

Types of Cabling Used in Cable Tray

The purpose of this report is to discuss the types of cables that can be used in cable trays. Since the purpose of cable trays is to support, route, protect, and provide a pathway for cable systems, this is an important issue. It is important to understand and properly apply the cables. Cables and cable trays are part of the cable management system. Cable tray cables are quality products and have withstood the rigors of severe environments. They are protected by either a metal or plastic armor jacket over individual conductor insulations. They can be rated for outdoors, indoors, corrosive areas, hazardous locations, high electrical noise and vibration areas. They should be U.L. listed and generally marked as cable tray rated. They are tested for flammability and other mechanical and temperature tests that allow them to be U.L. listed. Many cable tray cables include a crush test as part of the listing and are rated to leave the cable tray unsupported for distances up to six feet. Communication cables in particular are marked to be applied in certain building areas based on fire propagation properties and testing.

The types of wiring methods permitted in cable trays are listed in NEC section 318-3 along with the corresponding NEC article that describes the conditions of use for that particular type of cable. Cables should be applied according to the environment they are located, for instance, hazardous areas, plenums, outdoor (sunlight rated), indoor, corrosive areas, etc.

Cable tray rated cables are available for any application and any environment, for instance, Tray Cable (type TC) can be used in Class I, division 2 locations, MI cable can be used where fire protection is required and communication cables can be used for computer signal systems.

There are more than one type of cable for many applications, for instance, TC and MC can be used for 600-volt motor power cables. Single conductor cables

can only be used in sizes 1/0 or larger in industrial facilities only where conditions of maintenance and supervision ensure that only qualified persons will service the installed system. Single conductor cables cannot be used in solid bottom cable trays.

The most frequently used tray cables are:

1. Tray Cable – type TC
2. Power Limited Tray Cable – type PLTC
3. Metal Clad cables – type MC
4. Mineral Insulated Cables – type MI
5. Optical Fiber Cables – types OFN thru OPC – table 770-50
6. Multipurpose and Communication Cables – types CMX, CM, CMG, CMR, CMP, MP, MPG, MPR, MPP
7. Fire Alarm Cables – type NPLF and NPLR

Cable tray cables can be plastic jacketed (for instance type TC) or provided with metal armor (for instance type MC). Cables with metal armor can be applied more liberally than plastic jacketed cables. However, plastic jacketed cables, for instance type TC, are lower cost, easier to install and have an excellent record for durability in every adverse environment.

Power cables can be supplied with or without equipment-grounding conductors. This design provides a low impedance ground fault circuit and is standard practice for many companies.

Users should check cable manufacturer's specifications to verify that they meet environmental, circuit, and NEC requirements.

1. Type TC – Tray Cable – NEC Article 340 – U.L. Standard 1277 tray cable has been used in industry for over thirty years. It is easy to install and durable. This type of cable is rated for 600-volts

and can be used for power and instrumental circuits. It is available for cable tray use, or conduit, direct burial, or supported or a messenger wire. It can be used in division 2 hazardous locations and as open cabling where the cable is listed and marked as such. TC cable marked as open cabling can be used as open wiring in lengths not to exceed fifty feet between the cable tray and the device or equipment. The cable shall be secured and supported at intervals less than six feet. Note these distances are limits not design goals. Lengths of open cable, flexible conduit, cords, or other wiring that is not protected by an enclosure or conduit should be kept to a minimum. Chemical industry experience with open wiring is excellent because the open cabling is kept to a minimum only that which is necessary, and is protected against mechanical damage by equipment or location or both. Tray cables are listed per U.L. 1277 as flame retardant which means the cable tray vertical flame test to minimize flame propagation if the cable tray would be exposed to fire.

2. PLTC / ITC – These types of cables are instrumentation cables and are available in single pair or multiple pair cables, shielded. They have 300-volt insulation rating and are available in sizes down to #18 and lower. PLTC cable is covered in NEC sections 725-61© and 725-71 (e) and listed per U.L. standard 13. Application of PLTC requires the power supply listing requirements of article 725. To avoid this complication, the industrial users added a new type of cable, type ITC, Instrumental Tray Cable, which is described in article 727 and does not have the limitations of article 725. Type ITC is listed per U.L. standard 2250 and is well suited to cable tray installation. Both types of cables should be separated from 600-volt power cabling. This can be accomplished by a barrier in the cable tray or other means. The NEC does not generally require that PLTC and ITC is separated for power wiring if the PLTC and ITC cable is supplied with a metal armor. However, separation is still desirable to avoid cross talk noise problems.
 3. Optical Fiber Cables – NEC Article 770 – U.L. 1651 – There is no equivalent “tray rating” for optical fiber cables. Any listed optical fiber cable is acceptable for cable tray application for any type of cable tray. See NEC table 770-50. They include cables marked OFNP, OFCP, OFNR, OFCR, OFNG, OFCG, OFN, and OFC. The last letter in the cable designates the NEC building fire rating. For instance, P denotes plenum rating, the most severe, while R denotes riser. This rating depends on a particular U.L. flame test. General purpose cables (or G) cannot be installed in a cable tray in a plenum area. If the installation is exposed to sunlight, the cable should be so rated, typically a U-V resistant sheath. Cable tray fill requirements for fiber optic cables is not specifically addressed in article 318. Please consult the cable manufacturer. The issue is mechanical damage to the fiber optic cable. Non-conductive optical fiber cables can occupy the same cable tray or raceway with conductors for electrical light, and other power circuits, conductive optical fibers cannot.
 4. Mineral Insulated or MI Cable (NEC Article 330) – This cable consists of copper conductors in magnesium oxide insulation with an overall liquid and gas tight continuous copper or stainless steel sheath. It can also be provided with an overall PVC jacket for corrosion protection. The mineral insulation provides the cable with a very high temperature rating. This cable has a very high temperature rating, is very durable, and can be used in very severe applications where other cables cannot be used. It can be used in division one hazardous locations. Its tight construction prevents the transmission of gases, pressure, or flames. Therefore, it could eliminate the need for explosion seals. It has a two-hour fire rating for critical emergency service and can be used as plenum cabling without an overall non-metallic jacket.
 5. Type MC Cable (NEC Article 334) – U.L. standard 1569 Type MC consists of conductors in a metallic cover of a smooth or corrugated metal tube or an interlocking metal tape. A plastic overall jacket can also be provided. The cable construction provides excellent mechanical protection. MC cable without a plastic cover but with an impervious metal sheath can be used as plenum cabling. MC cable is also acceptable in division 2 locations and a special construction MC is listed for division 1 locations. MC cable is used for power and instrumentation circuits.
 6. Multi-Purpose and Communication Cables – NEC Article 800 and Fire Alarm Cables Article 770 – These cables are marked with a letter indicating their building fire rating, R for Riser, P for Plenum. The same as optical fiber cable. They must be used in the proper area for the fire rating.
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