</u>	<u>-</u>
<u>10</u>	<u>50</u>	<u>1.26</u>
<u>20</u>	<u>68</u>	<u>1.18</u>
<u>30</u>	<u>86</u>	<u>1.10</u>
<u>40</u>	<u>104</u>	<u>1.00</u>
<u>50</u>	<u>122</u>	<u>0.90</u>

Table 400.51(A)(3) Adjustment Factors for Number of Layers of Cable Wound on a Reel

<u>Number of Layers</u>	<u>Multiplying Correction Factor</u>
<u>1</u>	<u>0.85</u>
<u>2</u>	<u>0.65</u>
<u>3</u>	<u>0.45</u>

<u>Number of Layers</u>	<u>Multiplying Correction Factor</u>
<u>4*</u>	<u>0.35</u>
*If more than four layers of cable are wound on the reel, ampacity derating should be calculated using engineering supervision. (B)_ Engineering Supervision. Under engineering supervision, conductor ampacities shall be permitted to be calculated in accordance with 310.14(B). 400.52 <u>Markings</u> (A)_ Required Markings. Portable power feeder cables shall be marked by means of a printed tag attached to the coil reel or carton. The tag shall contain the information required in 310.8(A). Types G, SHD-PCG, SH, SHD, SHD-GC, and SHD-CGC portable power feeder cables shall be durably marked on the surface at intervals not exceeding 610 mm (24 in.) with the following: (1) <u>The maximum rated voltage</u> (2) <u>The proper type letter or letters for the type of portable power feeder cable as specified elsewhere in this Code</u> (3) <u>The manufacturer's name, trademark, or other distinctive marking by which the organization responsible for the product can be readily identified</u> (4) <u>The AWG size or circular mil area</u> (5) <u>Maximum operating temperature</u> (B)_ Optional Markings. Portable power feeder cables listed in Table 400.50 shall be permitted to be surface marked to indicate special characteristics of the cable materials. These markings shall be permitted to include, but are not limited to, markings for limited smoke, sunlight resistance, and so forth.	

Supplemental Information

<u>File Name</u>	<u>Description</u>	<u>Approved</u>
PI-2700_New_Part_IV_Article_400_v2.docx	PI-2700 New Part IV Article 400 v2. For staff use	

Submitter Information Verification

Committee: NEC-P06
Submittal Date: Wed Jan 06 16:15:35 EST 2021

Committee Statement

Committee Statement: A new Part is being added to address portable power feeder cables for voltages 2000 Volts and up. This will provide clear guidance in using flexible cords above 2000 volts.

Response Message: FR-8465-NFPA 70-2021

Public Input No. 2700-NFPA 70-2020 [New Section after 400.36]

Ballot Results

✔ **This item has passed ballot**

14 Eligible Voters

0 Not Returned

14 Affirmative All

0 Affirmative with Comments

0 Negative with Comments

0 Abstention

Affirmative All

Crisman, Todd

Cross, Joseph W.

Deacy, Brian

Earl, Timothy

Graser, Peter

Hunter, Christel K.

Kent, Gerald W.

Lamp, Kelly

Newman Searce, Susan

Nielsen, Dennis A.

Porcaro, Michael Thomas

Riedl, Kenneth

Stene, Susan L.

Watson, Dave



First Revision No. 8478-NFPA 70-2021 [Section No. 402.2]

402.2 Other Articles.

Fixture wires shall comply with this article and also with the applicable provisions of other articles of this *Code*.

Informational Note: For See Part VI of Article 410 for application in luminaires, ~~see Article 410~~.

Submitter Information Verification

Committee: NEC-P06

Submittal Date: Wed Jan 06 17:17:31 EST 2021

Committee Statement

Committee Statement: A reference to Part VI of article 410 was added to the informational note since it is more specific to wiring luminaires.

Response Message: FR-8478-NFPA 70-2021

Public Input No. 3877-NFPA 70-2020 [Section No. 402.2]

Ballot Results

✔ This item has passed ballot

14 Eligible Voters

0 Not Returned

14 Affirmative All

0 Affirmative with Comments

0 Negative with Comments

0 Abstention

Affirmative All

Crisman, Todd

Cross, Joseph W.

Deacy, Brian

Earl, Timothy

Graser, Peter

Hunter, Christel K.

Kent, Gerald W.

Lamp, Kelly

Newman Searce, Susan

Nielsen, Dennis A.

Porcaro, Michael Thomas

Riedl, Kenneth

Stene, Susan L.

Watson, Dave



First Revision No. 8475-NFPA 70-2021 [Part III.]

Part III. Portable Cables Over 600 Volts, up to 2000 Volts, Nominal

Submitter Information Verification

Committee: NEC-P06

Submission Date: Wed Jan 06 17:09:29 EST 2021

Committee Statement

Committee Statement: The title to Part III was revised in order to accommodate adding a new Part IV.

Response Message: FR-8475-NFPA 70-2021

Public Input No. 2659-NFPA 70-2020 [Part III.]

Ballot Results

✔ **This item has passed ballot**

14 Eligible Voters

0 Not Returned

14 Affirmative All

0 Affirmative with Comments

0 Negative with Comments

0 Abstention

Affirmative All

Crisman, Todd

Cross, Joseph W.

Deacy, Brian

Earl, Timothy

Graser, Peter

Hunter, Christel K.

Kent, Gerald W.

Lamp, Kelly

Newman Searce, Susan

Nielsen, Dennis A.

Porcaro, Michael Thomas

Riedl, Kenneth

Stene, Susan L.

Watson, Dave



First Revision No. 8602-NFPA 70-2021 [Section No. Table]

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Table 8

Table 8 Conductor Properties

Conductors												Direct-Current	
Size (AWG or kcmil)	Area		Quantity	Stranding		Overall				Conductor			
	mm ²	Circular mils		mm	in.	mm	in.	mm ²	in. ²	ohm/ km	ohm/ kFT		
18	0.823	1620	1	—	—	1.02	0.040	0.823	0.001	25.5	7.77		
18	0.823	1620	7	0.39	0.015	1.16	0.046	1.06	0.002	26.1	7.95		
16	1.31	2580	1	—	—	1.29	0.051	1.31	0.002	16.0	4.89		
16	1.31	2580	7	0.49	0.019	1.46	0.058	1.68	0.003	16.4	4.99		
14	2.08	4110	1	—	—	1.63	0.064	2.08	0.003	10.1	3.07		
14	2.08	4110	7	0.62	0.024	1.85	0.073	2.68	0.004	10.3	3.14		
12	3.31	6530	1	—	—	2.05	0.081	3.31	0.005	6.34	1.93		
12	3.31	6530	7	0.78	0.030	2.32	0.092	4.25	0.006	6.50	1.98		
10	5.261	10380	1	—	—	2.588	0.102	5.26	0.008	3.984	1.21		
10	5.261	10380	7	0.98	0.038	2.95	0.116	6.76	0.011	4.070	1.24		
8	8.367	16510	1	—	—	3.264	0.128	8.37	0.013	2.506	0.764		
8	8.367	16510	7	1.23	0.049	3.71	0.146	10.76	0.017	2.551	0.778		
6	13.30	26240	7	1.56	0.061	4.67	0.184	17.09	0.027	1.608	0.491		
4	21.15	41740	7	1.96	0.077	5.89	0.232	27.19	0.042	1.010	0.308		
3	26.67	52620	7	2.20	0.087	6.60	0.260	34.28	0.053	0.802	0.245		
2	33.62	66360	7	2.47	0.097	7.42	0.292	43.23	0.067	0.634	0.194		
1	42.41	83690	19	1.69	0.066	8.43	0.332	55.80	0.087	0.505	0.154		
1/0	53.49	105600	19	1.89	0.074	9.45	0.372	70.41	0.109	0.399	0.122		
2/0	67.43	133100	19	2.13	0.084	10.62	0.418	88.74	0.137	0.3170	0.0967		
3/0	85.01	167800	19	2.39	0.094	11.94	0.470	111.9	0.173	0.2512	0.0766		
4/0	107.2	211600	19	2.68	0.106	13.41	0.528	141.1	0.219	0.1996	0.0608		
250	127	—	37	2.09	0.082	14.61	0.575	168	0.260	0.1687	0.0515		
300	152	—	37	2.29	0.090	16.00	0.630	201	0.312	0.1409	0.0429		
350	177	—	37	2.47	0.097	17.30	0.681	235	0.364	0.1205	0.0367		
400	203	—	37	2.64	0.104	18.49	0.728	268	0.416	0.1053	0.0321		
500	253	—	37	2.95	0.116	20.65	0.813	336	0.519	0.0845	0.0258		
600	304	—	61	2.52	0.099	22.68	0.893	404	0.626	0.0704	0.0214		
700	355	—	61	2.72	0.107	24.49	0.964	471	0.730	0.0603	0.0184		
750	380	—	61	2.82	0.111	25.35	0.998	505	0.782	0.0563	0.0171		
800	405	—	61	2.91	0.114	26.16	1.030	538	0.834	0.0528	0.0161		
900	456	—	61	3.09	0.122	27.79	1.094	606	0.940	0.0470	0.0143		
1000	507	—	61	3.25	0.128	29.26	1.152	673	1.042	0.0423	0.0129		
1250	633	—	91	2.98	0.117	32.74	1.289	842	1.305	0.0338	0.0103		
1500	760	—	91	3.26	0.128	35.86	1.412	1011	1.566	0.02814	0.00858		
1750	887	—	127	2.98	0.117	38.76	1.526	1180	1.829	0.02410	0.00735		
2000	1013	—	127	3.19	0.126	41.45	1.632	1349	2.092	0.02109	0.00643		

1. These resistance values are valid **only** for the parameters as given. Using conductors having coated strands, different stranding type, and, especially, other temperatures changes the resistance.
2. Equation for temperature change: $R_2 = R_1 [1 + \alpha (T_2 - 75)]$, where $\alpha_{CU} = 0.00323$, $\alpha_{AL} = 0.00330$ at 75°C.
3. Conductors with compact and compressed stranding have ~~about 9 percent and 3 percent, respectively,~~ smaller bare conductor diameters than those shown. See Table 5A for actual compact cable dimensions.
4. The IACS conductivities used: bare copper = 100%, aluminum = 61%.
5. Class B stranding is listed as well as solid for some sizes. Its overall diameter and area are those of its circumscribing circle.

Informational Note: ~~The construction information is in accordance with~~ NEMA WC/70-2009, *Power Cables Rated 2000 Volts or Less for the Distribution of Electrical Energy*, or ANSI/UL 1581-2017, *Reference Standard for Electrical Wires, Cables, and Flexible Cords*, is the source for the construction information .

~~The resistance is calculated in accordance with~~ National Bureau of Standards Handbook 100, dated 1966, and

Handbook 109, dated 1972, is the reference where the resistance is calculated .

Submitter Information Verification

Committee: NEC-P06

Submittal Date: Thu Jan 07 18:41:14 EST 2021

Committee Statement

Committee Statement: This First Revision will improve necessary clarity with respect to the application of definitions. These actions will also achieve compliance with the Style Manual. Three Definitions for conductor stranding will be relocated to Article 100 and text will be removed from Chapter 9 Table 8 and Annex C. The revisions made are reflected in the revised articles submitted by the task groups.

The revisions made to the informational notes were done to ensure compliance with the Style Manual.

Response Message: FR-8602-NFPA 70-2021

Ballot Results

✔ **This item has passed ballot**

14 Eligible Voters

0 Not Returned

14 Affirmative All

0 Affirmative with Comments

0 Negative with Comments

0 Abstention

Affirmative All

Crisman, Todd

Cross, Joseph W.

Deacy, Brian

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