**Chapter 8 Communications Systems**

Article 800 General Requirements for Communications Systems

Part I General

800.1 Scope

This article covers general requirements for communications systems. These general requirements apply to communications circuits, community antenna television and radio distribution systems, network-powered broadband communications systems, and premises-powered broadband communications systems, unless modified by Articles 805, 820, 830, or 840.

Informational Note No. 1: See 90.2(B)(4) for installations of circuits and equipment that are not covered.

Informational Note No. 2: For further information for remote control, signaling, and power-limited circuits, see Article 725.

Informational Note No. 3: For further information for fire alarm systems, see Article 760.

800.2 Definitions

The definitions in Part I of Article 100 shall apply throughout Chapter 8. The definitions in 800.2 shall apply only within Chapter 8.

Abandoned Cable. Cable that is not terminated at equipment or is not identified for future use with a tag.

Block. A square or portion of a city, town, or village enclosed by streets and including the alleys so enclosed, but not any street.

Cable Sheath. A covering over the conductor assembly that may include one or more metallic members, strength members, or jackets.

Communications Circuit. The circuit that extends service from the communications utility or service provider up to and including the customer's communications equipment.

Communications Service Provider. An organization, business, or individual that offers communications service to others.

Exposed (to Accidental Contact). A circuit in such a position that, in case of failure of supports or insulation, contact with another circuit may result.

Informational Note: See Part I of Article 100 for two other definitions of Exposed: Exposed (as applied to live parts) and Exposed (as applied to wiring methods).

Point of Entrance. The point within a building at which the wire or cable emerges from an external wall or from a concrete floor slab.

Premises. The land and buildings of a user located on the user side of the utility-user network point of demarcation.

800.3 Other Articles

Only those sections of Chapters 1 through 7 referenced in Chapter 8 shall apply to Chapter 8.

(A) Hazardous (Classified) Locations

Circuits and equipment installed in a location that is classified in accordance with 500.5 and 505.5 shall comply with the applicable requirements of Chapter 5.

(B) Wiring in Ducts for Dust, Loose Stock, or Vapor Removal

The requirements of 300.22(A) shall apply.

(C) Equipment in Other Space Used for Environmental Air

The requirements of 300.22(C)(3) shall apply.

(D) Installation and Use

The requirements of 110.3(B) shall apply.

(E) Optical Fiber Cable

Where optical fiber cable is used to provide a communications circuit within a building, Article 770 shall apply.

(F) Other Communications Systems

As appropriate for the system involved, communications systems shall also comply with the requirements of the following:

Communications circuits — Article 805

Radio and television equipment — Article 810

Community antenna television and radio distribution systems — Article 820

Network-powered broadband communications systems — Article 830

Premises-powered broadband communications systems — Article 840

(G) Reconditioned Equipment

The requirements of 110.21(A)(2) shall apply.

800.21 Access to Electrical Equipment Behind Panels Designed to Allow Access

Access to electrical equipment shall not be denied by an accumulation of wires and cables that prevents removal of panels, including suspended ceiling panels.

800.24 Mechanical Execution of Work

Circuits and equipment shall be installed in a neat and workmanlike manner. Cables installed exposed on the surface of ceilings and sidewalls shall be supported by the building structure in such a manner that the cable will not be damaged by normal building use. Such cables shall be secured by hardware, including straps, staples, cable ties, hangers, or similar fittings, designed and installed so as not to damage the cable. The installation shall also conform to 300.4 and 300.11. Nonmetallic cable ties and other nonmetallic cable accessories used to secure and support cables in other spaces used for environmental air (plenums) shall be listed as having low smoke and heat release properties in accordance with 805.170(C).

Informational Note No. 1: Accepted industry practices are described in ANSI/TIA-568.1-D-2015, Commercial Building Telecommunications Infrastructure Standard; ANSI/TIA-569-D-2015, Telecommunications Pathways and Spaces; ANSI/TIA-570-C-2012, Residential Telecommunications Infrastructure Standard; ANSI/TIA-1005-A-2012, Telecommunications Infrastructure Standard for Industrial Premises; ANSI/TIA-1179-2010, Healthcare Facility Telecommunications Infrastructure Standard; ANSI/TIA-4966-2014, Telecommunications Infrastructure Standard for Educational Facilities; and other ANSI-approved installation standards.

Informational Note No. 2: See NFPA 90A-2018, Standard for the Installation of Air-Conditioning and Ventilating Systems, for discrete combustible components installed in accordance with 300.22(C).

Informational Note No. 3: Paint, plaster, cleaners, abrasives, corrosive residues, or other contaminants may result in an undetermined alteration of wire and cable properties.

800.25 Abandoned Cables

The accessible portion of abandoned cables shall be removed. Where cables are identified for future use with a tag, the tag shall be of sufficient durability to withstand the environment involved.

800.26 Spread of Fire or Products of Combustion

Installations of cables, communications raceways, cable routing assemblies in hollow spaces, vertical shafts, and ventilation or air-handling ducts shall be made so that the possible spread of fire or products of combustion will not be substantially increased. Openings around penetrations of cables, communications raceways, and cable routing assemblies through fire-resistant-rated walls, partitions, floors, or ceilings shall be firestopped using approved methods to maintain the fire resistance rating.

Informational Note: Directories of electrical construction materials published by qualified testing laboratories contain many listing installation restrictions necessary to maintain the fire-resistive rating of assemblies where penetrations or openings are made. Building codes also contain restrictions on membrane penetrations on opposite sides of a fire resistance-rated wall assembly. An example is the 600 mm (24 in.) minimum horizontal separation that usually applies between boxes installed on opposite sides of the wall. Assistance in complying with 800.26 can be found in building codes, fire resistance directories, and product listings.

800.27 Temperature Limitation of Wires and Cables

No wire or cable shall be used in such a manner that its operating temperature exceeds that of its rating.

Part II Wires and Cables Outside and Entering Buildings

800.44 Overhead (Aerial) Wires and Cables

Overhead (aerial) wires and cables entering buildings shall comply with 800.44(A) through (D).

Informational Note: For additional information regarding overhead (aerial) wires and cables, see ANSI C2-2017, National Electrical Safety Code, Part 2 Safety Rules for Overhead Lines.

(A) On Poles and In-Span

Where wires and cables and electric light or power conductors are supported by the same pole or are run parallel to each other in-span, the conditions described in 800.44(A)(1) through (A)(4) shall be met.

(1) Relative Location

Where practicable, the wires and cables shall be located below the electric light or power conductors.

(2) Attachment to Cross-Arms

Wires and cables shall not be attached to a cross-arm that carries electric light or power conductors.

(3) Climbing Space

The climbing space through wires and cables shall comply with the requirements of 225.14(D).

(4) Clearance

Supply service drops and sets of overhead service conductors of 0 volts to 750 volts running above and parallel to communications and CATV type coaxial service drops shall have a minimum separation of 300 mm (12 in.) at any point in the span, including the point of and at their attachment to the building, provided that the ungrounded conductors are insulated and that a clearance of not less than 1.0 m (40 in.) is maintained between the two services at the pole.

(B) Above Roofs

Communications wires and cables and CATV type coaxial cables shall have a vertical clearance of not less than 2.5 m (8 ft) from all points of roofs above which they pass.

Exception No. 1: Communications wires and cables and CATV type coaxial cables shall not be required to have a vertical clearance of not less than 2.5 m (8 ft) above auxiliary buildings, such as garages and the like.

Exception No. 2: A reduction in clearance above only the overhanging portion of the roof to not less than 450 mm (18 in.) shall be permitted if (1) not more than 1.2 m (4 ft) of communications service-drop conductors pass above the roof overhang and (2) they are terminated at a through- or above-the-roof raceway or approved support.

Exception No. 3: Where the roof has a slope of not less than 100 mm in 300 mm (4 in. in 12 in.), a reduction in clearance to not less than 900 mm (3 ft) shall be permitted.

Informational Note: For additional information regarding overhead (aerial) wires and cables, see ANSI/IEEE C2-2017, National Electrical Safety Code, Part 2, Safety Rules for Overhead Lines.

(C) On Masts

Overhead (aerial) communications and CATV type coaxial cables shall be permitted to be attached to an above-the-roof raceway mast that does not enclose or support conductors of electric light or power circuits.

(D) Between Buildings

Communications and CATV type coaxial cables extending between buildings or structures, and also the supports or attachment fixtures, shall be identified and shall have sufficient strength to withstand the loads to which they might be subjected.

Exception: Where a coaxial cable does not have sufficient strength to be self-supporting, it shall be attached to a supporting messenger cable that, together with the attachment fixtures or supports, shall be acceptable for the purpose and shall have sufficient strength to withstand the loads to which they may be subjected.

800.49 Metal Entrance Conduit Grounding

Metal conduit containing entrance wire or cable shall be connected by a bonding conductor or grounding electrode conductor to a grounding electrode or, where present, the building grounding electrode system in accordance with 800.100(B).

800.53 Separation From Lightning Conductors

Where practicable, a separation of at least 1.8 m (6 ft) shall be maintained between lightning conductors and all communication wires and cables and CATV type coaxial cables on buildings.

Informational Note No. 1: For additional information regarding overhead (aerial) wires and cables, see ANSI C2-2017 National Electrical Safety Code, Part 2, Safety Rules for Overhead Lines.

Informational Note No. 2: Specific separation distances may be calculated from the sideflash equation in NFPA 780-2017, Standard for the Installation of Lightning Protection Systems.

Part III Grounding Methods

800.100 Cable and Primary Protector Bonding and Grounding

(A) Bonding Conductor or Grounding Electrode Conductor

(1) Insulation

The bonding conductor or grounding electrode conductor shall be listed and shall be permitted to be insulated, covered, or bare.

(2) Material

The bonding conductor or grounding electrode conductor shall be copper or other corrosion-resistant conductive material, stranded or solid.

(3) Size

The bonding conductor or grounding electrode conductor shall not be smaller than 14 AWG. The bonding conductor or grounding electrode conductor shall have a current-carrying capacity not less than the grounded metallic cable sheath member of the communications cable, the protected conductor of the communications cable, or the outer sheath of the coaxial cable, as applicable. The bonding conductor or grounding electrode conductor shall not be required to exceed 6 AWG.

(4) Length

The bonding conductor or grounding electrode conductor shall be as short as practicable. In one- and two-family dwellings, the bonding conductor or grounding electrode conductor shall be as short as practicable, not to exceed 6.0 m (20 ft) in length.

Informational Note: Similar bonding conductor or grounding electrode conductor length limitations applied at apartment buildings and commercial buildings help to reduce voltages that may be developed between the building's power and communications systems during lightning events.

Exception: In one- and two-family dwellings where it is not practicable to achieve an overall maximum bonding conductor or grounding electrode conductor length of 6.0 m (20 ft), a separate ground rod meeting the minimum dimensional criteria of 800.100(B)(3)(2) or (B)(3)(3) shall be driven, the bonding conductor or grounding electrode conductor shall be connected to the ground rod in accordance with 800.100(C), and the ground rod shall be connected to the power grounding electrode system in accordance with 800.100(D).

(5) Run in Straight Line

The bonding conductor or grounding electrode conductor shall be run in as straight a line as practicable.

(6) Physical Protection

Bonding conductors and grounding electrode conductors shall be protected where exposed to physical damage. Where the bonding conductor or grounding electrode conductor is installed in a metal raceway, both ends of the raceway shall be bonded to the contained conductor or to the same terminal or electrode to which the bonding conductor or grounding electrode conductor is connected.

(B) Electrode

The bonding conductor or grounding electrode conductor shall be connected in accordance with 800.100(B)(1), (B)(2), or (B)(3).

(1) In Buildings or Structures With an Intersystem Bonding Termination

If the building or structure served has an intersystem bonding termination as required by 250.94, the bonding conductor shall be connected to the intersystem bonding termination.

Informational Note: Informational Note Figure 800.100(B)(1) illustrates the connection of the bonding conductor in buildings or structures equipped with an intersystem bonding termination or a terminal block providing access to the building grounding means.

Informational Note Figure 800.100(B)(1) Illustration of a Bonding Conductor in a Communications Installation.

(2) In Buildings or Structures With Grounding Means

If an intersystem bonding termination is established, 250.94(A) shall apply. If the building or structure served has no intersystem bonding termination, the bonding conductor or grounding electrode conductor shall be connected to the nearest accessible location on one of the following:

The building or structure grounding electrode system as covered in 250.50

The grounded interior metal water piping system, within 1.5 m (5 ft) from its point of entrance to the building, as covered in 250.52

The power service accessible means external to enclosures using the options identified in 250.94(A), Exception

The nonflexible metal power service raceway

The service equipment enclosure

The grounding electrode conductor or the grounding electrode conductor metal enclosure of the power service

The grounding electrode conductor or the grounding electrode of a building or structure disconnecting means that is connected to a grounding electrode as covered in 250.32

A bonding device intended to provide a termination point for the bonding conductor (intersystem bonding) shall not interfere with the opening of an equipment enclosure. A bonding device shall be mounted on nonremovable parts. A bonding device shall not be mounted on a door or cover even if the door or cover is nonremovable.

For purposes of this section, the mobile home service equipment or the mobile home disconnecting means located within 9.0 m (30 ft) of the exterior wall of the mobile home it serves, or at a mobile home disconnecting means connected to an electrode by a grounding electrode conductor in accordance with 250.32 and located within 9.0 m (30 ft) of the exterior wall of the mobile home it serves, shall be considered to meet the requirements of this section.

Informational Note: Informational Note Figure 800.100(B)(2) illustrates the connection of the bonding conductor in buildings or structures equipped with an intersystem bonding termination or a terminal block providing access to the building grounding means.

Informational Note Figure 800.100(B)(2) Illustration of a Grounding Electrode Conductor and a Bonding Conductor in a Communications Installation.

(3) In Buildings or Structures Without an Intersystem Bonding Termination or Grounding Means

If the building or structure served has no intersystem bonding termination or grounding means, as described in 800.100(B)(2), the grounding electrode conductor shall be connected to one of the following:

To any one of the individual grounding electrodes described in 250.52(A)(1), (A)(2), (A)(3), or (A)(4)

If the building or structure served has no intersystem bonding termination or grounding means, as described in 800.100(B)(2) or (B)(3)(1), to any one of the individual grounding electrodes described in 250.52(A)(5), (A)(7), and (A)(8)

For communications circuits covered in Article 805 or network-powered broadband communications systems covered in Article 830, to a ground rod or pipe not less than 1.5 m (5 ft) in length and 12.7 mm (0.5 in.) in diameter, driven, where practicable, into permanently damp earth and separated from lightning protection system conductors, as covered in 800.53, and at least 1.8 m (6 ft) from electrodes of other systems

Steam pipes, hot water pipes, or lightning protection system conductors shall not be employed as grounding electrodes for protectors and grounded metallic members.

(C) Electrode Connection

Connections to grounding electrodes shall comply with 250.70.

(D) Bonding of Electrodes

A bonding jumper not smaller than 6 AWG copper or equivalent shall be connected between the grounding electrode and power grounding electrode system at the building or structure served where separate electrodes are used.

Exception: At mobile homes as covered in 800.106.

Informational Note No. 1: See 250.60 for connection to a lightning protection system.

Informational Note No. 2: Bonding together of all separate electrodes limits potential differences between them and between their associated wiring systems.

800.106 Primary Protector Grounding and Bonding at Mobile Homes

(A) Grounding

Grounding shall comply with 800.106(A)(1) and (A)(2).

(1) Mobile Home Service Equipment

Where there is no mobile home service equipment located within 9.0 m (30 ft) of the exterior wall of the mobile home it serves, grounding shall comply with one of the following:

The primary protector grounding terminal; the coaxial cable shield ground, or surge arrester grounding terminal; or the network-powered broadband communications cable shield, network-powered broadband communications cable metallic members not used for communications or powering, and network interface unit shall be connected to a grounding electrode conductor or grounding electrode in accordance with 800.100(B)(3).

The non-current-carrying metallic members of optical fiber cables shall be connected to a grounding electrode in accordance with 770.106(A)(1). The network terminal, if required to be grounded, shall be connected to a grounding electrode in accordance with 800.106(A)(1)(1). The grounding electrode shall be bonded in accordance with 770.106(B).

(2) Mobile Home Feeder Disconnecting Means

Where there is no mobile home disconnecting means grounded in accordance with 250.32 and located within 9.0 m (30 ft) of the exterior wall of the mobile home it serves, grounding shall comply with one of the following:

The primary protector grounding terminal; the network-powered broadband communications cable shield, network-powered broadband communications cable metallic members not used for communications or powering, and network interface unit shall be connected to a grounding electrode in accordance with 800.100(B)(3).

The non-current-carrying metallic members of optical fiber cables shall be connected to a grounding electrode in accordance with 770.106(A)(2). The network terminal, if required to be grounded, shall be connected to a grounding electrode in accordance with 800.106(A)(2). The grounding electrode shall be bonded in accordance with 770.106(B).

(B) Bonding

The primary protector grounding terminal or grounding electrode, network-powered broadband communications cable grounding terminal, or network interface unit grounding terminal shall be bonded together and connected to the metal frame or available grounding terminal of the mobile home with a copper conductor not smaller than 12 AWG under either of the following conditions:

Where there is no mobile home service equipment or disconnecting means as in 800.106(A)

Where the mobile home is supplied by cord and plug

Part IV Installation Methods Within Buildings

800.110 Raceways, Cable Routing Assemblies, and Cable Trays

(A) Types of Raceways

Wires and cables shall be permitted to be installed in raceways that comply with either 800.110(A)(1) or (A)(2). Medium-power network-powered broadband communications cables shall not be permitted to be installed in raceways that comply with 800.110(A)(2).

(1) Raceways Recognized in Chapter 3

Wires and cables shall be permitted to be installed in any raceway included in Chapter 3. The raceways shall be installed in accordance with the requirements of Chapter 3.

(2) Communications Raceways

Wires and cables shall be permitted to be installed in plenum communications raceways, riser communications raceways, and general-purpose communications raceways selected in accordance with Table 800.154(b), listed in accordance with 800.182, and installed in accordance with 800.113 and 362.24 through 362.56, where the requirements applicable to electrical nonmetallic tubing (ENT) apply.

(3) Innerduct for Communications Wires and Cables, Coaxial Cables, or Network-Powered Broadband Communications Cables

Listed plenum communications raceways, listed riser communications raceways, and listed general-purpose communications raceways selected in accordance with Table 800.154(b) shall be permitted to be installed as innerduct in any type of listed raceway permitted in Chapter 3.

(B) Raceway Fill

The raceway fill requirements of Chapters 3 and 9 shall apply to medium-power network-powered broadband communications cables.

(C) Cable Routing Assemblies

Cables shall be permitted to be installed in plenum cable routing assemblies, riser cable routing assemblies, and general-purpose cable routing assemblies selected in accordance with Table 800.154(c), listed in accordance with 800.182, and installed in accordance with 800.110(C)(1) and (C)(2) and 800.113.

(1) Horizontal Support

Cable routing assemblies shall be supported where run horizontally at intervals not to exceed 900 mm (3 ft) and at each end or joint, unless listed for other support intervals. In no case shall the distance between supports exceed 3 m (10 ft).

(2) Vertical Support

Vertical runs of cable routing assemblies shall be supported at intervals not exceeding 1.2 m (4 ft), unless listed for other support intervals, and shall not have more than one joint between supports.

(D) Cable Trays

Wires and cables and communications raceways shall be permitted to be installed in metal or listed nonmetallic cable tray systems. Ladder cable trays shall be permitted to support cable routing assemblies.

800.113 Installation of Wires, Cables, Cable Routing Assemblies, and Communications Raceways

Installation of wires, cables, cable routing assemblies, and communications raceways shall comply with 800.113(A) through (L). Installation of cable routing assemblies and communications raceways shall comply also with 800.110.

(A) Listing

Wires, cables, cable routing assemblies, and communications raceways installed in buildings shall be listed.

Exception: Cables installed in compliance with 805.48 or 820.48 shall not be required to be listed.

(B) Ducts Specifically Fabricated for Environmental Air

The following wires and cables shall be permitted in ducts specifically fabricated for environmental air as described in 300.22(B) if they are directly associated with the air distribution system:

Plenum cables up to 1.22 m (4 ft) in length

Plenum cables, riser cables, general-purpose cables, and limited-use cables installed in raceways that are installed in compliance with 300.22(B)

Informational Note: For information on fire protection of wiring installed in fabricated ducts, see NFPA 90A-2018, Standard for the Installation of Air-Conditioning and Ventilating Systems.

(C) Other Spaces Used for Environmental Air (Plenums)

The following wires, cables, cable routing assemblies, and communications raceways shall be permitted in other spaces used for environmental air as described in 300.22(C):

Plenum cables

Plenum communications raceways

Plenum cable routing assemblies

Plenum cables installed in plenum communications raceways

Plenum cables installed in plenum cable routing assemblies

Plenum cables and plenum communications raceways supported by open metal cable tray systems

Plenum cables, riser cables, general-purpose cables, limited-use cables, and communications wires installed in raceways that are installed in compliance with 300.22(C)

Plenum cables, riser cables, general-purpose cables, limited-use cables, plenum communications raceways, riser communications raceways, and general-purpose communications raceways supported by solid bottom metal cable trays with solid metal covers in other spaces used for environmental air (plenums) as described in 300.22(C)

Plenum cables, riser cables, general-purpose cables, and limited-use cables installed in plenum communications raceways, riser communications raceways, and general-purpose communications raceways supported by solid bottom metal cable trays with solid metal covers in other spaces used for environmental air (plenums) as described in 300.22(C)

Informational Note: For information on fire protection of wiring installed in other spaces used for environmental air, see NFPA 90A-2018, Standard for the Installation of Air-Conditioning and Ventilating Systems.

(D) Risers — Cables, Cable Routing Assemblies, and Communications Raceways in Vertical Runs

The following cables, cable routing assemblies, and communications raceways shall be permitted in vertical runs penetrating one or more floors and in vertical runs in a shaft:

Plenum and riser cables

Plenum and riser communications raceways

Plenum and riser cable routing assemblies

Plenum and riser cables installed in:

Plenum communications raceways

Riser communications raceways

Plenum cable routing assemblies

Riser cable routing assemblies

Informational Note: See 800.26 for firestop requirements for floor penetrations.

(E) Risers — Cables and Innerducts in Metal Raceways

The following cables and innerducts shall be permitted in metal raceways in a riser having firestops at each floor:

Plenum cables, riser cables, general-purpose cables, and limited-use cables

Plenum, riser, and general-purpose communications raceways

Plenum cables, riser cables, general-purpose cables, and limited-use cables installed in:

Plenum communications raceways (innerduct)

Riser communications raceways (innerduct)

General-purpose communications raceways (innerduct)

Informational Note: See 800.26 for firestop requirements for floor penetrations.

(F) Risers — Cables, Cable Routing Assemblies, and Communications Raceways in Fireproof Shafts

The following cables, cable routing assemblies, and communications raceways shall be permitted to be installed in fireproof riser shafts having firestops at each floor:

Plenum cables, riser cables, general-purpose cables, and limited-use cables

Plenum, riser, and general-purpose communications raceways

Plenum, riser, and general-purpose cable routing assemblies

Plenum cables, riser cables, general-purpose cables, and limited-use cables installed in:

Plenum communications raceways

Riser communications raceways

General-purpose communications raceways

Plenum cable routing assemblies

Riser cable routing assemblies

General-purpose cable routing assemblies

Informational Note: See 800.26 for firestop requirements for floor penetrations.

(G) Risers — One- And Two-Family Dwellings

The following cables, cable routing assemblies, and communications raceways shall be permitted in one- and two-family dwellings:

Plenum cables, riser cables, and general-purpose cables

Limited-use cables less than 6 mm (0.25 in.) in diameter

Plenum, riser, and general-purpose communications raceways

Plenum, riser, and general-purpose cable routing assemblies

Plenum cables, riser cables, and general-purpose cables installed in:

Plenum communications raceways

Riser communications raceways

General-purpose communications raceways

Plenum cable routing assemblies

Riser cable routing assemblies

General-purpose cable routing assemblies

(H) Cable Trays

The following wires, cables, and communications raceways shall be permitted to be supported by cable trays:

Plenum cables, riser cables, and general-purpose cables

Plenum, riser, and general-purpose communications raceways

Communications wires, plenum cables, riser cables, and general-purpose cables installed in:

Plenum communications raceways

Riser communications raceways

General-purpose communications raceways

(I) Distributing Frames and Cross-Connect Arrays

The following wires, cables, cable routing assemblies, and communications raceways shall be permitted to be installed in distributing frames and cross-connect arrays:

Plenum cables, riser cables, general-purpose cables, and communications wires

Plenum, riser, and general-purpose communications raceways

Plenum, riser, and general-purpose cable routing assemblies

Communications wires, plenum cables, riser cables, and general-purpose cables installed in:

Plenum communications raceways

Riser communications raceways

General-purpose communications raceways

Plenum cable routing assemblies

Riser cable routing assemblies

General-purpose cable routing assemblies

(J) Other Building Locations

The following wires, cables, cable routing assemblies, and communications raceways shall be permitted to be installed in building locations other than the locations covered in 800.113(B) through (I):

Plenum cables, riser cables, and general-purpose cables

Limited-use cables with a maximum of 3 m (10 ft) of exposed length in nonconcealed spaces

Plenum, riser, and general-purpose communications raceways

Plenum, riser, and general-purpose cable routing assemblies

Communications wires, plenum cables, riser cables, and general-purpose cables installed in the following:

Plenum communications raceways

Riser communications raceways

General-purpose communications raceways

Plenum cables, riser cables, and general-purpose cables installed in the following:

Plenum cable routing assemblies

Riser cable routing assemblies

General-purpose cable routing assemblies

Communications wires, plenum cables, riser cables, general-purpose cables, and limited-use cables installed in raceways recognized in Chapter 3

Type CMUC under-carpet communications wires and cables installed under carpet, modular flooring, and planks

(K) Multifamily Dwellings

The following cables, cable routing assemblies, and communications raceways shall be permitted to be installed in multifamily dwellings in locations other than the locations covered in 800.113(B) through (G):

Plenum cables, riser cables, and general-purpose cables

Limited-use cables less than 6 mm (0.25 in.) in diameter in nonconcealed spaces

Plenum, riser, and general-purpose communications raceways

Plenum, riser, and general-purpose cable routing assemblies

Communications wires, plenum cables, riser cables, and general-purpose cables installed in the following:

Plenum communications raceways

Riser communications raceways

General-purpose communications raceways

Plenum cables, riser cables, and general-purpose cables installed in the following:

Plenum cable routing assemblies

Riser cable routing assemblies

General-purpose cable routing assemblies

Communications wires, plenum cables, riser cables, general-purpose cables, and limited-use cables installed in raceways recognized in Chapter 3

Type CMUC under-carpet communications wires and cables installed under carpet, modular flooring, and planks

(L) One- And Two-Family Dwellings

The following wires, cables, cable routing assemblies, and communications raceways shall be permitted to be installed in one- and two-family dwellings in locations other than the locations covered in 800.113(B) through (F):

Plenum cables, riser cables, and general-purpose cables

Limited-use cables less than 6 mm (0.25 in.) in diameter

Plenum, riser, and general-purpose communications raceways

Plenum, riser, and general-purpose cable routing assemblies

Communications wires, plenum cables, riser cables, and general-purpose cables installed in the following:

Plenum communications raceways

Riser communications raceways

General-purpose communications raceways

Plenum cables, riser cables, and general-purpose cables installed in the following:

Plenum cable routing assemblies

Riser cable routing assemblies

General-purpose cable routing assemblies

Communications wires, plenum cables, riser cables, general-purpose cables, and limited-use cables installed in raceways recognized in Chapter 3

Type CMUC under-carpet communications wires and cables installed under carpet, modular flooring, and planks

Hybrid power and communications cable listed in accordance with 805.179(F)

800.154 Applications of Listed Communications Wires, Cables, and Raceways, and Listed Cable Routing Assemblies

Permitted and nonpermitted applications of listed communications wires, cables, coaxial cables, network-powered broadband communications system cables and raceways, and listed cable routing assemblies, shall be in accordance with one of the following:

Listed communications wires and cables as indicated in Table 800.154(a)

Listed communications raceways as indicated in Table 800.154(b)

Listed cable routing assemblies as indicated in Table 800.154(c)

The permitted applications shall be subject to the installation requirements of 800.110 and 800.113.

Table 800.154(a) Applications of Listed Communications Wires, Cables, and Network-Powered Broadband Communications System Cables in Buildings

Applications Wire and Cable Type

Plenum Riser BMR General-Purpose BM Limited-Use Undercarpet BMU, BLU Hybrid Power

and Communications

Cables Communications

Wires

In ducts specifically fabricated for environmental air as described in 300.22(B) In fabricated ducts Y N N N N N N N N N

In metal raceway that complies with 300.22(B) Y Y Y Y Y Y N N N Y

In other spaces used for

environmental air (plenums)

as described in 300.22(C) In other spaces used for environmental air Y N N N N N N N N N

In metal raceway that complies with 300.22(C) Y Y Y Y Y Y N N N Y

In plenum communications

raceways Y N N N N N N N N N

In plenum cable routing assemblies Y N N N N N N N N N

Supported by open metal cable trays Y N N N N N N N N N

Supported by solid bottom metal cable trays with solid metal covers Y Y Y Y Y Y N N N N

In risers In vertical runs Y Y Y N N N N N N N

In metal raceways Y Y Y Y Y Y N N N N

In fireproof shafts Y Y Y Y Y Y N N N N

In plenum communications raceways Y Y N N N N N N N N

In plenum cable routing assemblies Y Y N N N N N N N N

In riser communications raceways Y Y N N N N N N N N

In riser cable routing assemblies Y Y N N N N N N N N

In one- and two-family dwellings Y Y Y Y Y Y N N Y N

Within buildings in other

than air-handling

spaces and risers General Y Y Y Y Y Y N N N N

In one- and two-family dwellings Y Y Y Y Y Y Y N Y N

In multifamily dwellings Y Y Y Y Y Y Y N N N

In nonconcealed spaces Y Y Y Y Y Y Y N N N

Supported by cable trays Y Y Y Y Y N N N N N

Under carpet, modular

flooring, and planks N N N N N N Y N N N

In distributing frames and

cross-connect arrays Y Y N Y N N N N N Y

In rigid metal conduit (RMC) and intermediate metal conduit (IMC) Y Y Y Y Y Y Y Y Y Y

In any raceway recognized in Chapter 3 Y Y Y Y Y Y N N N Y

In plenum communications raceways Y Y N Y N N N N N Y

In plenum cable routing assemblies Y Y N Y N N N N N Y

In riser communications raceways Y Y N Y N N N N N Y

In riser cable routing assemblies Y Y N Y N N N N N Y

In general-purpose

communications raceways Y Y N Y N N N N N Y

In general-purpose

cable routing assemblies Y Y N Y N N N N N Y

Note: An "N" in the table indicates that the cable type shall not be permitted to be installed in the application. A "Y" indicates that the cable type shall be permitted to be installed in the application subject to the limitations described in 800.113. The Riser column includes all riser cables except BMR, and the General-Purpose column includes all general-purpose cables except BM.

Informational Note No. 1: Part IV of Article 800 covers installation methods within buildings. This table covers the applications of listed communications wires, cables, and raceways in buildings. See the definition of Point of Entrance in 800.2.

Informational Note No. 2: For information on the restrictions to the installation of communications cables in fabricated ducts, see 800.113(B).

Table 800.154(b) Applications of Listed Communications Raceways in Buildings

Applications Listed Communications Raceways Type

Plenum Riser General-Purpose

In ducts specifically fabricated for

environmental air as described in 300.22(B) In fabricated ducts N N N

In metal raceway that complies with 300.22(B) N N N

In other spaces used for

environmental air (plenums) as described in 300.22(C) In other spaces used for environmental air Y N N

In metal raceway that complies with 300.22(C) Y Y Y

In plenum cable routing assemblies N N N

Supported by open metal cable trays Y N N

Supported by solid bottom metal cable

trays with solid metal covers Y Y Y

In risers In vertical runs Y Y N

In metal raceways Y Y Y

In fireproof shafts Y Y Y

In plenum cable routing assemblies N N N

In riser cable routing assemblies N N N

In one- and two-family dwellings Y Y Y

Within buildings in other

than air-handling spaces and risers General Y Y Y

In one- and two-family dwellings Y Y Y

In multifamily dwellings Y Y Y

In nonconcealed spaces Y Y Y

Supported by cable trays Y Y Y

Under carpet, modular flooring, and planks N N N

In distributing frames and cross-connect arrays Y Y Y

In any raceway recognized in Chapter 3 Y Y Y

In plenum cable routing assemblies N N N

In riser cable routing assemblies N N N

In general-purpose cable routing assemblies N N N

Note: An "N" in the table indicates that the communications raceway type shall not be permitted to be installed in the application. A "Y" indicates that the communications raceway type shall be permitted to be installed in the application, subject to the limitations described in 800.110 and 800.113.

Table 800.154(c) Applications of Listed Cable Routing Assemblies in Buildings

Applications Listed Cable Routing Assembly Type

Plenum Riser General-Purpose

In ducts specifically fabricated for

environmental air as described in 300.22(B) In fabricated ducts N N N

In metal raceway that complies with 300.22(B) N N N

In other spaces used for environmental

air (plenums) as described in 300.22(C) In other spaces used for environmental air Y N N

In metal raceway that complies with 300.22(C) N N N

In plenum communications raceways N N N

Supported by open metal cable trays Y N N

Supported by solid bottom metal

cable trays with solid metal covers N N N

In risers In vertical runs Y Y N

In metal raceways N N N

In fireproof shafts Y Y Y

In plenum communications raceways N N N

In riser communications raceways N N N

In one- and two-family dwellings Y Y Y

Within buildings in other than

air-handling spaces and risers General Y Y Y

In one- and two-family dwellings Y Y Y

In multifamily dwellings Y Y Y

In nonconcealed spaces Y Y Y

Supported by cable trays Y Y Y

Under carpet, modular flooring, and planks N N N

In distributing frames and cross-connect arrays Y Y Y

In any raceway recognized in Chapter 3 N N N

In plenum communications raceways N N N

In riser communications raceways N N N

In general-purpose communications raceways N N N

Note: An "N" in the table indicates that the cable routing assembly type shall not be permitted to be installed in the application. A "Y" indicates that the cable routing assembly type shall be permitted to be installed in the application subject to the limitations described in 800.113.

800.179 Plenum, Riser, General-Purpose, and Limited Use Cables

Plenum, riser, general-purpose, and limited-use cables shall be listed in accordance with 800.179(A) through (D) and shall have a temperature rating of not less than 60°C (140°F). The temperature rating shall be marked on the jacket of cables that have a temperature rating exceeding 60°C (140°F). The cable voltage rating shall not be marked on the cable.

(A) Plenum Cables

Type CMP communications plenum cables, Type CATVP community antenna television plenum coaxial cables, and Type BLP network-powered broadband communication low-power plenum cables shall be listed as being suitable for use in ducts, plenums, and other spaces used for environmental air and shall also be listed as having adequate fire-resistant and low smoke-producing characteristics.

Informational Note: One method of defining a cable that is low-smoke-producing cable and fire-resistant cable is that the cable exhibits a maximum peak optical density of 0.50 or less, an average optical density of 0.15 or less, and a maximum flame spread distance of 1.52 m (5 ft) or less when tested in accordance with NFPA 262-2019, Standard Method of Test for Flame Travel and Smoke of Wires and Cables for Use in Air-Handling Spaces.

(B) Riser Cables

Type CMR communications riser cables, Type CATVR community antenna television riser coaxial cables, Type BMR network-powered broadband communications medium-power riser cables, and Type BLR network-powered broadband communications low-power riser cables shall be listed as being suitable for use in a vertical run in a shaft or from floor to floor and shall also be listed as having fire-resistant characteristics capable of preventing the carrying of fire from floor to floor.

Informational Note: One method of defining fire-resistant characteristics capable of preventing the carrying of fire from floor to floor is that the cables pass the requirements of ANSI/UL 1666-2011, Standard Test for Flame Propagation Height of Electrical and Optical-Fiber Cable Installed Vertically in Shafts.

(C) General-Purpose Cables

Type CM communications general-purpose cables, Type CATV community antenna television coaxial general-purpose cables, Type BM network-powered broadband communications medium-power general-purpose cables, and Type BL network-powered broadband communications low-power general-purpose cables shall be listed as being suitable for general-purpose use, with the exception of risers and plenums, and shall also be listed as being resistant to the spread of fire.

Informational Note: One method of defining resistant to the spread of fire is that the cables do not spread fire to the top of the tray in the "UL Flame Exposure, Vertical Flame Tray Test" in ANSI/UL 1685-2010, Standard for Safety for Vertical-Tray Fire-Propagation and Smoke-Release Test for Electrical and Optical-Fiber Cables. The smoke measurements in the test method are not applicable. Another method of defining resistant to the spread of fire is for the damage (char length) not to exceed 1.5 m (4 ft 11 in.) when performing the CSA "Vertical Flame Test — Cables in Cable Trays," as described in CSA C22.2 No. 0.3-09, Test Methods for Electrical Wires and Cables.

(D) Limited-Use Cables

Type CMX limited-use communications cables, Type CATVX limited-use community antenna television coaxial cables, and Type BLX limited-use network-powered broadband low-power cables shall be listed as being suitable for use in dwellings and for use in raceway and shall also be listed as being resistant to flame spread.

Informational Note: One method of determining that cable is resistant to flame spread is by testing the cable to the VW-1 (vertical-wire) flame test in ANSI/UL 1581-2017, Reference Standard for Electrical Wires, Cables and Flexible Cords.

Part IV Listing Requirements

800.180 Grounding Devices

Where bonding or grounding is required, devices used to connect a shield, a sheath, or non-current-carrying metallic members of a cable to a bonding conductor or grounding electrode conductor shall be listed or be part of listed equipment.

800.182 Cable Routing Assemblies and Communications Raceways

Cable routing assemblies and communications raceways shall be listed in accordance with 800.182(A) through (C). Cable routing assemblies shall be marked in accordance with Table 800.182(a). Communications raceways shall be marked in accordance with Table 800.182(b).

Informational Note: For information on listing requirements for both communications raceways and cable routing assemblies, see ANSI/UL 2024-5-2015, Cable Routing Assemblies and Communications Raceways.

Table 800.182(a) Cable Routing Assembly Markings

Type Marking

Plenum Cable Routing Assembly Plenum Cable Routing Assembly

Riser Cable Routing Assembly Riser Cable Routing Assembly

General-Purpose Cable Routing Assembly General-Purpose Cable Routing Assembly

Table 800.182(b) Communications Raceway Markings

Type Marking

Plenum Communications Raceway Plenum Communications Raceway

Riser Communications Raceway Riser Communications Raceway

General-Purpose Communications Raceway General-Purpose Communications Raceway

(A) Plenum Cable Routing Assemblies and Plenum Communications Raceways

Plenum cable routing assemblies and plenum communications raceways shall be listed as having adequate fire-resistant and low-smoke-producing characteristics.

Informational Note No. 1: One method of defining cable routing assemblies and communications raceways that have adequate fire-resistant and low-smoke-producing characteristics is that they exhibit a maximum flame spread index of 25 and a maximum smoke developed index of 50 when tested in accordance with ASTM E84-15a, Standard Test Method for Surface Burning Characteristics of Building Materials, or ANSI/UL 723-2013, Standard Test Method for Surface Burning Characteristics of Building Materials.

Informational Note No. 2: Another method of defining communications raceways that have adequate fire-resistant and low-smoke-producing characteristics is that they exhibit a maximum peak optical density of 0.50 or less, an average optical density of 0.15 or less, and a maximum flame spread distance of 1.52 m (5 ft) or less when tested in accordance with NFPA 262-2015, Standard Method of Test for Flame Travel and Smoke of Wires and Cables for Use in Air-Handling Spaces.

Informational Note No. 3: See 4.3.11.2.6 or 4.3.11.5.5 of NFPA 90A-2015, Standard for the Installation of Air-Conditioning and Ventilating Systems, for information on materials exposed to the airflow in ceiling cavity and raised floor plenums.

(B) Riser Cable Routing Assemblies and Riser Communications Raceways

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

Informational Note: One method of defining fire-resistant characteristics capable of preventing the carrying of fire from floor to floor is that the cable routing assemblies and communications raceways pass the requirements of ANSI/UL 1666-2011, Standard Test for Flame Propagation Height of Electrical and Optical-Fiber Cable Installed Vertically in Shafts.

(C) General-Purpose Cable Routing Assemblies and General-Purpose Communications Raceways

General-purpose cable routing assemblies and general-purpose communications raceways shall be listed as being resistant to the spread of fire.

Informational Note: One method of defining resistant to the spread of fire is that the cable routing assemblies and communications raceways do not spread fire to the top of the tray in the "UL Flame Exposure, Vertical Flame Tray Test" in ANSI/UL 1685-2011, Standard for Safety for Vertical-Tray Fire-Propagation and Smoke-Release Test for Electrical and Optical-Fiber Cables.

Article 805 Communications Circuits

Part I General

805.1 Scope

This article covers communications circuits and equipment.

805.2 Definitions

The definitions in this section shall apply only within Articles 805 and 840.

Cable. A factory assembly of two or more conductors having an overall covering.

Communications Circuit Integrity (CI) Cable. Cable used in communications systems to ensure continued operation of critical circuits during a specified time under fire conditions.

Wire. A factory assembly of one or more insulated conductors without an overall covering.

805.18 Installation of Equipment

Equipment electrically connected to a communications network shall be listed in accordance with 805.170.

Exception: This listing requirement shall not apply to test equipment that is intended for temporary connection to a telecommunications network by qualified persons during the course of installation, maintenance, or repair of telecommunications equipment or systems.

Part II Wires and Cables Outside and Entering Buildings

805.47 Underground Communications Wires and Cables Entering Buildings

Underground communications wires and cables entering buildings shall comply with 805.47(A) and (B). The requirements of 310.10(C) shall not apply to communications wires and cables.

(A) Underground Systems With Electric Light, Power, Class 1, or Non-Power-Limited Fire Alarm Circuit Conductors

Underground communications wires and cables in a raceway, handhole enclosure, or manhole containing electric light, power, Class 1, or non-power-limited fire alarm circuit conductors shall be in a section separated from such conductors by means of brick, concrete, or tile partitions or by means of a suitable barrier.

(B) Underground Block Distribution

Where the entire street circuit is run underground and the circuit within the block is placed so as to be free from the likelihood of accidental contact with electric light or power circuits of over 300 volts to ground, the insulation requirements of 805.50(A) and 805.50(C) shall not apply, insulating supports shall not be required for the conductors, and bushings shall not be required where the conductors enter the building.

805.48 Unlisted Cables Entering Buildings

Unlisted outside plant communications cables shall be permitted to be installed in building spaces other than risers, ducts used for environmental air, plenums used for environmental air, and other spaces used for environmental air, where the length of the cable within the building, measured from its point of entrance, does not exceed 15 m (50 ft) and the cable enters the building from the outside and is terminated in an enclosure or on a listed primary protector. The point of entrance shall be permitted to be extended from the penetration of the external wall or floor slab by continuously enclosing the entrance cables in rigid metal conduit (RMC) or intermediate metal conduit (IMC) to the point of emergence.

Informational Note No. 1: Splice cases or terminal boxes, both metallic and plastic types, are typically used as enclosures for splicing or terminating telephone cables.

Informational Note No. 2: This section limits the length of unlisted outside plant cable to 15 m (50 ft), while 805.90(B) requires that the primary protector be located as close as practicable to the point at which the cable enters the building. Therefore, in installations requiring a primary protector, the outside plant cable may not be permitted to extend 15 m (50 ft) into the building if it is practicable to place the primary protector closer than 15 m (50 ft) to the point of entrance.

805.50 Circuits Requiring Primary Protectors

Circuits that require primary protectors as provided in 805.90 shall comply with 805.50(A), 805.50(B), and 805.50(C).

(A) Insulation, Wires, and Cables

Communications wires and cables without a metallic shield, running from the last outdoor support to the primary protector, shall be listed in accordance with 805.173.

(B) On Buildings

Communications wires and cables in accordance with 805.50(A) shall be separated at least 100 mm (4 in.) from electric light or power conductors not in a raceway or cable or be permanently separated from conductors of the other systems by a continuous and firmly fixed nonconductor in addition to the insulation on the wires, such as porcelain tubes or flexible tubing. Communications wires and cables in accordance with 805.50(A) exposed to accidental contact with electric light and power conductors operating at over 300 volts to ground and attached to buildings shall be separated from woodwork by being supported on glass, porcelain, or other insulating material.

Exception: Separation from woodwork shall not be required where fuses are omitted as provided for in 805.90(A)(1), or where conductors are used to extend circuits to a building from a cable having a grounded metal sheath.

(C) Entering Buildings

Where a primary protector is installed inside the building, the communications wires and cables shall enter the building either through a noncombustible, nonabsorbent insulating bushing or through a metal raceway. The insulating bushing shall not be required where the entering communications wires and cables (1) are in metal-sheathed cable, (2) pass through masonry, (3) meet the requirements of 805.50(A) and fuses are omitted as provided in 805.90(A)(1), or (4) meet the requirements of 805.50(A) and are used to extend circuits to a building from a cable having a grounded metallic sheath. Raceways or bushings shall slope upward from the outside or, where this cannot be done, drip loops shall be formed in the communications wires and cables immediately before they enter the building.

Raceways shall be equipped with an approved service head. More than one communications wire and cable shall be permitted to enter through a single raceway or bushing. Conduits or other metal raceways located ahead of the primary protector shall be grounded.

Part III Protection

805.90 Protective Devices

(A) Application

A listed primary protector shall be provided on each circuit run partly or entirely in aerial wire or aerial cable not confined within a block. Also, a listed primary protector shall be provided on each circuit, aerial or underground, located within the block containing the building served so as to be exposed to accidental contact with electric light or power conductors operating at over 300 volts to ground. In addition, where there exists a lightning exposure, each interbuilding circuit on a premises shall be protected by a listed primary protector at each end of the interbuilding circuit. Installation of primary protectors shall also comply with 110.3(B).

Informational Note No. 1: On a circuit not exposed to accidental contact with power conductors, providing a listed primary protector in accordance with this article helps protect against other hazards, such as lightning and above-normal voltages induced by fault currents on power circuits in proximity to the communications circuit.

Informational Note No. 2: Interbuilding circuits are considered to have a lightning exposure unless one or more of the following conditions exist:

Circuits in large metropolitan areas where buildings are close together and sufficiently high to intercept lightning.

Interbuilding cable runs of 42 m (140 ft) or less, directly buried or in underground conduit, where a continuous metallic cable shield or a continuous metal conduit containing the cable is connected to each building grounding electrode system.

Areas having an average of five or fewer thunderstorm days per year and earth resistivity of less than 100 ohm-meters. Such areas are found along the Pacific coast.

Informational Note No. 3: For information on lightning protection systems, see NFPA 780-2017, Standard for the Installation of Lightning Protection Systems.

(1) Fuseless Primary Protectors

Fuseless-type primary protectors shall be permitted under any of the conditions given in 805.90(A)(1)(a) through (A)(1)(e).

(a) Where conductors enter a building through a cable with grounded metallic sheath member(s) and where the conductors in the cable safely fuse on all currents greater than the current-carrying capacity of the primary protector and of the primary protector bonding conductor or grounding electrode conductor

(b) Where insulated conductors in accordance with 805.50(A) are used to extend circuits to a building from a cable with an effectively grounded metallic sheath member(s) and where the conductors in the cable or cable stub, or the connections between the insulated conductors and the plant exposed to accidental contact with electric light or power conductors operating at greater than 300 volts to ground, safely fuse on all currents greater than the current-carrying capacity of the primary protector, or the associated insulated conductors and of the primary protector bonding conductor or grounding electrode conductor

(c) Where insulated conductors in accordance with 805.50(A) or (B) are used to extend circuits to a building from other than a cable with metallic sheath member(s), where (1) the primary protector is listed as being suitable for this purpose for application with circuits extending from other than a cable with metallic sheath members, and (2) the connections of the insulated conductors to the plant exposed to accidental contact with electric light or power conductors operating at greater than 300 volts to ground or the conductors of the plant exposed to accidental contact with electric light or power conductors operating at greater than 300 volts to ground safely fuse on all currents greater than the current-carrying capacity of the primary protector, or associated insulated conductors and of the primary protector bonding conductor or grounding electrode conductor

(d) Where insulated conductors in accordance with 805.50(A) are used to extend circuits aerially to a building from a buried or underground circuit that is unexposed to accidental contact with electric light or power conductors operating at greater than 300 volts to ground

(e) Where insulated conductors in accordance with 805.50(A) are used to extend circuits to a building from cable with an effectively grounded metallic sheath member(s), and where (1) the combination of the primary protector and insulated conductors is listed as being suitable for this purpose for application with circuits extending from a cable with an effectively grounded metallic sheath member(s), and (2) the insulated conductors safely fuse on all currents greater than the current-carrying capacity of the primary protector and of the primary protector bonding conductor or grounding electrode conductor

Informational Note: Section 9 of ANSI/IEEE C2-2012, National Electrical Safety Code, provides an example of methods of protective grounding that can achieve effective grounding of communications cable sheaths for cables from which communications circuits are extended.

(2) Fused Primary Protectors

Where the requirements listed under 805.90(A)(1)(a) through (A)(1)(e) are not met, fused-type primary protectors shall be used. Fused-type primary protectors shall consist of an arrester connected between each line conductor and ground, a fuse in series with each line conductor, and an appropriate mounting arrangement. Primary protector terminals shall be marked to indicate line, instrument, and ground, as applicable.

(B) Location

The primary protector shall be located in, on, or immediately adjacent to the structure or building served and as close as practicable to the point of entrance.

For purposes of this section, primary protectors located at mobile home service equipment within 9.0 m (30 ft) of the exterior wall of the mobile home it serves, or at a mobile home disconnecting means connected to an electrode by a grounding electrode conductor in accordance with 250.32 and located within 9.0 m (30 ft) of the exterior wall of the mobile home it serves, shall be considered to meet the requirements of this section.

Informational Note: Selecting a primary protector location to achieve the shortest practicable primary protector bonding conductor or grounding electrode conductor helps limit potential differences between communications circuits and other metallic systems.

(C) Hazardous (Classified) Locations

The primary protector shall not be located in any hazardous (classified) locations, as defined in 500.5 and 505.5, or in the vicinity of easily ignitible material.

Exception: As permitted in 501.150, 502.150, and 503.150.

(D) Secondary Protectors

Where a secondary protector is installed in series with the indoor communications wire and cable between the primary protector and the equipment, it shall be listed for the purpose in accordance with 805.170(B).

Informational Note: Secondary protectors on circuits exposed to accidental contact with electric light or power conductors operating at greater than 300 volts to ground are not intended for use without primary protectors.

805.93 Grounding, Bonding, or Interruption of Non—Current-Carrying Metallic Sheath Members of Communications Cables

Communications cables entering the building or terminating on the outside of the building shall comply with 805.93(A) or (B).

(A) Entering Buildings

In installations where the communications cable enters a building, the metallic sheath members of the cable shall be grounded or bonded as specified in 800.100 or interrupted by an insulating joint or equivalent device. The grounding, bonding, or interruption shall be as close as practicable to the point of entrance.

(B) Terminating on the Outside of Buildings

In installations where the communications cable is terminated on the outside of the building, the metallic sheath members of the cable shall be grounded or bonded as specified in 800.100 or interrupted by an insulating joint or equivalent device. The grounding, bonding, or interruption shall be as close as practicable to the point of termination of the cable.

Part IV Installation Methods Within Buildings

805.133 Installation of Communications Wires, Cables, and Equipment

Communications wires and cables from the protector to the equipment or, where no protector is required, communications wires and cables attached to the outside or inside of the building shall comply with 805.133(A) and 805.133(B)

(A) Separation From Other Conductors

(1) In Raceways, Cable Trays, Boxes, Cables, Enclosures, and Cable Routing Assemblies

(a) Other Circuits. Communications cables shall be permitted in the same raceway, cable tray, box, enclosure, or cable routing assembly with cables of any of the following:

Class 2 and Class 3 remote-control, signaling, and power-limited circuits in compliance with Article 645 or Parts I and III of Article 725

Power-limited fire alarm systems in compliance with Parts I and III of Article 760

Nonconductive and conductive optical fiber cables in compliance with Parts I and V of Article 770

Community antenna television and radio distribution systems in compliance with Parts I and V of Article 820

Low-power network-powered broadband communications circuits in compliance with Parts I and V of Article 830

(b) Class 2 and Class 3 Circuits. Class 1 circuits shall not be run in the same cable with communications circuits. Class 2 and Class 3 circuit conductors shall be permitted in the same listed communications cable with communications circuits.

(c) Electric Light, Power, Class 1, Non—Power-Limited Fire Alarm, and Medium-Power Network-Powered Broadband Communications Circuits in Raceways, Compartments, and Boxes. Communications conductors shall not be placed in any raceway, compartment, outlet box, junction box, or similar fitting with conductors of electric light, power, Class 1, non-power-limited fire alarm, or medium-power network-powered broadband communications circuits.

Exception No. 1: Section 805.133(A)(1)(c) shall not apply if all of the conductors of electric light, power, Class 1, non—power-limited fire alarm, and medium-power network-powered broadband communications circuits are separated from all of the conductors of communications circuits by a permanent barrier or listed divider.

Exception No. 2: Power conductors in outlet boxes, junction boxes, or similar fittings or compartments where such conductors are introduced solely for power supply to communications equipment. The power circuit conductors shall be routed within the enclosure to maintain a minimum of 6 mm (1/4 in.) separation from the communications circuit conductors.

Exception No. 3: As permitted by 620.36.

(2) Other Applications

Communications wires and cables shall be separated at least 50 mm (2 in.) from conductors of any electric light, power, Class 1, non—power-limited fire alarm, or medium-power network-powered broadband communications circuits.

Exception No. 1: Section 805.133(A)(2) shall not apply where either (1) all of the conductors of the electric light, power, Class 1, non—power-limited fire alarm, and medium-power network-powered broadband communications circuits are in a raceway or in metal-sheathed, metal-clad, nonmetallic-sheathed, Type AC, or Type UF cables, or (2) all of the conductors of communications circuits are encased in raceway.

Exception No. 2: Section 805.133(A)(2) shall not apply where the communications wires and cables are permanently separated from the conductors of electric light, power, Class 1, non—power-limited fire alarm, and medium-power network-powered broadband communications circuits by a continuous and firmly fixed nonconductor, such as porcelain tubes or flexible tubing, in addition to the insulation on the wire.

(B) Support of Communications Wires and Cables

Raceways shall be used for their intended purpose. Communications wires and cables shall not be strapped, taped, or attached by any means to the exterior of any raceway as a means of support.

Exception: Overhead (aerial) spans of communications wires and cables shall be permitted to be attached to the exterior of a raceway-type mast intended for the attachment and support of such wires and cables.

805.154 Substitutions of Listed Communications Wires, Cables, and Raceways, and Listed Cable Routing Assemblies

The substitutions for communications cables listed in Table 805.154 and illustrated in Figure 805.154 shall be permitted.

Table 805.154 Cable Substitutions

Cable Type Permitted Substitutions

CMR CMP

CMG, CM CMP, CMR

CMX CMP, CMR, CMG, CM

FIGURE 805.154 Cable Substitution Hierarchy.

805.156 Dwelling Unit Communications Outlet

For new construction, a minimum of one communications outlet shall be installed within the dwelling in a readily accessible area and cabled to the service provider demarcation point.

Part V Listing Requirements

805.170 Equipment

Communications equipment shall be listed as being suitable for electrical connection to a communications network.

Informational Note No. 1: One way to determine applicable requirements is to refer to ANSI/UL 60950-1-2014, Standard for Safety of Information Technology Equipment; ANSI/UL 1863-2012, Standard for Safety Communications Circuit Accessories; or ANSI/UL 62368-1-2014, Audio/Video, Information and Communication Technology Equipment — Part 1: Safety Requirements.

Informational Note No. 2: Additional information regarding voltages, currents, and power allowed on communications circuits can be found in ANSI/ATIS 0600337-2016, Requirements for Maximum Voltage, Current, and Power Levels Used in Communications Transport Circuits.

(A) Primary Protectors

The primary protector shall consist of an arrester connected between each line conductor and ground in an appropriate mounting. Primary protector terminals shall be marked to indicate line and ground as applicable.

Informational Note: One way to determine applicable requirements for a listed primary protector is to refer to ANSI/UL 497-2013, Standard for Protectors for Paired Conductor Communications Circuits.

(B) Secondary Protectors

The secondary protector shall be listed as suitable to provide means to safely limit currents to less than the current-carrying capacity of listed indoor communications wire and cable, listed telephone set line cords, and listed communications terminal equipment having ports for external wire line communications circuits. Any overvoltage protection, arresters, or grounding connection shall be connected on the equipment terminals side of the secondary protector current-limiting means.

Informational Note: One way to determine applicable requirements for a listed secondary protector is to refer to ANSI/UL 497A-2012, Standard for Secondary Protectors for Communications Circuits.

(C) Plenum Grade Cable Ties

Cable ties intended for use in other space used for environmental air (plenums) shall be listed as having low smoke and heat release properties.

Informational Note: See NFPA 90A-2018, Standard for the Installation of Air-Conditioning and Ventilating Systems, and ANSI/UL 2043-2013, Standard for Safety Fire Test for Heat and Visible Smoke Release for Discrete Products and Their Accessories Installed in Air-Handling Spaces, for information on listing discrete products as having low smoke and heat release properties.

805.173 Drop Wire and Cable

Communications wires and cables without a metallic shield, running from the last outdoor support to the primary protector, shall be listed as being suitable for the purpose and shall have current-carrying capacity as specified in 805.90(A)(1)(b) or (A)(1)(c).

805.179 Communications Wires and Cables

Communications wires and cables shall be listed in accordance with 805.179(A) through (F) and marked in accordance with Table 805.179 and 805.179(G). Conductors in communications cables, other than in a coaxial cable, shall be copper.

Communications wires and cables shall have a voltage rating of not less than 300 volts. The insulation for the individual conductors, other than the outer conductor of a coaxial cable, shall be rated for 300 volts minimum. The cable voltage rating shall not be marked on the cable or on the under-carpet communications wire.

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

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

Table 805.179 Cable Markings

Cable Marking Type

CMP Communications plenum cable

CMR Communications riser cable

CMG Communications general-purpose cable

CM Communications general-purpose cable

CMX Communications cable, limited use

CMUG Under-carpet communications wire and cable

Informational Note: Cable types are listed in descending order of fire performance.

(A) General Requirements

The general requirements in 805.179 shall apply.

(B) Type CMUC Undercarpet Wires and Cables

Type CMUC under-carpet communications wires and cables shall be listed as being suitable for under-carpet use and shall also be listed as being resistant to flame spread.

Informational Note: One method of determining that cable is resistant to flame spread is by testing the cable to the VW-1 (vertical-wire) flame test in ANSI/UL 1581-2017, Reference Standard for Electrical Wires, Cables and Flexible Cords.

(C) Circuit Integrity (CI) Cable or Electrical Circuit Protective System

Cables that are used for survivability of critical circuits under fire conditions shall be listed and meet either 805.179(C)(1) or 805.179(C)(2).

Informational Note: The listing organization provides information for circuit integrity (CI) cable and electrical circuit protective systems, including installation requirements required to maintain the fire rating.

(1) Circuit Integrity (CI) Cables

Circuit integrity (CI) cables specified in 805.179(A) through (D), and used for survivability of critical circuits, shall have an additional classification using the suffix "CI." In order to maintain its listed fire rating, circuit integrity (CI) cable shall only be installed in free air.

Informational Note: One method of defining circuit integrity (CI) cable is by establishing a minimum 2-hour fire resistance rating for the cable when tested in accordance with ANSI/UL 2196-2017, Standard for Fire Test for Circuit Integrity of Fire-Resistant Power, Instrumentation, Control, and Data Cables.

(2) Fire-Resistive Cables

Cables specified in 800.179(A) through (D) and 805.179(C)(1), that are part of an electrical circuit protective system, shall be fire-resistive cable identified with the protective system number on the product, or on the smallest unit container in which the product is packaged, and shall be installed in accordance with the listing of the protective system.

Informational Note No. 1: One method of defining an electrical circuit protective system is by establishing a minimum 2-hour fire resistance rating for the system when tested in accordance with UL Subject 1724, Outline of Investigation for Fire Tests for Electrical Circuit Protective Systems.

Informational Note No. 2: The listing organization provides information for electrical circuit protective systems (FHIT), including installation requirements for maintaining the fire rating.

(D) Types CMP-LP, CMR-LP, CMG-LP, and CM-LP Limited Power (LP) Cables

Types CMP-LP, CMR-LP, CMG-LP, and CM-LP communications limited power cables shall be listed as suitable for carrying power and data up to a specified current limit for each conductor without exceeding the temperature rating of the cable where the cable is installed in cable bundles in free air or installed within a raceway, cable tray, or cable routing assembly. The cables shall be marked with the suffix "-LP(XXA)," where XX designates the current limit in amperes per conductor.

Informational Note: An example of the marking on a communications cable with an LP rating is "CMP-LP (0.6A)(75°C) 23 AWG 4 pair," which indicates that it is a 4-pair plenum cable with 23 AWG conductors, a temperature rating of 75°C, and a current limit of 0.6 ampere.

(E) Communications Wires

Communications wires, such as distributing frame wire and jumper wire, shall be listed as being resistant to the spread of fire.

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

Another method of defining resistant to the spread of fire is for the damage (char length) not to exceed 1.5 m (4 ft 11 in.) when performing the CSA "Vertical Flame Test — Cables in Cable Trays," as described in CSA C22.2 No. 0.3-09, Test Methods for Electrical Wires and Cables.

(F) Hybrid Power and Communications Cables

Listed hybrid power and communications cables shall be permitted where the power cable is a listed Type NM or NM-B, conforming to Part III of Article 334, and the communications cable is a listed Type CM, the jackets on the listed NM or NM-B, and listed CM cables are rated for 600 volts minimum, and the hybrid cable is listed as being resistant to the spread of fire.

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

Another method of defining resistant to the spread of fire is for the damage (char length) not to exceed 1.5 m (4 ft 11 in.) when performing the CSA "Vertical Flame Test — Cables in Cable Trays," as described in CSA C22.2 No. 0.3-09, Test Methods for Electrical Wires and Cables.

(G) Optional Markings

Cables shall be permitted to be surface marked to indicate special characteristics of the cable materials.

Informational Note: These markings can include, but are not limited to, markings for limited-smoke, halogen-free, low-smoke halogen-free, and sunlight resistance.

Article 810 Radio and Television Equipment

Part I General

810.1 Scope

This article covers antenna systems for radio and television receiving equipment, amateur and citizen band radio transmitting and receiving equipment, and certain features of transmitter safety. This article covers antennas such as wire-strung type, multi-element, vertical rod, flat, or parabolic and also covers the wiring and cabling that connect them to equipment. This article does not cover equipment and antennas used for coupling carrier current to power line conductors.

810.2 Definitions

The definitions in Part I of Article 100 shall apply.

810.3 Other Articles

Wiring from the source of power to and between devices connected to the interior wiring system shall comply with Chapters 1 through 4 other than as modified by Parts I and II of Article 640. Wiring for audio signal processing, amplification, and reproduction equipment shall comply with Article 640. Coaxial cables that connect antennas to equipment shall comply with Article 820.

810.4 Community Television Antenna

The antenna shall comply with this article. The distribution system shall comply with Article 820.

810.5 Radio Noise Suppressors

Radio interference eliminators, interference capacitors, or noise suppressors connected to power-supply leads shall be of a listed type. They shall not be exposed to physical damage.

810.6 Antenna Lead-in Protectors

Where an antenna lead-in surge protector is installed, it shall be listed as being suitable for limiting surges on the cable that connects the antenna to the receiver/transmitter electronics and shall be connected between the conductors and the grounded shield or other ground connection. The antenna lead-in protector shall be grounded using a bonding conductor or grounding electrode conductor installed in accordance with 810.21(F).

Informational Note: For requirements covering protectors for antenna lead-in conductors, refer to UL 497E, Outline of Investigation for Protectors for Antenna Lead-In Conductors.

810.7 Grounding Devices

Where bonding or grounding is required, devices used to connect a shield, a sheath, non—current-carrying metallic members of a cable, or metal parts of equipment or antennas to a bonding conductor or grounding electrode conductor shall be listed or be part of listed equipment.

Part II Receiving Equipment — Antenna Systems

810.11 Material

Antennas and lead-in conductors shall be of hard-drawn copper, bronze, aluminum alloy, copper-clad steel, or other high-strength, corrosion-resistant material.

Exception: Soft-drawn or medium-drawn copper shall be permitted for lead-in conductors where the maximum span between points of support is less than 11 m (35 ft).

810.12 Supports

Outdoor antennas and lead-in conductors shall be securely supported. The antennas or lead-in conductors shall not be attached to the electric service mast. They shall not be attached to poles or similar structures carrying open electric light or power wires or trolley wires of over 250 volts between conductors. Insulators supporting the antenna conductors shall have sufficient mechanical strength to safely support the conductors. Lead-in conductors shall be securely attached to the antennas.

810.13 Avoidance of Contacts With Conductors of Other Systems

Outdoor antennas and lead-in conductors from an antenna to a building shall not cross over open conductors of electric light or power circuits and shall be kept well away from all such circuits so as to avoid the possibility of accidental contact. Where proximity to open electric light or power service conductors of less than 250 volts between conductors cannot be avoided, the installation shall be such as to provide a clearance of at least 600 mm (2 ft).

Where practicable, antenna conductors shall be installed so as not to cross under open electric light or power conductors.

810.14 Splices

Splices and joints in antenna spans shall be made mechanically secure with approved splicing devices or by such other means as will not appreciably weaken the conductors.

810.15 Grounding

Masts and metal structures supporting antennas shall be grounded in accordance with 810.21, unless the antenna and its related supporting mast or structure are within a zone of protection defined by a 46 m (150 ft) radius rolling sphere.

Informational Note: See 4.8.3.1 of NFPA 780-2017, Standard for the Installation of Lightning Protection Systems, for the application of the term rolling sphere.

810.16 Size of Wire-Strung Antenna — Receiving Station

(A) Size of Antenna Conductors

Outdoor antenna conductors for receiving stations shall be of a size not less than given in Table 810.16(A).

Table 810.16(A) Size of Receiving Station Outdoor Antenna Conductors

Minimum Size of Conductors (AWG) Where Maximum Open Span Length Is

Material Less Than 11 m (35 ft) 11 m to 45 m (35 ft to 150 ft) Over 45 m (150 ft)

Aluminum alloy, hard-drawn copper 19 14 12

Copper-clad steel, bronze, or other high-strength material 20 17 14

(B) Self-Supporting Antennas

Outdoor antennas, such as vertical rods and flat, parabolic, or dipole structures, shall be of corrosion-resistant materials and of strength suitable to withstand ice and wind loading conditions and shall be located well away from overhead conductors of electric light and power circuits of over 150 volts to ground, so as to avoid the possibility of the antenna or structure falling into or making accidental contact with such circuits.

810.17 Size of Lead-in — Receiving Station

Lead-in conductors from outside antennas for receiving stations shall, for various maximum open span lengths, be of such size as to have a tensile strength at least as great as that of the conductors for antennas as specified in 810.16. Where the lead-in consists of two or more conductors that are twisted together, are enclosed in the same covering, or are concentric, the conductor size shall, for various maximum open span lengths, be such that the tensile strength of the combination is at least as great as that of the conductors for antennas as specified in 810.16.

810.18 Clearances — Receiving Stations

(A) Outside of Buildings

Lead-in conductors attached to buildings shall be installed so that they cannot swing closer than 600 mm (2 ft) to the conductors of circuits of 250 volts or less between conductors, or 3.0 m (10 ft) to the conductors of circuits of over 250 volts between conductors, except that in the case of circuits not over 150 volts between conductors, where all conductors involved are supported so as to ensure permanent separation, the clearance shall be permitted to be reduced but shall not be less than 100 mm (4 in.). The clearance between lead-in conductors and any conductor forming a part of a lightning protection system shall not be less than 1.8 m (6 ft). Underground conductors shall be separated at least 300 mm (12 in.) from conductors of any light or power circuits or Class 1 circuits.

Exception: Where the electric light or power conductors, Class 1 conductors, or lead-in conductors are installed in raceways or metal cable armor.

Informational Note No. 1: See 250.60 for grounding associated with lightning protection components — strike termination devices. For further information, see NFPA 780-2017, Standard for the Installation of Lightning Protection Systems, which contains detailed information on grounding, bonding, and spacing from lightning protection systems, and the calculation of specific separation distances using the sideflash equation in Section 4.6.

Informational Note No. 2: Metal raceways, enclosures, frames, and other non—current-carrying metal parts of electrical equipment installed on a building equipped with a lightning protection system may require bonding or spacing from the lightning protection conductors in accordance with NFPA 780-2017, Standard for the Installation of Lightning Protection Systems. Separation from lightning protection conductors is typically 1.8 m (6 ft) through air or 900 mm (3 ft) through dense materials such as concrete, brick, or wood.

(B) Antennas and Lead-Ins — Indoors

Indoor antennas and indoor lead-ins shall not be run nearer than 50 mm (2 in.) to conductors of other wiring systems in the premises.

Exception No. 1: Where such other conductors are in metal raceways or cable armor.

Exception No. 2: Where permanently separated from such other conductors by a continuous and firmly fixed nonconductor, such as porcelain tubes or flexible tubing.

(C) In Boxes or Other Enclosures

Indoor antennas and indoor lead-ins shall be permitted to occupy the same box or enclosure with conductors of other wiring systems where separated from such other conductors by an effective permanently installed barrier.

810.19 Electrical Supply Circuits Used in Lieu of Antenna — Receiving Stations

Where an electrical supply circuit is used in lieu of an antenna, the device by which the radio receiving set is connected to the supply circuit shall be listed.

810.20 Antenna Discharge Units — Receiving Stations

(A) Where Required

Each conductor of a lead-in from an outdoor antenna shall be provided with a listed antenna discharge unit.

Exception: Where the lead-in conductors are enclosed in a continuous metallic shield that either is grounded with a conductor in accordance with 810.21 or is protected by an antenna discharge unit.

(B) Location

Antenna discharge units shall be located outside the building or inside the building between the point of entrance of the lead-in and the radio set or transformers and as near as practicable to the entrance of the conductors to the building. The antenna discharge unit shall not be located near combustible material or in a hazardous (classified) location as defined in Article 500.

(C) Grounding

The antenna discharge unit shall be grounded in accordance with 810.21.

810.21 Bonding Conductors and Grounding Electrode Conductors — Receiving Stations

Bonding conductors and grounding electrode conductors shall comply with 810.21(A) through 810.21(K).

(A) Material

The bonding conductor or grounding electrode conductor shall be of copper, aluminum, copper-clad steel, copper-clad aluminum, bronze, or similar corrosion-resistant material. Aluminum or copper-clad aluminum bonding conductors or grounding electrode conductors shall not be used where in direct contact with masonry or the earth or where subject to corrosive conditions. Where used outside, aluminum or copper-clad aluminum conductors shall not be installed within 450 mm (18 in.) of the earth.

(B) Insulation

Insulation on bonding conductors or grounding electrode conductors shall not be required.

(C) Supports

The bonding conductor or grounding electrode conductor shall be securely fastened in place and shall be permitted to be directly attached to the surface wired over without the use of insulating supports.

Exception: Where proper support cannot be provided, the size of the bonding conductors or grounding electrode conductors shall be increased proportionately.

(D) Physical Protection

Bonding conductors and grounding electrode conductors shall be protected where exposed to physical damage. Where the bonding conductor or grounding electrode conductor is installed in a metal raceway, both ends of the raceway shall be bonded to the contained conductor or to the same terminal or electrode to which the bonding conductor or grounding electrode conductor is connected.

(E) Run in Straight Line

The bonding conductor or grounding electrode conductor for an antenna mast or antenna discharge unit shall be run in as straight a line as practicable.

(F) Electrode

The bonding conductor or grounding electrode conductor shall be connected as required in 810.21(F)(1) through 810.21(F)(3).

(1) In Buildings or Structures With an Intersystem Bonding Termination

If the building or structure served has an intersystem bonding termination as required by 250.94, the bonding conductor shall be connected to the intersystem bonding termination.

(2) In Buildings or Structures With Grounding Means

If the building or structure served has no intersystem bonding termination, the bonding conductor or grounding electrode conductor shall be connected to the nearest accessible location on the following:

The building or structure grounding electrode system as covered in 250.50

The grounded interior metal water piping systems, within 1.52 m (5 ft) from its point of entrance to the building, as covered in 250.52

The power service accessible means external to the building, as covered in 250.94

The nonflexible metal power service raceway

The service equipment enclosure, or

The grounding electrode conductor or the grounding electrode conductor metal enclosures of the power service

A bonding device intended to provide a termination point for the bonding conductor (intersystem bonding) shall not interfere with the opening of an equipment enclosure. A bonding device shall be mounted on nonremovable parts. A bonding device shall not be mounted on a door or cover even if the door or cover is nonremovable.

(3) In Buildings or Structures Without an Intersystem Bonding Termination or Grounding Means

If the building or structure served has no intersystem bonding termination or grounding means as described in 810.21(F)(2), the grounding electrode conductor shall be connected to a grounding electrode as described in 250.52.

(G) Inside or Outside Building

The bonding conductor or grounding electrode conductor shall be permitted to be run either inside or outside the building.

(H) Size

The bonding conductor or grounding electrode conductor shall not be smaller than 10 AWG copper, 8 AWG aluminum, or 17 AWG copper-clad steel or bronze.

(I) Common Ground

A single bonding conductor or grounding electrode conductor shall be permitted for both protective and operating purposes.

(J) Bonding of Electrodes

A bonding jumper not smaller than 6 AWG copper or equivalent shall be connected between the radio and television equipment grounding electrode and the power grounding electrode system at the building or structure served where separate electrodes are used.

(K) Electrode Connection

Connections to grounding electrodes shall comply with 250.70.

Part III Amateur and Citizen Band Transmitting and Receiving Stations — Antenna Systems

810.51 Other Sections

In addition to complying with Part III, antenna systems for amateur and citizen band transmitting and receiving stations shall also comply with 810.11 through 810.15.

810.52 Size of Antenna

Antenna conductors for transmitting and receiving stations shall be of a size not less than given in Table 810.52.

Table 810.52 Size of Outdoor Antenna Conductors

Minimum Size of Conductors (AWG) Where Maximum Open Span Length Is

Material Less Than 45 m (150 ft) Over 45 m (150 ft)

Hard-drawn copper 14 10

Copper-clad steel, bronze, or other high-strength material 14 12

810.53 Size of Lead-in Conductors

Lead-in conductors for transmitting stations shall, for various maximum span lengths, be of a size at least as great as that of conductors for antennas as specified in 810.52.

810.54 Clearance on Building

Antenna conductors for transmitting stations, attached to buildings, shall be firmly mounted at least 75 mm (3 in.) clear of the surface of the building on nonabsorbent insulating supports, such as treated pins or brackets equipped with insulators having not less than 75-mm (3-in.) creepage and airgap distances. Lead-in conductors attached to buildings shall also comply with these requirements.

Exception: Where the lead-in conductors are enclosed in a continuous metallic shield that is grounded with a conductor in accordance with 810.58, they shall not be required to comply with these requirements. Where grounded, the metallic shield shall also be permitted to be used as a conductor.

810.55 Entrance to Building

Except where protected with a continuous metallic shield that is grounded with a conductor in accordance with 810.58, lead-in conductors for transmitting stations shall enter buildings by one of the following methods:

Through a rigid, noncombustible, nonabsorbent insulating tube or bushing

Through an opening provided for the purpose in which the entrance conductors are firmly secured so as to provide a clearance of at least 50 mm (2 in.)

Through a drilled window pane

810.56 Protection Against Accidental Contact

Lead-in conductors to radio transmitters shall be located or installed so as to make accidental contact with them difficult.

810.57 Antenna Discharge Units — Transmitting Stations

Each conductor of a lead-in for outdoor antennas shall be provided with an antenna discharge unit or other suitable means that drain static charges from the antenna system.

Exception No. 1: Where the lead-in is protected by a continuous metallic shield that is grounded with a conductor in accordance with 810.58, an antenna discharge unit or other suitable means shall not be required.

Exception No. 2: Where the antenna is grounded with a conductor in accordance with 810.58, an antenna discharge unit or other suitable means shall not be required.

810.58 Bonding Conductors and Grounding Electrode Conductors — Amateur and Citizen Band Transmitting and Receiving Stations

Bonding conductors and grounding electrode conductors shall comply with 810.58(A) through 810.58(C).

(A) Other Sections

All bonding conductors and grounding electrode conductors for amateur and citizen band transmitting and receiving stations shall comply with 810.21(A) through 810.21(C).

(B) Size of Protective Bonding Conductor or Grounding Electrode Conductor

The protective bonding conductor or grounding electrode conductor for transmitting stations shall be as large as the lead-in but not smaller than 10 AWG copper, bronze, or copper-clad steel.

(C) Size of Operating Bonding Conductor or Grounding Electrode Conductor

The operating bonding conductor or grounding electrode conductor for transmitting stations shall not be less than 14 AWG copper or its equivalent.

Part IV Interior Installation — Transmitting Stations

810.70 Clearance From Other Conductors

All conductors inside the building shall be separated at least 100 mm (4 in.) from the conductors of any electric light, power, or signaling circuit.

Exception No. 1: As provided in Article 640.

Exception No. 2: Where separated from other conductors by raceway or some firmly fixed nonconductor, such as porcelain tubes or flexible tubing.

810.71 General

Transmitters shall comply with 810.71(A) through (C).

(A) Enclosing

The transmitter shall be enclosed in a metal frame or grille or separated from the operating space by a barrier or other equivalent means, all metallic parts of which are effectively connected to a bonding conductor or grounding electrode conductor.

(B) Grounding of Controls

All external metal handles and controls accessible to the operating personnel shall be effectively connected to an equipment grounding conductor if the transmitter is powered by the premises wiring system or grounded with a conductor in accordance with 810.21.

(C) Interlocks on Doors

All access doors shall be provided with interlocks that disconnect all voltages of over 350 volts between conductors when any access door is opened.

Article 820 Community Antenna Television and Radio Distribution Systems

Part I General

820.1 Scope

This article covers coaxial cable distribution of radio frequency signals typically employed in community antenna television (CATV) systems.

820.2 Definitions

The definitions in this section shall apply only within Articles 820 and 840.

820.3 Other Articles

Circuits and equipment shall comply with 820.3(A) and (B).

(A) General Requirements

The general requirements of Article 800 shall apply.

(B) Alternate Wiring Methods

The wiring methods of Article 830 shall be permitted to substitute for the wiring methods of Article 820.

Informational Note: Use of Article 830 wiring methods will facilitate the upgrading of Article 820 installations to network-powered broadband applications.

820.15 Power Limitations

Coaxial cable shall be permitted to deliver power to equipment that is directly associated with the radio frequency distribution system if the voltage is not over 60 volts and if the current is supplied by a transformer or other device that has power-limiting characteristics.

Power shall be blocked from premises devices on the network that are not intended to be powered via the coaxial cable.

Part II Coaxial Cables Outside and Entering Buildings

820.44 Overhead (Aerial) Coaxial Cables

Overhead (aerial) coaxial cables, prior to the point of grounding, as specified in 820.93, shall comply with 820.44(A) or 800.44.

(A) On Poles and In-Span, Above Roofs, on Masts, or Between Buildings

Where coaxial cables are installed on poles and in-span, above roofs, on masts, or between buildings, they shall comply with 800.44.

(B) On Buildings

Where attached to buildings, coaxial cables shall be securely fastened in such a manner that they will be separated from other conductors in accordance with 820.44(B)(1) and (B)(2).

(1) Electric Light or Power

The coaxial cable shall have a separation of at least 100 mm (4 in.) from electric light, power, Class 1, or non-power-limited fire alarm circuit conductors not in raceway or cable, or shall be permanently separated from conductors of the other system by a continuous and firmly fixed nonconductor in addition to the insulation on the wires.

(2) Other Communications Systems

Coaxial cable shall be installed so that there will be no unnecessary interference in the maintenance of the separate systems. In no case shall the conductors, cables, messenger strand, or equipment of one system cause abrasion to the conductors, cable, messenger strand, or equipment of any other system.

820.47 Underground Coaxial Cables Entering Buildings

Underground coaxial cables entering buildings shall comply with 820.47(A) and 820.47(B).

(A) Underground Systems With Electric Light, Power, Class 1, or Non—Power-Limited Fire Alarm Circuit Conductors

Underground coaxial cables in a duct, pedestal, handhole enclosure, or manhole that contains electric light, power, or Class 1 or non—power-limited fire alarm circuit conductors shall be in a section permanently separated from such conductors by means of a suitable barrier.

(B) Direct-Buried Cables and Raceways

Direct-buried coaxial cable shall be separated at least 300 mm (12 in.) from conductors of any light or power, non-power-limited fire alarm circuit conductors, or Class 1 circuit.

Exception No. 1: Separation shall not be required where electric service conductors or coaxial cables are installed in raceways or have metal cable armor.

Exception No. 2: Separation shall not be required where electric light or power branch-circuit or feeder conductors or Class 1 circuit conductors are installed in a raceway or in metal-sheathed, metal-clad, or Type UF or Type USE cables; or the coaxial cables have metal cable armor or are installed in a raceway.

820.48 Unlisted Cables Entering Buildings

Unlisted outside plant coaxial cables shall be permitted to be installed in building spaces other than risers, ducts used for environmental air, plenums used for environmental air, and other spaces used for environmental air, where the length of the cable within the building, measured from its point of entrance, does not exceed 15 m (50 ft) and the cable enters the building from the outside and is terminated at a grounding block. The point of entrance shall be permitted to be extended from the penetration of the external wall or floor slab by continuously enclosing the entrance cables in rigid metal conduit (RMC) or intermediate metal conduit (IMC) to the point of emergence.

Part III Protection

820.93 Grounding of the Outer Conductive Shield of Coaxial Cables

Coaxial cables entering buildings or attached to buildings shall comply with 820.93(A) or (B). Where the outer conductive shield of a coaxial cable is grounded, no other protective devices shall be required. For purposes of this section, grounding located at mobile home service equipment located within 9.0 m (30 ft) of the exterior wall of the mobile home it serves, or at a mobile home disconnecting means grounded in accordance with 250.32 and located within 9.0 m (30 ft) of the exterior wall of the mobile home it serves, shall be considered to meet the requirements of this section.

Informational Note: Selecting a grounding block location to achieve the shortest practicable bonding conductor or grounding electrode conductor helps limit potential differences between CATV and other metallic systems.

(A) Entering Buildings

In installations where the coaxial cable enters the building, the outer conductive shield shall be grounded in accordance with 820.100. The grounding shall be as close as practicable to the point of entrance.

(B) Terminating Outside of the Building

In installations where the coaxial cable is terminated outside of the building, the outer conductive shield shall be grounded in accordance with 820.100. The grounding shall be as close as practicable to the point of attachment or termination.

(C) Location

Where installed, a listed primary protector shall be applied on each community antenna and radio distribution (CATV) cable external to the premises. The listed primary protector shall be located as close as practicable to the entrance point of the cable on either side or integral to the ground block.

(D) Hazardous (Classified) Locations

Where a primary protector or equipment providing the primary protection function is used, it shall not be located in any hazardous (classified) location as defined in 500.5 and 505.5 or in the vicinity of easily ignitible material.

Exception: As permitted in 501.150, 502.150, and 503.150.

Part IV Grounding Methods

820.100 Cable Bonding and Grounding

The shield of the coaxial cable shall be bonded or grounded as specified in 820.100(A) and (B).

Exception: For communications systems using coaxial cable completely contained within the building (i.e., they do not exit the building) or the exterior zone of protection defined by a 46 m (150 ft) radius rolling sphere and isolated from outside cable plant, the shield shall be permitted to be grounded by a connection to an equipment grounding conductor as described in 250.118. Connecting to an equipment grounding conductor through a grounded receptacle using a dedicated bonding jumper and a permanently connected listed device shall be permitted. Use of a cord and plug for the connection to an equipment grounding conductor shall not be permitted.

Informational Note: See 4.8.3.1 of NFPA 780-2017, Standard for the Installation of Lightning Protection Systems, for the application of the term rolling sphere.

(A) General Requirements

The installation shall be in accordance with 800.100.

(B) Shield Protection Devices

Grounding of a coaxial drop cable shield by means of a protective device that does not interrupt the grounding system within the premises shall be permitted.

820.103 Equipment Grounding

Unpowered equipment and enclosures or equipment powered by the coaxial cable shall be considered grounded where connected to the metallic cable shield.

Part V Installation Methods Within Buildings

820.133 Installation of Coaxial Cables and Equipment

Beyond the point of grounding, as defined in 820.93, the coaxial cable installation shall comply with 820.133(A) and (B).

(A) Separation From Other Conductors

(1) In Raceways, Cable Trays, Boxes, Enclosures, and Cable Routing Assemblies

(a) Other Circuits. Coaxial cables shall be permitted in the same raceway, cable tray, box, enclosure, or cable routing assembly with jacketed cables of any of the following:

Class 2 and Class 3 remote control, signaling, and power-limited circuits in compliance with Article 645 or Parts I and III of Article 725

Power-limited fire alarm systems in compliance with Parts I and III of Article 760

Nonconductive and conductive optical fiber cables in compliance with Parts I and V of Article 770

Communications circuits in compliance with Parts I and IV of Article 805

Low-power network-powered broadband communications circuits in compliance with Parts I and V of Article 830

(b) Electric Light, Power, Class 1, Non-Power-Limited Fire Alarm, and Medium-Power Network-Powered Broadband Communications Circuits. Coaxial cable shall not be placed in any raceway, compartment, outlet box, junction box, or other enclosures with conductors of electric light, power, Class 1, non-power-limited fire alarm, or medium-power network-powered broadband communications circuits.

Exception No. 1: Coaxial cable shall be permitted to be placed in any raceway, compartment, outlet box, junction box, or other enclosures with conductors of electric light, power, Class 1, non-power-limited fire alarm, or medium-power network-powered broadband communications circuits where all of the conductors of electric light, power, Class 1, non-power-limited fire alarm, and medium-power network-powered broadband communications circuits are separated from all of the coaxial cables by a permanent barrier or listed divider.

Exception No. 2: Coaxial cable shall be permitted to be placed in outlet boxes, junction boxes, or similar fittings or compartments with power conductors where such conductors are introduced solely for power supply to the coaxial cable system distribution equipment. The power circuit conductors shall be routed within the enclosure to maintain a minimum 6 mm (1/4 in.) separation from coaxial cables.

(2) Other Applications

Coaxial cable shall be separated at least 50 mm (2 in.) from conductors of any electric light, power, Class 1, non-power-limited fire alarm, or medium-power network-powered broadband communications circuits.

Exception No. 1: Separation shall not be required where either (1) all of the conductors of electric light, power, Class 1, non-power-limited fire alarm, and medium-power network-powered broadband communications circuits are in a raceway, or in metal-sheathed, metal-clad, nonmetallic-sheathed, Type AC or Type UF cables, or (2) all of the coaxial cables are encased in a raceway.

Exception No. 2: Separation shall not be required where the coaxial cables are permanently separated from the conductors of electric light, power, Class 1, non-power-limited fire alarm, and medium-power network-powered broadband communications circuits by a continuous and firmly fixed nonconductor, such as porcelain tubes or flexible tubing, in addition to the insulation on the wire.

(B) Support of Coaxial Cables

Raceways shall be used for their intended purpose. Coaxial cables shall not be strapped, taped, or attached by any means to the exterior of any conduit or raceway as a means of support.

Exception: Overhead (aerial) spans of coaxial cables shall be permitted to be attached to the exterior of a raceway-type mast intended for the attachment and support of such cables.

820.154 Substitutions of Listed CATV Cables

The substitutions for coaxial cables in Table 820.154 and illustrated in Figure 820.154 shall be permitted.

Informational Note: The substitute cables in Table 820.154 and Figure 820.154 are only coaxial-type cables.

Table 820.154 Coaxial Cable Uses and Permitted Substitutions

Cable Marking Permitted Substitutions

CATVP CMP, BLP

CATVR CATVP, CMP, CMR, BMR, BLP, BLR

CATV CATVP, CMP, CATVR, CMR, CMG, CM, BMR, BM, BLP, BLR, BL

CATVX CATVP, CMP, CATVR, CMR, CATV, CMG, CM, BMR, BM, BLP, BLR, BL, BLX

Type BL—Network-powered broadband communications low-power cables

Type BM—Network-powered broadband communications medium-power cables

Type CATV—Community antenna television cables

Type CM—Communications cables

FIGURE 820.154 Cable Substitution Hierarchy.

Part VI Listing Requirements

820.179 Coaxial Cables

Cables shall be listed in accordance with 820.179(A) and marked in accordance with Table 820.179 and 820.179(B). The cable voltage rating shall not be marked on the cable.

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

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

Table 820.179 Coaxial Cable Markings

Cable Marking Type

CATVP CATV plenum cable

CATVR CATV riser cable

CATV CATV cable

CATVX CATV cable, limited use

(A) General Requirements

The general requirements in 800.179 shall apply.

(B) Optional Markings

Cables shall be permitted to be surface marked to indicate special characteristics of the cable materials.

Informational Note: These markings can include, but are not limited to, markings for limited-smoke, halogen-free, low-smoke halogen-free, and sunlight resistance.

Article 830 Network-Powered Broadband Communications Systems

Part I General

830.1 Scope

This article covers network-powered broadband communications systems that provide any combination of voice, audio, video, data, and interactive services through a network interface unit.

Informational Note: A typical basic system configuration includes a cable supplying power and broadband signal to a network interface unit that converts the broadband signal to the component signals. Typical cables are coaxial cable with both broadband signal and power on the center conductor, composite metallic cable with a coaxial member(s) or twisted pair members for the broadband signal and twisted pair members for power, and composite optical fiber cable with a pair of conductors for power. Larger systems may also include network components such as amplifiers that require network power.

830.2 Definitions

The definitions in this section shall apply only within Article 830.

Informational Note: A typical single-family network-powered communications circuit consists of a communications drop or communications service cable and an NIU and includes the communications utility's serving terminal or tap where it is not under the exclusive control of the communications utility.

Fault Protection Device. An electronic device that is intended for the protection of personnel and functions under fault conditions, such as network-powered broadband communications cable short or open circuit, to limit the current or voltage, or both, for a low-power network-powered broadband communications circuit and provide acceptable protection from electric shock.

Network Interface Unit (NIU). A device that converts a broadband signal into component voice, audio, video, data, and interactive services signals and provides isolation between the network power and the premises signal circuits. These devices often contain primary and secondary protectors.

Network-Powered Broadband Communications Circuit. The circuit extending from the communications utility's or service provider's serving terminal or tap up to and including the NIU.

Informational Note: A typical one-family dwelling network-powered communications circuit consists of a communications drop or communications service cable and an NIU and includes the communications utility's serving terminal or tap where it is not under the exclusive control of the communications utility.

830.3 Other Articles

Circuits and equipment shall comply with 830.3(A) through (C).

(A) General Requirements

The general requirements of Article 800 shall apply.

(B) Output Circuits

As appropriate for the services provided, the output circuits derived from the network interface unit shall comply with the requirements of the following:

Installations of communications circuits — Part IV of Article 805

Installations of community antenna television and radio distribution circuits — Part V of Article 820

Exception: Where protection is provided in the output of the NIU 830.90(B)(3) shall apply.

Installations of optical fiber cables — Part V of Article 770

Installations of Class 2 and Class 3 circuits — Part III of Article 725

Installations of power-limited fire alarm circuits — Part III of Article 760

(C) Protection Against Physical Damage

The requirements of 300.4 shall apply.

830.15 Power Limitations

Network-powered broadband communications systems shall be classified as having low- or medium-power sources as specified in 830.15(1) or (2).

Sources shall be classified as defined in Table 830.15.

Direct-current power sources exceeding 150 volts to ground, but no more than 200 volts to ground, with the current to ground limited to 10 mA dc, that meet the current and power limitation for medium-power sources in Table 830.15 shall be classified as medium-power sources.

Informational Note: One way to determine compliance with 830.15(2) is listed information technology equipment intended to supply power via a communications network that complies with the requirements for RFT-V circuits as defined in UL 60950-21-2007, Standard for Safety for Information Technology Equipment — Safety — Part 21: Remote Power Feeding.

Table 830.15 Limitations for Network-Powered Broadband Communications Systems

Network Power Source Low Medium

Circuit voltage, Vmax (volts) 1 0—100 0—150

Power limitation, VAmax (volt-amperes)1 250 250

Current limitation, Imax (amperes)1 1000/Vmax 1000/Vmax

Maximum power rating (volt-amperes) 100 100

Maximum voltage rating (volts) 100 150

Maximum overcurrent protection (amperes) 2 100/Vmax NA

1 Vmax, Imax, and VAmax are determined with the current-limiting impedance in the circuit (not bypassed) as follows:

Vmax — Maximum system voltage regardless of load with rated input applied.

Imax — Maximum system current under any noncapacitive load, including short circuit, and with overcurrent protection bypassed if used. Imax limits apply after 1 minute of operation.

VAmax — Maximum volt-ampere output after 1 minute of operation regardless of load and overcurrent protection bypassed if used.

2 Overcurrent protection is not required where the current-limiting device provides equivalent current limitation and the current-limiting device does not reset until power or the load is removed.

830.24 Mechanical Execution of Work

The installation shall also conform to 300.4 and 300.11.

Part II Cables Outside and Entering Buildings

830.40 Entrance Cables

Network-powered broadband communications cables located outside and entering buildings shall comply with 830.40(A) and (B).

(A) Medium-Power Circuits

Medium-power network-powered broadband communications circuits located outside and entering buildings shall be installed using Type BMU, Type BM, or Type BMR network-powered broadband communications medium-power cables.

(B) Low-Power Circuits

Low-power network-powered broadband communications circuits located outside and entering buildings shall be installed using Type BLU or Type BLX low-power network-powered broadband communications cables. Cables shown in Table 830.154 shall be permitted to substitute.

Exception: Outdoor community antenna television and radio distribution system coaxial cables installed prior to January 1, 2000, and installed in accordance with Article 820, shall be permitted for low-power-type, network-powered broadband communications circuits.

830.44 Overhead (Aerial) Cables

Overhead (aerial) network-powered broadband communications cables shall comply with 830.44(A) through (F).

(A) On Poles and In-Span or Above Roofs

Where network-powered broadband communications cables are installed on poles and in-span or above roofs, they shall comply with 800.44.

(B) Clearance From Ground

Overhead (aerial) spans of network-powered broadband communications cables shall conform to not less than the following:

2.9 m (91/2 ft) — above finished grade, sidewalks, or from any platform or projection from which they might be reached and accessible to pedestrians only

3.5 m (111/2 ft) — over residential property and driveways, and those commercial areas not subject to truck traffic

4.7 m (151/2 ft) — over public streets, alleys, roads, parking areas subject to truck traffic, driveways on other than residential property, and other land traversed by vehicles such as cultivated, grazing, forest, and orchard

Informational Note: These clearances have been specifically chosen to correlate with ANSI/IEEE C2-2012, National Electrical Safety Code, Table 232-1, which provides for clearances of wires, conductors, and cables above ground and roadways, rather than using the clearances referenced in 225.18. Because Article 805 and Article 820 have had no required clearances, the communications industry has used the clearances from the NESC for their installed cable plant.

(C) Over Pools

Clearance of network-powered broadband communications cable in any direction from the water level, edge of pool, base of diving platform, or anchored raft shall comply with those clearances in 680.9.

(D) Final Spans

Final spans of network-powered broadband communications cables without an outer jacket shall be permitted to be attached to the building, but they shall be kept not less than 900 mm (3 ft) from windows that are designed to be opened, doors, porches, balconies, ladders, stairs, fire escapes, or similar locations.

Exception: Conductors run above the top level of a window shall be permitted to be less than the 900-mm (3-ft) requirement above.

Overhead (aerial) network-powered broadband communications cables shall not be installed beneath openings through which materials might be moved, such as openings in farm and commercial buildings, and shall not be installed where they obstruct entrance to these building openings.

(E) Between Buildings

Network-powered broadband communications cables extending between buildings or structures, and also the supports or attachment fixtures, shall be identified as suitable for outdoor aerial applications and shall have sufficient strength to withstand the loads to which they may be subjected.

Exception: Where a network-powered broadband communications cable does not have sufficient strength to be self-supporting, it shall be attached to a supporting messenger cable that, together with the attachment fixtures or supports, shall be acceptable for the purpose and shall have sufficient strength to withstand the loads to which they may be subjected.

(F) On Buildings

Where attached to buildings, network-powered broadband communications cables shall be securely fastened in such a manner that they are separated from other conductors in accordance with 830.44(F)(1) through (F)(3).

(1) Electric Light or Power

The network-powered broadband communications cable shall have a separation of at least 100 mm (4 in.) from electric light, power, Class 1, or non-power-limited fire alarm circuit conductors not in raceway or cable, or be permanently separated from conductors of the other system by a continuous and firmly fixed nonconductor in addition to the insulation on the wires.

(2) Other Communications Systems

Network-powered broadband communications cables shall be installed so that there will be no unnecessary interference in the maintenance of the separate systems. In no case shall the conductors, cables, messenger strand, or equipment of one system cause abrasion to the conductors, cables, messenger strand, or equipment of any other system.

(3) Protection From Damage

Network-powered broadband communications cables attached to buildings or structures and located within 2.5 m (8 ft) of finished grade shall be protected by enclosures, raceways, or other approved means.

Exception: A low-power network-powered broadband communications circuit that is equipped with a listed fault protection device, appropriate to the network-powered broadband communications cable used, and located on the network side of the network-powered broadband communications cable shall not be required to be additionally protected by enclosures, raceways, or other approved means.

830.47 Underground Network-Powered Broadband Communications Cables Entering Buildings

Underground network-powered broadband communications cables entering buildings shall comply with 830.47(A) through 830.47(D).

(A) Underground Systems With Electric Light and Power, Class 1, or Non—Power-Limited Fire Alarm Circuit Conductors

Underground network-powered broadband communications cables in a duct, pedestal, handhole enclosure, or manhole that contains electric light, power conductors, non-power-limited fire alarm circuit conductors, or Class 1 circuits shall be in a section permanently separated from such conductors by means of a suitable barrier.

(B) Direct-Buried Cables and Raceways

Direct-buried network-powered broadband communications cables shall be separated by at least 300 mm (12 in.) from conductors of any light, power, non—power-limited fire alarm circuit conductors or Class 1 circuit.

Exception No. 1: Separation shall not be required where electric service conductors or network-powered broadband communications cables are installed in raceways or have metal cable armor.

Exception No. 2: Separation shall not be required where electric light or power branch-circuit or feeder conductors, non—power-limited fire alarm circuit conductors, or Class 1 circuit conductors are installed in a raceway or in metal-sheathed, metal-clad, or Type UF or Type USE cables; or the network-powered broadband communications cables have metal cable armor or are installed in a raceway.

(C) Protection From Physical Damage

Direct-buried cable, conduit, or other raceways shall be installed to meet the minimum cover requirements of Table 830.47(C). In addition, direct-buried cables emerging from the ground shall be protected by enclosures, raceways, or other approved means extending from the minimum cover distance required by Table 830.47(C) below grade to a point at least 2.5 m (8 ft) above finished grade. In no case shall the protection be required to exceed 450 mm (18 in.) below finished grade. Types BMU and BLU direct-buried cables emerging from the ground shall be installed in rigid metal conduit (RMC), intermediate metal conduit (IMC), rigid nonmetallic conduit, or other approved means extending from the minimum cover distance required by Table 830.47(C) below grade to the point of entrance.

Exception: A low-power network-powered broadband communications circuit that is equipped with a listed fault protection device, appropriate to the network-powered broadband communications cable used, and located on the network side of the network-powered broadband communications cable being protected.

Table 830.47(C) Network-Powered Broadband Communications Systems Minimum Cover Requirements (Cover is the shortest distance measured between a point on the top surface of any direct-buried cable, conduit, or other raceway and the top surface of finished grade, concrete, or similar cover.)

Location of Wiring Method or Circuit Direct Burial Cables Rigid Metal Conduit (RMC) or Intermediate Metal Conduit (IMC) Nonmetallic Raceways Listed for Direct Burial; Without Concrete Encasement or Other Approved Raceways

mm in. mm in. mm in.

All locations not specified below 450 18 150 6 300 12

In trench below 50-mm (2-in.) thick concrete or equivalent 300 12 150 6 150 6

Under a building (in raceway only) 0 0 0 0 0 0

Under minimum of 100-mm (4-in.) thick concrete exterior slab with no vehicular traffic and the slab extending not less than 150 mm (6 in.) beyond the underground installation 300 12 100 4 100 4

One- and two-family dwelling driveways and outdoor parking areas and used only for dwelling-related purposes 300 12 300 12 300 12

Notes:

1. Raceways approved for burial only where concrete encased shall require a concrete envelope not less than 50 mm (2 in.) thick.

2. Lesser depths shall be permitted where cables rise for terminations or splices or where access is otherwise required.

3. Where solid rock is encountered, all wiring shall be installed in 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. Low-power network-powered broadband communications circuits using directly buried community antenna television and radio distribution system coaxial cables that were installed outside and entering buildings prior to January 1, 2000, in accordance with Article 820 shall be permitted where buried to a minimum depth of 300 mm (12 in.).

(D) Pools

Cables located under the pool or within the area extending 1.5 m (5 ft) horizontally from the inside wall of the pool shall meet those clearances and requirements specified in 680.11.

Part III Protection

830.90 Primary Electrical Protection

(A) Application

Primary electrical protection shall be provided on all network-powered broadband communications conductors that are neither grounded nor interrupted and are run partly or entirely in aerial cable not confined within a block. Also, primary electrical protection shall be provided on all aerial or underground network-powered broadband communications conductors that are neither grounded nor interrupted and are located within the block containing the building served so as to be exposed to lightning or accidental contact with electric light or power conductors operating at over 300 volts to ground.

Exception: Primary electrical protection shall not be required on the network-powered broadband communications conductors where electrical protection is provided on the derived circuit(s) (output side of the NIU) in accordance with 830.90(B)(3).

Informational Note No. 1: On network-powered broadband communications conductors not exposed to lightning or accidental contact with power conductors, providing primary electrical protection in accordance with this article helps protect against other hazards, such as ground potential rise caused by power fault currents, and above-normal voltages induced by fault currents on power circuits in proximity to the network-powered broadband communications conductors.

Informational Note No. 2: Network-powered broadband communications circuits are considered to have a lightning exposure unless one or more of the following conditions exist:

Circuits in large metropolitan areas where buildings are close together and sufficiently high to intercept lightning.

Areas having an average of five or fewer thunderstorm days each year and earth resistivity of less than 100 ohm-meters. Such areas are found along the Pacific coast.

Informational Note No. 3: For information on lightning protection systems, see NFPA 780-2017, Standard for the Installation of Lightning Protection Systems.

(1) Fuseless Primary Protectors

Fuseless-type primary protectors shall be permitted where power fault currents on all protected conductors in the cable are safely limited to a value no greater than the current-carrying capacity of the primary protector and of the primary protector bonding conductor or grounding electrode conductor.

(2) Fused Primary Protectors

Where the requirements listed in 830.90(A)(1) are not met, fused-type primary protectors shall be used. Fused-type primary protectors shall consist of an arrester connected between each conductor to be protected and ground, a fuse in series with each conductor to be protected, and an appropriate mounting arrangement. Fused primary protector terminals shall be marked to indicate line, instrument, and ground, as applicable.

(B) Location

The location of the primary protector, where required, shall comply with 830.90(B)(1), (B)(2), or (B)(3):

A listed primary protector shall be applied on each network-powered broadband communications cable external to and on the network side of the network interface unit.

The primary protector function shall be an integral part of and contained in the network interface unit. The network interface unit shall be listed as being suitable for application with network-powered broadband communications systems and shall have an external marking indicating that it contains primary electrical protection.

The primary protector(s) shall be provided on the derived circuit(s) (output side of the NIU), and the combination of the NIU and the protector(s) shall be listed as being suitable for application with network-powered broadband communications systems.

A primary protector, whether provided integrally or external to the network interface unit, shall be located as close as practicable to the point of entrance.

For purposes of this section, a network interface unit and any externally provided primary protectors located at mobile home service equipment located in sight from and not more than 9.0 m (30 ft) from the exterior wall of the mobile home it serves, or at a mobile home disconnecting means grounded in accordance with 250.32 and located in sight from and not more than 9.0 m (30 ft) from the exterior wall of the mobile home it serves, shall be considered to meet the requirements of this section.

Informational Note: Selecting a network interface unit and primary protector location to achieve the shortest practicable primary protector bonding conductor or grounding electrode conductor helps limit potential differences between communications circuits and other metallic systems.

(C) Hazardous (Classified) Locations

The primary protector or equipment providing the primary protection function shall not be located in any hazardous (classified) location as defined in 500.5 and 505.5 or in the vicinity of easily ignitible material.

Exception: As permitted in 501.150, 502.150, and 503.150.

Part IV Grounding Methods

830.93 Grounding or Interruption of Metallic Members of Network-Powered Broadband Communications Cables

Network-powered communications cables entering buildings or attaching to buildings shall comply with 830.93(A) or (B).

For purposes of this section, grounding located at mobile home service equipment located within 9.0 m (30 ft) of the exterior wall of the mobile home it serves, or at a mobile home disconnecting means grounded in accordance with 250.32 and located within 9.0 m (30 ft) of the exterior wall of the mobile home it serves, shall be considered to meet the requirements of this section.

Informational Note: Selecting a grounding location to achieve the shortest practicable bonding conductor or grounding electrode conductor helps limit potential differences between the network-powered broadband communications circuits and other metallic systems.

(A) Entering Buildings

In installations where the network-powered communications cable enters the building, the shield shall be grounded in accordance with 800.100, and metallic members of the cable not used for communications or powering shall be grounded in accordance with 800.100 or interrupted by an insulating joint or equivalent device. The grounding or interruption shall be as close as practicable to the point of entrance.

(B) Terminating Outside of the Building

In installations where the network-powered communications cable is terminated outside of the building, the shield shall be grounded in accordance with 800.100, and metallic members of the cable not used for communications or powering shall be grounded in accordance with 800.100 or interrupted by an insulating joint or equivalent device. The grounding or interruption shall be as close as practicable to the point of attachment of the NIU.

Part V Installation Methods Within Buildings

830.133 Installation of Network-Powered Broadband Communications Cables and Equipment

Cable and equipment installations within buildings shall comply with 830.133(A) and (B), as applicable.

(A) Separation of Conductors

(1) In Raceways, Cable Trays, Boxes, Enclosures, and Cable Routing Assemblies

(a) Low- and Medium-Power Network-Powered Broadband Communications Circuit Cables. Low- and medium-power network-powered broadband communications cables shall be permitted in the same raceway, cable tray, box, enclosure, or cable routing assembly.

(b) Low-Power Network-Powered Broadband Communications Circuit Cables with Other Circuits. Low-power network-powered broadband communications cables shall be permitted in the same raceway, cable tray, box, enclosure, or cable routing assembly with jacketed cables of any of the following circuits:

Class 2 and Class 3 remote-control, signaling, and power-limited circuits in compliance with Parts I and III of Article 725

Power-limited fire alarm systems in compliance with Parts I and III of Article 760

Communications circuits in compliance with Parts I and IV of Article 805

Nonconductive and conductive optical fiber cables in compliance with Parts I and V of Article 770

Community antenna television and radio distribution systems in compliance with Parts I and V of Article 820

(c) Medium-Power Network-Powered Broadband Communications Circuit Cables with Optical Fiber Cables and Other Communications Cables. Medium-power network-powered broadband communications cables shall not be permitted in the same raceway, cable tray, box, enclosure, or cable routing assembly with conductors of any of the following circuits:

Communications circuits in compliance with Parts I and IV of Article 805

Conductive optical fiber cables in compliance with Parts I and V of Article 770

Community antenna television and radio distribution systems in compliance with Parts I and V of Article 820

(d) Medium-Power Network-Powered Broadband Communications Circuit Cables with Other Circuits. Medium-power network-powered broadband communications cables shall not be permitted in the same raceway, cable tray, box, enclosure, or cable routing assembly with conductors of any of the following circuits:

Class 2 and Class 3 remote-control, signaling, and power-limited circuits in compliance with Parts I and III of Article 725

Power-limited fire alarm systems in compliance with Parts I and III of Article 760

(e) Electric Light, Power, Class 1, Non—Powered Broadband Communications Circuit Cables. Network-powered broadband communications cable shall not be placed in any raceway, cable tray, compartment, outlet box, junction box, or similar fittings with conductors of electric light, power, Class 1, or non-power-limited fire alarm circuit cables.

Exception No. 1: Where all of the conductors of electric light, power, Class 1, non—power-limited fire alarm circuits are separated from all of the network-powered broadband communications cables by a permanent barrier or listed divider.

Exception No. 2: Power circuit conductors in outlet boxes, junction boxes, or similar fittings or compartments where such conductors are introduced solely for power supply to the network-powered broadband communications system distribution equipment. The power circuit conductors shall be routed within the enclosure to maintain a minimum 6 mm (1/4 in.) separation from network-powered broadband communications cables.

(2) Other Applications

Network-powered broadband communications cable shall be separated at least 50 mm (2 in.) from conductors of any electric light, power, Class 1, and non—power-limited fire alarm circuits.

Exception No. 1: Separation shall not be required where: (1) all of the conductors of electric light, power, Class 1, and non—power-limited fire alarm circuits are in a raceway, or in metal-sheathed, metal-clad, nonmetallic-sheathed, Type AC, or Type UF cables, or (2) all of the network-powered broadband communications cables are encased in a raceway.

Exception No. 2: Separation shall not be required where the network-powered broadband communications cables are permanently separated from the conductors of electric light, power, Class 1, and non—power-limited fire alarm circuits by a continuous and firmly fixed nonconductor, such as porcelain tubes or flexible tubing, in addition to the insulation on the wire.

(B) Support of Network-Powered Broadband Communications Cables

Raceways shall be used for their intended purpose. Network-powered broadband communications cables shall not be strapped, taped, or attached by any means to the exterior of any conduit or raceway as a means of support.

830.154 Substitutions of Network-Powered Broadband Communications System Cables

The substitutions for network-powered broadband system cables listed in Table 830.154 shall be permitted.

Table 830.154 Cable Substitutions

Cable Type Permitted Cable Substitutions

BM BMR

BMP CMP, CL3P

BLR CMP, CL3P, CMR, CL3R, BLP, BMR

BL CMP, CMR, CM, CMG, CL3P, CL3R, CL3, BMR, BM, BLP, BLR

BLX CMP, CMR, CM, CMG, CMX, CL3P, CL3R, CL3, CL3X, BMR, BM, BLP, BRP, BL

830.160 Bends

Bends in network broadband cable shall be made so as not to damage the cable.

Part VI Listing Requirements

830.179 Network-Powered Broadband Communications Equipment and Cables

Network-powered broadband communications equipment and cables shall be listed and marked in accordance with 830.179(A) through (D).

Exception No. 1: This listing requirement shall not apply to community antenna television and radio distribution system coaxial cables that were installed prior to January 1, 2000, in accordance with Article 820 and are used for low-power network-powered broadband communications circuits.

Exception No. 2: Substitute cables for network-powered broadband communications cables shall be permitted as shown in Table 830.154.

(A) General Requirements

The general requirements in 800.179 shall apply.

(B) Network-Powered Broadband Communications Medium-Power Cables

Network-powered broadband communications medium-power cables shall be factory-assembled cables consisting of a jacketed coaxial cable, a jacketed combination of coaxial cable and multiple individual conductors, or a jacketed combination of an optical fiber cable and multiple individual conductors. The insulation for the individual conductors shall be rated for 300 volts minimum. Cables intended for outdoor use shall be listed as suitable for the application. Cables shall be marked in accordance with 310.8. Type BMU cables shall be jacketed and listed as being suitable for outdoor underground use.

(C) Network-Powered Broadband Communication Low-Power Cables

Network-powered broadband communications low-power cables shall be factory-assembled cables consisting of a jacketed coaxial cable, a jacketed combination of coaxial cable and multiple individual conductors, or a jacketed combination of an optical fiber cable and multiple individual conductors. The insulation for the individual conductors shall be rated for 300 volts minimum. Cables intended for outdoor use shall be listed as suitable for the application. Cables shall be marked in accordance with 310.8. Type BLU cables shall be jacketed and listed as being suitable for outdoor underground use.

(D) Optional Markings

Cables shall be permitted to be surface marked to indicate special characteristics of the cable materials.

Informational Note: These markings can include, but are not limited to, markings for limited-smoke, halogen-free, low-smoke halogen-free, and sunlight resistance.

Article 840 Premises-Powered Broadband Communications Systems

Part I General

840.1 Scope

This article covers premises-powered broadband communications systems.

Informational Note: A typical basic system configuration consists of an optical fiber, twisted pair, or coaxial cable to the premises supplying a broadband signal to a network terminal that converts the broadband signal into component electrical signals, such as traditional telephone, video, high-speed Internet, and interactive services. Powering for the network terminal and network devices is typically accomplished through a premises power supply that might be built into the network terminal or provided as a separate unit. In order to provide communications in the event of a power interruption, a battery backup unit or an uninterruptible power supply (UPS) is typically part of the powering system.

840.2 Definitions

The definitions in 805.2 and 820.2 shall apply. The definitions in this section shall apply only within Article 840.

Broadband. Wide bandwidth data transmission that transports multiple signals, protocols, and traffic types over various media types.

Network Terminal. A device that converts network-provided signals (optical, electrical, or wireless) into component signals, including voice, audio, video, data, wireless, optical, and interactive services, and is considered a network device on the premises that is connected to a communications service provider and is powered at the premises.

Premises Communications Circuit. The circuit that extends voice, audio, video, data, interactive services, telegraph (except radio), and outside wiring for fire alarm and burglar alarm from the service provider's network terminal to the customer's communications equipment up to and including terminal equipment, such as a telephone, a fax machine, or an answering machine.

Premises Community Antenna Television (CATV) Circuit. The circuit that extends community antenna television (CATV) systems for audio, video, data, and interactive services from the service provider's network terminal to the appropriate customer equipment.

Premises-Powered. Using power provided locally from the premises.

840.3 Other Articles

Circuits and equipment shall comply with 840.3(A) through (C).

(A) General Requirements

The general requirements of Article 800 shall apply.

(B) Output Circuits

As appropriate for the services provided, the output circuits derived from the network terminal shall comply with the requirements of the following:

Installations of communications circuits — Part IV of Article 805

Installations of premises (within buildings) community antenna television and radio distribution circuits — Part V of Article 820

Installations of optical fiber cables — Part V of Article 770

Installations of Class 2 and Class 3 circuits — Part III of Article 725

Informational Note: See 725.121 for information on the classification of information technology equipment circuits.

Installations of power-limited fire alarm circuits — Part III of Article 760

(C) Electrical Classification of Data Circuits and Cables

Sections 725.139(D)(1) and 805.133(A)(1)(b) shall apply to the electrical classification of Class 2 and Class 3 circuits in the same cable with communications circuits.

840.24 Mechanical Execution of Work

The requirements of 770.24 and 800.24 shall apply.

840.25 Abandoned Cables

The requirements of 770.25 and 800.25 shall apply.

840.26 Spread of Fire or Products of Combustion

The requirements of 770.26 and 800.26 shall apply.

Part II Cables Outside and Entering Buildings

840.47 Underground Wires and Cables Entering Buildings

Underground wires and cables entering buildings shall comply with 840.47(A) through (C).

(A) Optical Fiber Cables

(1) Class 1 or Non—Power-Limited Fire Alarm Circuits

Underground conductive optical fiber cables entering buildings with electric light, power, Class 1, or non—power-limited fire alarm circuit conductors in a raceway, handhole enclosure, or manhole shall be located in a section separated from such conductors by means of brick, concrete, or tile partitions or by means of a suitable barrier.

(2) Direct-Buried Cables

Direct-buried conductive optical fiber cables shall be separated by at least 300 mm (12 in.) from conductors of any electric light, power, or non-power-limited fire alarm circuit conductors or Class 1 circuit.

Exception No. 1: Separation shall not be required where the electric service conductors are installed in raceways or have metal cable armor.

Exception No. 2: Separation shall not be required where the electric light or power branch-circuit or feeder conductors, non-power-limited fire alarm circuit conductors, or Class 1 circuit conductors are installed in a raceway or in metal-sheathed, metal-clad, or Type UF or Type USE cables.

(3) Mechanical Protection

Direct-buried cable, conduit, or other raceway shall be installed to have a minimum cover of 150 mm (6 in.).

(B) Communications Wires and Cables

Installations of communications wires and multipair communications cables shall comply with 805.47.

(C) Coaxial Cables

Installations of coaxial cables shall comply with 820.47.

840.48 Unlisted Wires and Cables Entering Buildings

Installations of unlisted cables entering buildings shall comply with 840.48(A), (B), or (C), as applicable.

(A) Optical Fiber Cables

Installations of unlisted optical fiber cables entering buildings shall comply with 770.48.

(B) Communications Wires and Cables

Installations of unlisted communications wires and unlisted multipair communications cables entering buildings shall comply with 805.48.

(C) Coaxial Cables

Installations of unlisted coaxial cables entering buildings shall comply with 820.48.

Part III Protection

840.90 Protective Devices

The requirements of 805.90 shall apply.

840.93 Grounding or Interruption

Non—current-carrying metallic members of optical fiber cables, communications cables, or coaxial cables entering buildings or attaching to buildings shall comply with 840.93(A), (B), or (C), respectively.

(A) Non—Current-Carrying Metallic Members of Optical Fiber Cables

Non—current-carrying metallic members of optical fiber cables entering a building or terminating on the outside of a building shall comply with 770.93(A) or (B).

(B) Communications Cables

The grounding or interruption of the metallic sheath of communications cable shall comply with 805.93.

(C) Coaxial Cables

Where the network terminal is installed inside or outside of the building, with coaxial cables terminating at the network terminal, and is either entering, exiting, or attached to the outside of the building, 820.93 shall apply.

840.94 Premises Circuits Leaving the Building

Where circuits leave the building to power equipment remote to the building or outside the exterior zone of protection defined by a 46 m (150 ft) radius rolling sphere, 805.90 and 805.93 shall apply.

Informational Note: See NFPA 780-2017, Standard for the Installation of Lightning Protection Systems, for the theory of the term rolling sphere.

Part IV Grounding Methods

840.101 Premises Circuits Not Leaving the Building

Where the network terminal is served by a nonconductive optical fiber cable, or where any non—current-carrying metallic member of a conductive optical fiber cable is interrupted by an insulating joint or equivalent device, and circuits that terminate at the network terminal are completely contained within the building (i.e., they do not exit the building), 840.101(A), (B), or (C) shall apply, as applicable.

(A) Coaxial Cable Shield Grounding

The shield of coaxial cable shall be grounded by one of the following:

Any of the methods described in 820.100 or 800.106

A fixed connection to an equipment grounding conductor as described in 250.118

Connection to the network terminal grounding terminal provided that the terminal is connected to ground by one of the methods described in 820.100 or 800.106, or to an equipment grounding conductor through a listed grounding device that will retain the ground connection if the network terminal is unplugged

(B) Communications Circuit Grounding

Communications circuits shall not be required to be grounded.

(C) Network Terminal Grounding

The network terminal shall not be required to be grounded unless required by its listing. If the coaxial cable shield is separately grounded as described in 840.101(A)(1) or 840.101(A)(2), the use of a cord and plug for the connection to the network terminal grounding connection shall be permitted.

Informational Note: Where required to be grounded, a listed device that extends the equipment grounding conductor from the receptacle to the network terminal equipment grounding terminal is permitted. Sizing of the extended equipment grounding conductor is covered in Table 250.122.

840.102 Premises Circuits Leaving the Building

Where circuits leave the building to power equipment remote to the building or outside the exterior zone of protection defined by a 46 m (150 ft) radius rolling sphere, the installation of communications wires and cables shall comply with 800.100 and 800.106, and the installation of coaxial cables shall comply with 820.100 and 800.106.

Informational Note: See NFPA 780-2017, Standard for the Installation of Lightning Protection Systems, for the application of the term rolling sphere.

Part V Installation Methods Within Buildings

840.133 Installation of Optical Fibers and Electrical Conductors

The requirements of 770.133 shall apply.

Part VI Premises Powering of Communications Equipment Over Communications Cables

840.160 Powering Circuits

Communications cables listed in accordance with 805.179, in addition to carrying the communications circuit, shall also be permitted to carry circuits for powering communications equipment listed in accordance with 805.170. The power source shall be listed in accordance with 840.170(G). Installation of the listed 4-pair communications cables for a communications circuit or installation where 4-pair communications cables are substituted for Class 2 and Class 3 cables in accordance with 725.154(A) shall comply with 725.144.

Exception: Installing communications cables in compliance with 725.144 shall not be required for listed 4-pair communications cables where the rated current of the power source does not exceed 0.3 amperes in any conductor 24 AWG or larger.

Informational Note: A typical communications cable for this application is a 4-pair cable sometimes referred to as Category 5e (or higher) LAN cable or balanced twisted pair cable. These types of cables are often used to provide Ethernet- and Power over Ethernet (PoE)-type services. A large number of such powering cables bundled together can cause overheating of the wiring if not controlled as described in Table 725.144.

Part VII Listing Requirements

840.170 Equipment and Cables

Premises-powered broadband communications systems equipment and cables shall comply with 840.170(A) through (H).

(A) Network Terminal

The network terminal and applicable grounding means shall be listed for application with premises-powered broadband communications systems.

Informational Note No. 1: One way to determine applicable requirements is to refer to ANSI/UL 60950-1-2014, Standard for Safety of Information Technology Equipment; ANSI/UL 498A-2015, Current Taps and Adapters; ANSI/UL 467-2013, Grounding and Bonding Equipment; or ANSI/UL 62368-1-2014, Audio/Video, Information and Communication Technology Equipment — Part 1: Safety Requirements.

Informational Note No. 2: There are no requirements on the network terminal and its grounding methodologies except for those covered by the listing of the product.

(B) Optical Fiber Cables

Optical fiber cables shall be listed in accordance with 770.179(A) through (D) and shall be marked in accordance with Table 770.179.

(C) Communications Equipment

Communications equipment shall be listed in accordance with 805.170.

(D) Cable Routing Assemblies and Communications Raceways

Cable routing assemblies and communications raceways shall be listed in accordance with 800.182.

(E) Premises Communications Wires and Cables

Communications wires and cable shall be listed and marked in accordance with 805.179.

(F) Premises Community Antenna Television (CATV) Circuits

Premises community antenna television (CATV) coaxial cables connecting to the network terminal shall be listed in accordance with 820.179. Applicable grounding means shall be listed for application with premises-powered broadband communications systems.

(G) Power Source

The power source for circuits intended to provide power over communications cables to remote equipment shall be limited in accordance with Table 11(B) in Chapter 9 for voltage sources up to 60 V dc and be listed as specified in either of the following:

A power source shall be listed as specified in 725.121(A)(1), (A)(2), (A)(3), or (A)(4). The power sources shall not have the output connections paralleled or otherwise interconnected unless listed for such interconnection.

A power source shall be listed as communications equipment for limited-power circuits.

Informational Note: One way to determine applicable requirements is to refer to ANSI/UL 60950-1-2014, Standard for Safety of Information Technology Equipment-Safety — Part 1; or ANSI/UL 62368-1-2014, Audio/Video, Information and Communication Technology Equipment — Part 1: Safety Requirements. Typically, such circuits are used to interconnect equipment for the purpose of exchanging information (data).

(H) Accessory Equipment

Communications accessory equipment and/or assemblies shall be listed for application with premises-powered communications systems.

Informational Note: One way to determine applicable requirements is to refer to ANSI/UL 1863-2004, Communications-Circuit Accessories.