TABLE 830.154 Cable Substitutions

Cable Type	Permitted Cable Substitutions
BM	BMR
BLP	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. The radius of the curve of the inner edge of any bend shall not be less than 10 times the diameter of the cable.

Informational Note: See ANSI/TIA-568.0-E *Generic Telecommunications Cabling for Customer Premises*, for information on bend radii of network broadband cable during different types of installation conditions.

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 (C).

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.

An insulation rating of 300 volts is necessary for the following reasons:

1. This rating coordinates with protector installation requirements.
2. Primary protectors are designed to allow voltages below 300 to pass.
3. Network-powered broadband communications circuits typically operate in a voltage range up to 150 volts root-mean square (rms).

(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.

ARTICLE 840 Premises-Powered Broadband Communications Systems

Part I. General

Δ **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 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.

Although similar to Article 830, which addresses network-powered broadband communications systems, Article 840 covers premises-powered broadband communications systems.

Premises-powered broadband communications systems provide a wide array of subscriber services, including voice, video, data (such as Internet access), and interactive services, through an optical network terminal (ONT).

Article 840 contains requirements for wiring both the inside and the outside of buildings. Other articles cover the wiring derived from the ONT into the premises.

See also

Article 725, which covers wiring of Class 2 and Class 3 circuits

Article 760, which covers the wiring of fire alarm systems

Article 770, which covers the installation of optical fiber cables

Article 800, which covers general requirements for all communications systems

Article 820, which covers coaxial cable installations for television signals

Part II. Cables Outside and Entering Buildings

840.47 Underground Wires and Cables Entering Buildings. Direct-buried cables shall be installed to have a minimum cover of 150 mm (6 in.).

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 780-2020, *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. If the network terminal is served by a nonconductive optical fiber cable, or where any non-current-carrying metal 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:

(1) Any of the methods described in 820.100 or 800.106
(2) A fixed connection to an equipment grounding conductor as described in 250.118
(3) 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

The coaxial shield is permitted to be grounded through the optical network terminal (ONT) if the ONT grounding connection is permanent or the connection is to an equipment grounding conductor (EGC) through a listed grounding device that will retain the grounding connection if the ONT 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: If 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. If 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 780-2020, *Standard for the Installation of Lightning Protection Systems*, for the application of the term *rolling sphere*.

Part VI. Premises Powering of Communications Equipment over Communications Cables

Δ **840.160 Powering Circuits.** Listed communications cables, in addition to carrying the communications circuit, shall also be permitted to carry circuits for powering listed communications equipment. The power source shall be listed in accordance with 840.170(C). 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 722.135(E) 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 No. 1: 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.

Informational Note No. 2: See 725.144 for requirements to manage the temperature rise of bundles of cables that provide power.

Power over Ethernet (PoE) systems are allowed to provide power to communications equipment via the communications cable. As more power is delivered to the equipment, overheating the cables becomes more of a concern. Therefore, how the cables are bundled together must be monitored and accounted for. Cables are required to comply with 725.144 for communications cables used as Class 2 and Class 3 cables. Table 725.144 contains ampacity values for various conductor sizes with respect to the number of cables within a given bundle. This requirement does not apply when the power source limits the current imposed on a conductor to less than 0.3 ampere when the conductor is 24 AWG or larger.

Part VII. Listing Requirements

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

(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: See 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) Premises Communications Wires and Cables. Communications wires and cables shall be listed and marked in accordance with 800.179.

(C) 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 volts dc and be listed as specified in either of the following:

(1) A power source shall be listed as specified in 725.60(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.
(2) A power source shall be listed as communications equipment for limited-power circuits.

Informational Note: See 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).

(D) Accessory Equipment. Communications accessory equipment and/or assemblies shall be listed for application with premises-powered communications systems.

Informational Note: See ANSI/UL 1863-2004, *Communications-Circuit Accessories*.