without an overall nonmetallic covering, flexible metal conduit, or, where accessible, surface metal raceway or metal wireway with metal covers.

Nonmetallic cable ties and other nonmetallic cable accessories used to secure and support cables shall be listed as having low smoke and heat release properties.

Informational Note: See UL 2043, *Fire Test for Heat and Visible Smoke Release for Discrete Products and Their Accessories Installed in Air-Handling Spaces*, for one method of testing low smoke and heat release properties for nonmetallic cable ties and other nonmetallic cable accessories to determine a maximum peak optical density of 0.50 or less, an average optical density of 0.15 or less, and a peak heat release rate of 100 kW or less.

Δ **(2) Cable Tray Systems.** The requirements in 300.22(C)(2)(a) or (C)(2)(b) shall apply to the use of metallic cable tray systems in other spaces used for environmental air (plenums), where accessible.

(a) *Metal Cable Tray Systems.* Metal cable tray systems shall be permitted to support the wiring methods specified in 300.22(C)(1).

(b) *Solid Side and Bottom Metal Cable Tray Systems.* Solid side and bottom metal cable tray systems with solid metal covers shall be permitted to enclose wiring methods and cables not already covered in 300.22(C)(1) in accordance with 392.10(A) and (B).

Δ **(3) Equipment.** Electrical equipment with a metal enclosure, or electrical equipment with a nonmetallic enclosure listed for use within an air-handling space and having low smoke and heat release properties, and associated wiring material suitable for the ambient temperature shall be permitted to be installed in such other spaces unless prohibited elsewhere in this *Code*.

Informational Note: See UL 2043, *Fire Test for Heat and Visible Smoke Release for Discrete Products and Their Accessories Installed in Air-Handling Spaces*, for one method of testing low smoke and heat release properties to determine that the equipment exhibits a maximum peak optical density of 0.50 or less, an average optical density of 0.15 or less, and a peak heat release rate of 100 kW or less.

Exception: Integral fan systems shall be permitted where specifically identified for use within an air-handling space.

(D) Information Technology Equipment. Where the installation complies with the special requirements specified in 645.4, electrical wiring in air-handling areas beneath raised floors for information technology equipment shall be permitted in accordance with 645.5(E).

Δ **300.23 Panels Designed to Allow Access.** Cables, raceways, and equipment installed behind panels designed to allow access, including suspended ceiling panels, shall be arranged and secured to allow the removal of panels and access to the equipment.

300.25 Exit Enclosures (Stair Towers). Where an exit enclosure is required to have a fire resistance rating, only electrical wiring methods serving equipment permitted by the authority having jurisdiction in the exit enclosure shall be installed within the exit enclosure.

Exception: Where egress lighting is required on outside exterior doorways from the exit enclosure, luminaires shall be permitted to be supplied from the inside of the exit enclosure.

Informational Note: See NFPA *101*-2021, *Life Safety Code*, 7.1.3.2.1(10)(b), for more information.

NFPA *101*®, *Life Safety Code*® requires certain stairways, those defined as "exit enclosures," to be separated from the building by fire-rated walls or other means. A critical function of these stairways is to provide safe passage out of the building in the event of an emergency. It is the intent of the requirements in NFPA *101* to limit the materials contained within an exit enclosure to only those needed to serve the intended function of the exit enclosure.

• N **300.26 Remote-Control and Signaling Circuits Classification.** Remote-control and signaling circuits shall be classified as either power-limited or non-power-limited and comply with the following:

(1) Class 1 power-limited remote-control and signaling circuits shall comply with 724.3.
(2) Class 2 and Class 3 power-limited remote-control and signaling circuits shall comply with 725.3.
(3) Non-power-limited remote-control and signaling circuits shall be installed in accordance with 300.2 through 300.25. •

ARTICLE N 305

General Requirements for Wiring Methods and Materials for Systems Rated Over 1000 Volts ac, 1500 Volts dc, Nominal

N **305.1 Scope.** This article covers wiring methods and materials for systems rated over 1000 volts ac, 1500 volts dc, nominal.

N **305.3 Other Articles.** Conductors shall be permitted to be installed in accordance with any of the wiring methods identified in Table 305.3.

Exposed runs of Type MV cables, bare conductors, and bare busbars shall be permitted in locations accessible only to qualified persons. Busbars shall be permitted to be either copper or aluminum.

Exception: Airfield lighting cable used in series circuits that are powered by regulators and installed in restricted airport lighting vaults shall be permitted as exposed cable installations.

Informational Note: An example of a common application is FAA L-824 cables installed as exposed runs within a restricted vault area.

N ***TABLE 305.3*** *Wiring Methods Permitted for Use in Systems Rated Over 1000 Volts ac, 1500 Volts dc, Nominal*

Wiring Methods Permitted for Use Above 1000 Volts ac, 1500 Volts dc	Voltage Levels	Reference
Pull and junction boxes, conduit bodies, and handhole enclosures	Over 1000	Article 314, Part IV
Metal-clad cable (Type MC)	1000–35,000	Article 330
Type IM cable	1000–2000	Article 337
Intermediate metal conduit (IMC)	Over 1000	Article 342
Rigid metal conduit (RMC)	Over 1000	Article 344
Rigid polyvinyl chloride conduit (PVC)	Over 1000	Article 352
Reinforced thermosetting resin conduit (RTRC)	Over 1000	Article 355
Electrical metallic tubing (EMT)	Over 1000	Article 358
Auxiliary gutters	Over 1000	Article 366
Busway	Over 1000	Article 368, Part IV
Cablebus	1000–35,000	Article 370
Cable trays	1000–35,000	Article 392
Messenger-supported wiring	1000–35,000	Article 396
Outdoor overhead conductors	Over 1000	Article 395
Insulated bus pipe (IBP)	1000–35,000 ac	Article 369

N **305.4 Conductors of Different Systems.** Conductors of circuits rated over 1000 volts ac, 1500 volts dc, nominal, shall not occupy the same equipment wiring enclosure, cable, or raceway with conductors of circuits rated 1000 volts ac, 1500 volts dc, nominal, or less unless otherwise permitted as follows:

(1) Where contained within the individual wiring enclosure, primary leads of electric-discharge lamp ballasts insulated for the primary voltage of the ballast shall be permitted to occupy the same luminaire, sign, or outline lighting enclosure as the branch-circuit conductors.
(2) Excitation, control, relay, and ammeter conductors used in connection with any individual motor or starter shall be permitted to occupy the same enclosure as the motor-circuit conductors.
(3) Conductors of different voltage ratings shall be permitted in motors, transformers, switchgear, switchboards, control assemblies, and similar equipment.
(4) If the conductors of each system in a manhole are permanently and effectively separated from the conductors of the other systems and securely fastened to racks, insulators, or other approved supports, conductors of different voltage ratings shall be permitted.

Conductors having nonshielded insulation and operating at different voltage levels shall not occupy the same enclosure, cable, or raceway.

305.5 Conductor Bending Radius. The conductor shall not be bent to a radius less than 8 times the overall diameter for nonshielded conductors or 12 times the overall diameter for shielded or lead-covered conductors during or after installation. For multiconductor or multiplexed single-conductor cables having individually shielded conductors, the minimum bending radius shall be 12 times the diameter of the individually shielded conductors or 7 times the overall diameter, whichever is greater.

Δ **305.6 Protection Against Induction Heating.** Metallic raceways and associated conductors shall be arranged to avoid heating of the raceway in accordance with 300.20.

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305.7 Covers Required. Suitable covers shall be installed on all boxes, fittings, and similar enclosures to prevent accidental contact with energized parts or physical damage to parts or insulation.

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305.8 Raceways in Wet Locations Above Grade. Where raceways are installed in wet locations above grade, the interior of these raceways shall be considered to be a wet location. Insulated conductors and cables installed in raceways in wet locations above grade shall be either moisture-impervious metal-sheathed or of a type listed for use in wet locations.

305.9 Braid-Covered Insulated Conductors — Exposed Installation. Exposed runs of braid-covered insulated conductors shall have a flame-retardant braid. If the conductors used do not have this protection, a flame-retardant saturant shall be applied to the braid covering after installation. This treated braid covering shall be stripped back a safe distance at conductor terminals, according to the operating voltage. Where practicable, this distance shall not be less than 25 mm (1 in.) for each kilovolt of the conductor-to-ground voltage of the circuit.

305.10 Insulation Shielding. Metallic and semiconducting insulation shielding components of shielded cables shall be removed for a distance dependent on the circuit voltage and insulation. Stress reduction means shall be provided at all terminations of factory-applied shielding.

Metallic shielding components such as tapes, wires, or braids, or combinations of them, shall be connected to an equipment grounding conductor, an equipment grounding busbar, or a grounding electrode.

305.11 Moisture or Mechanical Protection for Metal-Sheathed Cables. Where cable conductors emerge from a metal sheath and where protection against moisture or physical damage is necessary, the insulation of the conductors shall be protected by a cable sheath terminating device.

305.12 Danger Signs. Danger signs shall be conspicuously posted at points of access to conductors in all raceway systems and cable systems. The sign(s) shall meet the requirements in 110.21(B), shall be readily visible, and shall state the following:

DANGER—HIGH VOLTAGE—KEEP OUT

305.15 Underground Installations.

(A) General. Underground conductors shall be identified for the voltage and conditions under which they are installed. Conductors used for direct-burial applications shall be of a type identified for such use. Underground cables shall be installed in accordance with 305.15(A)(1), (A)(2), or (A)(3), and the installation shall meet the depth requirements of Table 305.15(A).

Prior to backfilling a ditch or trench, a warning ribbon must be placed near underground direct-buried conductors over 1000 volts, nominal, that are not encased in concrete, in accordance with Table 305.15(A), Footnote 1. This requirement is intended to reduce the risk of an accident, electrocution, or arc-flash incident during excavation.

Δ **(1) Shielded Cables and Nonshielded Cables in Metal-Sheathed Cable Assemblies.** Underground cables, including nonshielded, Type MC and moisture-impervious metal sheath cables, shall have those sheaths grounded through an effective grounding path meeting the requirements of 250.4(A)(5) or 250.4(B)(4). They shall be direct buried or installed in raceways identified for the use.

(2) Industrial Establishments. In industrial establishments, where conditions of maintenance and supervision ensure that only qualified persons service the installed cable, nonshielded single-conductor cables with insulation types up to 2000 volts that are listed for direct burial shall be permitted to be directly buried.

(3) Other Nonshielded Cables. Other nonshielded cables not covered in 305.15(A)(1) or (A)(2) shall be installed in rigid metal conduit, intermediate metal conduit, or rigid nonmetallic conduit encased in not less than 75 mm (3 in.) of concrete.

(B) Wet Locations. The interior of enclosures or raceways installed underground shall be considered to be a wet location. Insulated conductors and cables installed in these enclosures or raceways in underground installations shall be listed for use in wet locations and shall be either moisture-impervious metal-sheathed or of a type listed for use in wet locations. Any

Δ ***TABLE 305.15(A)*** *Minimum Cover Requirements*

	General Conditions (not otherwise specified)						Special Conditions (use if applicable)					
	Column 1		Column 2		Column 3		Column 4		Column 5		Column 6	
	Direct-Buried Cables[1]		Electrical Metallic Tubing, RTRC, PVC, and HDPE Conduit[2]		Rigid Metal Conduit and Intermediate Metal Conduit		Raceways Under Buildings or Exterior Concrete Slabs, 100 mm (4 in.) Minimum Thickness[3]		Cables in Airport Runways or Adjacent Areas Where Trespass Is Prohibited		Areas Subject to Vehicular Traffic, Such as Thoroughfares and Commercial Parking Areas	
Circuit Voltage	mm	in.	mm	in.	mm	in.	mm	in.	mm	in.	mm	in.
Over 1000 V ac, 1500 V dc, through 22 kV	750	30	450	18	150	6	100	4	450	18	600	24
Over 22 kV through 40 kV	900	36	600	24	150	6	100	4	450	18	600	24
Over 40 kV	1000	42	750	30	150	6	100	4	450	18	600	24

Notes:

1. Cover shall be defined as the shortest distance in millimeters (inches) measured between a point on the top surface of any direct-buried conductor, cable, conduit, or other raceway and the top surface of finished grade, concrete, or similar cover.
2. Lesser depths shall be permitted where cables and conductors rise for terminations or splices or where access is otherwise required.
3. Where solid rock prevents compliance with the cover depths specified in this table, the wiring shall be installed in a metal or nonmetallic raceway permitted for direct burial. The raceways shall be covered by a minimum of 50 mm (2 in.) of concrete extending down to rock.
4. In industrial establishments, where conditions of maintenance and supervision ensure that qualified persons will service the installation, the minimum cover requirements for other than rigid metal conduit and intermediate metal conduit shall be permitted to be reduced 150 mm (6 in.) for each 50 mm (2 in.) of concrete or equivalent placed entirely within the trench over the underground installation.

[1]Underground direct-buried cables that are not encased or protected by concrete and are buried 750 mm (30 in.) or more below grade shall have their location identified by a warning ribbon that is placed in the trench at least 300 mm (12 in.) above the cables.

[2]Listed by a qualified testing agency as suitable for direct burial without encasement. All other nonmetallic systems shall require 50 mm (2 in.) of concrete or equivalent above conduit in addition to the table depth.

[3]The slab shall extend a minimum of 150 mm (6 in.) beyond the underground installation, and a warning ribbon or other effective means suitable for the conditions shall be placed above the underground installation.