installation location dictates the type of cable permitted within the raceway or assembly as summarized in Table 800.154(a).

A raceway marked "plenum" on its surface or on a marker tape is suitable for use in ducts, plenums, or other spaces used for environmental air in accordance with 800.154. A "plenum" raceway is also suitable for installation in risers, for general-purpose use, and for dwellings.

A raceway or routing assembly marked "riser" on its surface or on a marker tape is suitable for installation in risers in accordance with 800.154. A "riser" raceway or routing assembly is also suitable for general-purpose use and for dwellings.

A raceway or routing assembly marked as "general purpose" is suitable for installation in general-purpose areas in accordance with 800.154 and for dwellings.

ARTICLE
805 Communications Circuits

Part I. General

805.1 Scope. This article covers communications circuits and equipment.

Article 805 contains the requirements that are unique within Chapter 8 for communications circuits. In previous editions of the *NEC*®, these requirements could be found in Article 800, which now contains requirements that apply generally across all of Chapter 8.

Although information technology equipment systems often are used for or with communications systems, Article 805 does not cover wiring of that equipment.

See also

Article 645, which provides requirements for wiring contained solely within an information technology equipment room

Article 722, which provides general wiring requirements that extend beyond a computer room and for wiring of local area networks within buildings

Article 760, which covers wiring requirements for fire alarm systems

• **805.18 Installation of Equipment.** Equipment electrically connected to a communications network shall be listed in accordance with 800.171.

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 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.

• **805.50 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 metal 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.

Δ **(C) Entering Buildings.**

N **(1) Installed Inside Buildings.** If 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.

Exception: The insulating bushing shall not be required if the entering communications wires and cables meet one or more of the following conditions:

(1) Is a metal-sheathed cable
(2) Pass through masonry
(3) Meet the requirements of 805.50(A) and fuses are omitted in accordance with 805.90(A)(1)
(4) Meet the requirements of 805.50(A) and are used to extend circuits to a building from a cable having a grounded metal sheath

N **(2) Orientation of Raceways or Bushings.** 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.

N **(3) Service Head.** 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:

(1) Circuits in large metropolitan areas where buildings are close together and sufficiently high to intercept lightning.
(2) 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.
(3) 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.

Telephone utility companies ordinarily provide primary protectors if telephone lines are exposed to lightning. Installers of private networks that include interbuilding cable should also install primary protectors where cables are exposed to lightning. A primary protector is required at each end of an interbuilding communications circuit where lightning exposure exists. See Exhibit 805.1 for an example of a primary protector unit typically installed in commercial buildings.

Informational Note No. 3: See NFPA 780-2020, *Standard for the Installation of Lightning Protection Systems*, for information on lightning protection systems.

Δ **(1) Fuseless Primary Protectors.** Fuseless-type primary protectors shall be permitted under any of the following conditions:

(1) 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
(2) 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
(3) 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 (a) 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 (b) 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
(4) 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

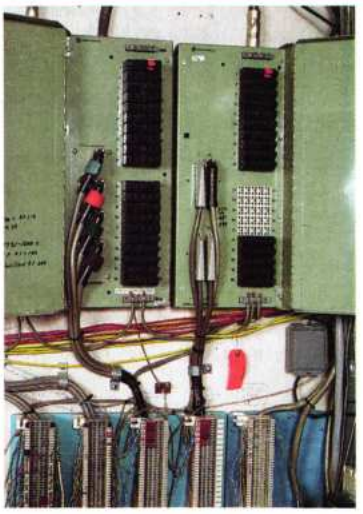

EXHIBIT 805.1 A primary protector unit installed in a commercial building that is the interface to the outside plant cable.

contact with electric light or power conductors operating at greater than 300 volts to ground

(5) 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 (a) 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 (b) 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: See ANSI/IEEE C2-2017, *National Electrical Safety Code*, Section 9, for examples 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

805.154 Substitutions for Listed Communications Cables. 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

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.

The location of the communications outlet within a dwelling is not specified, but cable must be installed between the outlet location and the point at which the communications services provider installs its equipment or the point at which it connects to owner-supplied equipment. Although an increasing number of dwelling unit owners or occupants use cellular or personal communications services (PCS) telephones exclusively, having at least one wired communications outlet in every dwelling facilitates connection of dial-up devices used in home fire detection and security systems.

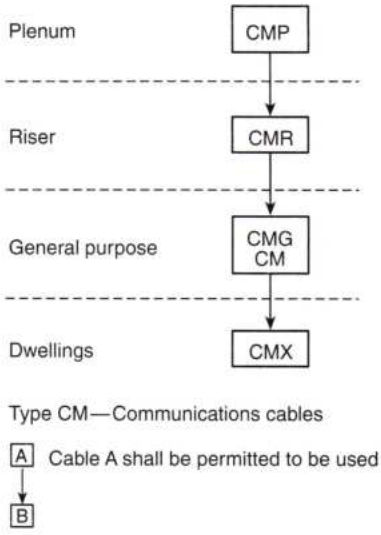

FIGURE 805.154 Cable Substitution Hierarchy.

Part V. Listing Requirements

Δ **805.170 Protectors.** Protectors shall be listed in accordance with 805.170(A) or 805.170(B).

(A) Primary Protectors. The primary protector shall be listed and 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: See ANSI/UL 497-2017, *Standard for Protectors for Paired Conductor Communications Circuits*, to determine applicable requirements for a listed primary protector.

(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: See ANSI/UL 497A-2019, *Standard for Secondary Protectors for Communications Circuits*, to determine applicable requirements for a listed secondary protector.

• **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). •

ARTICLE 810

Antenna Systems

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.

Article 810 covers wiring requirements for television and radio receiving equipment, specifically including digital satellite receiving equipment for television signals and wiring for amateur radio equipment and citizens band (CB) radio equipment. Chapters 1 through 4 cover wiring to the power supply.

• Δ **810.3 Other Articles.** Wiring from the source of power to and between devices connected to the interior wiring system shall comply with the following:

(1) Chapters 1 through 4 other than as modified by Parts I and II of Article 640.
(2) Coaxial cables that connect antennas to equipment shall comply with the appropriate article of Chapter 8.
(3) Wiring and equipment installed in hazardous (classified) locations shall comply with the appropriate requirements in Chapter 5.

810.4 Community Television Antenna. The installation of the antenna shall comply with this article. The installation of the distribution system shall comply with the appropriate article of Chapter 8.

810.5 Radio Noise Suppression. 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. If 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: See UL 497E, *Outline of Investigation for Protectors for Antenna Lead-In Conductors*, for information concerning protectors for antenna lead-in conductors.

810.7 Grounding Devices. If bonding or grounding is required, devices used to connect a shield, a sheath, non-current-carrying metal 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 if 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.

One of the leading causes of electric shock and electrocution, according to statistical reports, is the accidental contact of antennas, ladders, and other equipment with overhead light or power conductors. Extreme caution should be exercised during installation. Antennas should be visually inspected periodically to ensure that they continue to be safe from exposure to overhead 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 and be suitable for the conditions of use and location in compliance with 110.14(A) and (B).

Δ **810.15 Grounding or Bonding.** Masts and metal structures supporting antennas shall be grounded or bonded 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 NFPA 780-2020, *Standard for the Installation of Lightning Protection Systems*, 4.7.3.1, 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*

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

Δ **(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, if 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: The separation and clearance requirements shall not apply if 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. See NFPA 780-2020, *Standard for the Installation of Lightning Protection Systems*, for 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: See NFPA 780-2020, *Standard for the Installation of Lighting Protection Systems*, for information on bonding or separation of metal raceways, enclosures, frames, and other non-current-carrying metal parts of electrical equipment installed on a building equipped with a lightning protection system. 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.

Δ **(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 unless one of the following conditions applies:

(1) The other conductors are in metal raceways or cable armor.
(2) The indoor antennas and indoor lead-ins are permanently separated from such other conductors by a continuous firmly fixed nonconductor.

(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 if separated from such other conductors by an effective permanently installed barrier.

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

The connecting device is usually a small, fixed capacitor connecting the antenna terminal of the receiver and one wire of the supply circuit. As is the case with most receivers, the capacitor should be designed for operation at not less than 300 volts. This voltage rating ensures a high degree of safety and minimizes the possibility of a breakdown in the capacitor, thereby avoiding a short circuit to ground through the antenna coil of the set.

810.20 Antenna Discharge Units — Receiving Stations.

Δ **(A) General Requirement.** Each lead-in conductor from an outdoor antenna shall be provided with a listed antenna discharge unit.

Exception: A separate antenna discharge unit is not required if the lead-in conductors are enclosed in a continuous metal shield that complies with one of the following:

(1) Is grounded or bonded with a conductor in accordance with 810.21
(2) Is protected by an antenna discharge unit

An antenna discharge unit (lightning arrester) is not required if the lead-in conductors are enclosed in a continuous metal shield, such as rigid metal conduit (RMC) or intermediate metal conduit (IMC), electrical metallic tubing, or any metal raceway or metal-shielded cable that is effectively grounded. A lightning discharge will take the path of lower impedance and jump from the lead-in conductors to the metal raceway or shield rather than take the path through the antenna coil of the receiver.

(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 accordance with 500.5 and 505.5.

(C) Grounding or Bonding. The antenna discharge unit shall be grounded or bonded 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 if subject to corrosive conditions or in direct contact with masonry or the earth or where subject to corrosive conditions. If 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.

Where metal raceways are used to enclose the grounding electrode conductor (GEC), a connection between the GEC and the metal conduit must be provided at both ends of the conduit to ensure an adequate low-impedance current path to ground.

See also

250.64(E), which covers raceways, cable armor, and enclosures for GECs

(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.

Δ **(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 one of the following:

(1) The building or structure grounding electrode system as covered in 250.50
(2) The power service accessible means external to the building, as covered in 250.94
(3) The nonflexible metal power service raceway
(4) The service equipment enclosure
(5) The grounding electrode conductor or the grounding electrode conductor metal enclosures of the power service
(6) 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

See also

250.52(A)(1) for more information on the use of a metal water piping system

250.68(C) for more information on connections to GEC connections

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 if separate electrodes are used.

Antenna masts must be bonded to the same grounding electrode used for the building's electrical system to ensure that all exposed, non–current-carrying metal parts are at the same potential. In many cases, masts are connected incorrectly to conveniently located vent pipes, metal gutters, or downspouts. Such a connection could create potential differences between lead-in conductors and various metal parts located in or on buildings, resulting in possible shock and fire hazards. An underground gas piping system is not permitted to be used as a grounding electrode.

The use of separate radio/television grounding electrodes is not required. However, where they are provided, 810.21(J) requires the radio/television system grounding electrode to be connected, via a bonding jumper, to the grounding electrode of the electrical distribution system of the building or structure.

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

Δ *TABLE 810.52 Size of Outdoor Antenna Conductors*

Material	Minimum Size of Conductors (AWG) If Maximum Open Span Length Is	
	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: If the lead-in conductors are enclosed in a continuous metal shield that is grounded with a conductor in accordance with 810.58, they shall not be required to comply with these requirements. If grounded, the metal shield shall also be permitted to be used as a conductor.

The term *creepage distance*, as defined in NFPA 791, *Recommended Practice and Procedures for Unlabeled Electrical Equipment Evaluation*, is the shortest distance along the surface of the insulating material between two conductive parts. Creepage distance is measured from the conductor across the face of the supporting insulator to the building surface. Airgap distance is measured from the conductor (at its closest point) across the air space (not necessarily in a straight line) to the surface of the building.

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:

(1) Through a rigid, noncombustible, nonabsorbent insulating tube or bushing
(2) 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.)
(3) 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.

Δ **810.57 Antenna Discharge Units — Transmitting Stations.** Each lead-in conductor 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: If the lead-in conductor is protected by a continuous metal shield that is grounded with a conductor in accordance with 810.58, an antenna discharge unit or other suitable means shall not be required for the lead-in conductor.

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

If an antenna discharge unit is not installed at a transmitting station, protection against lightning can be provided by a switch that connects the lead-in conductors to ground during the times the station is not in operation.

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

Δ **810.70 Separation 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 unless one of the following conditions applies:

(1) The conductors of a permanent audio system are installed in compliance with Parts I and II of Article 640.
(2) The conductors of portable and temporary audio systems are installed in compliance with Parts I and III of Article 640.
(3) The conductors are separated from such other conductors by a continuous and firmly fixed nonconductor.