

Tray Cable Type TC

General

Tray cable, Type TC is an approved wiring method in the NEC found in article 336. It is an efficient method of installing feeders, branch circuits and control cable because multiple runs of tray cable can be installed in one cable support system (i.e. cable tray) rather than multiple conduit runs, which adds to labor and material cost.

Description

Tray cable is a factory assembly of two or more insulated conductors with or without an associated equipment ground conductor under a non-metallic jacket. For feeder and branch circuits, tray cable can be manufactured with any of the insulation types found in NEC 310.4 (A) or (B). Depending on the insulation used, tray cable will have either 600, 1000 or 2000 volt rating.

Metallic shields are allowed over groups of conductors or under the outer jacket or both. Metallic sheaths or armor is not allowed under or over the non-metallic jacket, doing so would make the cable type MC cable.

Use/Locations

Type TC cable can be used for a variety of applications such as, power, lighting, control, signal circuits, class 1 circuits and non-power limited fire alarm circuits.

Tray cable cannot be installed where it is subject to physical damage and must be installed in a cable tray with exceptions. Sections of the tray can have up to one foot breaks or separations without the need of adding protection to the cable in these areas.

TC Cable can also be installed in raceways, outdoor locations supported by a messenger wire, between cable tray and utilization equipment or devices (under certain conditions), in wet locations provided the jacket is resistant to moisture and corrosive agents, direct buried if identified for such use, in sunlight if jacket is marked sunlight resistant, in hazardous locations depending on application and cable type and in one and two family dwellings (under certain conditions).



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Types

There are four different types of tray cable, TC, TC-ER, TC-ER-HL and TC-ER-JP. Each one differs slightly based on the testing it passed and where it can be installed.

Type TC

Type TC is a standard tray cable that must be installed in cable tray, conduit or supported by a messenger wire outdoors.

Type TC-ER

Type TC-ER cable has passed the same crush and impact requirements as MC Cable. Tray cable marked ER (exposed run) allows the cable to leave the cable tray and terminate in utilization equipment or devices under certain conditions.

Exposed Run Conditions

- The cable is type TC-ER
- The cable is installed in industrial establishments where only qualified persons service the installations
- The cable is continuously supported and protected against physical damage by using struts, angles or channels
- The cable must be secured every six feet
- The equipment grounding conductor must be inside the cable assembly. Cables with conductors six awg and smaller can use an insulated conductor(s) in the assembly as the equipment ground but must be re-identified per NEC 250.119(B)

Exception for Exposed Run

When the cable is not subject to physical damage between cable trays and between cable trays and utilization equipment, the cable does not need to be continuously supported, protected or secured for a maximum distance six feet. The cable is required to be secured as it leaves the cable tray. See NEC 336.10 Exception to (7)

This is the only time TC-ER cable can be out of a tray or not continuously supported by a mechanical means, even if the cable is secured at six foot intervals.

Type TC and TC-ER cables are permitted in hazardous locations under certain conditions. The cable must be terminated with the appropriate fitting for the location, equipment grounding conductor in addition to a drain wire that may be present and cable support systems used. These cables can be installed in Class I- Division 2, Class II-Division 2, Class III-Division 1 and 2. See NEC 501.10 (A), 502.10 (B) and 503.10 (A)



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Type TC-ER-HL

Type TC-ER-HL cable is a tray cable that has passed an impact test at low temperatures, mechanical damage-impact test, crush test and a flame test. TC-ER-HL can be installed in Class I- Division 1 and Class II-Division 1 locations, including where flexible connections are necessary, when installed under certain conditions.

TC-ER-HL cable must meet certain construction requirements for Hazardous Location installations such as;

- The outer jacket is suitable for the environment it is installed
- The overall cable cross section is round (For better seal of cable connectors)
- The overall nonmetallic jacket is continuous and gas/vapor tight
- For cables larger than one inch in diameter, the equipment grounding conductor is bare and there must be a metallic shield between the conductors and the outer jacket

See NEC 336.130

Along with the construction requirements above, the installation must be in an industrial establishment with restricted public access and only qualified persons service the installation. The circuits are limited to 600 volts or less, the cables are not subject to physical damage, terminated with fittings listed for the location and when installed in ventilated trays or troughs, cable arrangement and spacing must be considered for dust buildup in Class II locations.

See NEC 501.10(A)(1)(6) and NEC 502.10(A)(1)(6)

Type TC-ER-JP

Type TC-ER-JP is a tray cable that has an additional rating “JP” or joist pull. This means that the cable can be pulled through holes bored in wood framing members without causing jacket damage from abrasion. This cable is primarily for generator power and control conductors in residential applications.

See NEC 336.10(9)



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Bending Radius for all Tray Cable Types

| Cable Sizes | Multiplier |
|--|---------------------------|
| Cables 1" or less in diameter | 4 times overall diameter |
| Cables larger than 1" but not more than 2" | 5 times overall diameter |
| Cables larger than 2" in diameter | 6 times overall diameter |
| Cables with metallic shielding | 12 times overall diameter |

Ampacity for all Tray Cable Types

| Installation Type | Conductor Size | NEC Articles |
|------------------------|------------------|--------------|
| Tray | 14 awg and above | 392.80(A) |
| Tray | 18 awg - 16 awg | 402.5 |
| Outside of Cable Trays | 18 awg and above | 310.14 |

References:

NFPA 70 - NEC 2020

UL 1277 - Tray Cables

UL 2225 - Standard for Cables and Cable Fittings for Use in Hazardous Locations