

## CABLES ALLOWED IN TRAY

Cable tray is one of the most common methods of supporting wire and cable. There are many different types of cable tray including basket, ladder and solid-bottom. Tray can be manufactured in various types of material including aluminum, steel and fiber and other nonmetallic materials. Cable tray allows for the clean organization and routing of cable and offers advantages over conduit because cables are easier to access for installation, repair, removal and future development.

### CABLE TRAY DEFINITION

Cable tray is classified by the NEC (NFPA 70 the National Electrical Code) as a support system and not as a raceway. Generally speaking raceway completely encloses the cable inside of it. This is a critical distinction because it means the requirements for the cable contained in raceway is different than cable supported by cable tray. Cable in tray is viewed as being exposed to a greater risk of mechanical damage and can be a potential ignition source or fuel load in a fire scenario.

### PERMITTED CABLE TYPES

Article 392 of the NEC provides the basic requirements for installations using cable tray. The respective article for the cable type must also be followed. Table 392.10 (see Table 1) lists the type of cable that is allowed to be installed in tray and the types of raceway that can be used. This table includes almost all common types of wire and cable found in the NEC.

Cable types that are not presented in the table include single-conductor building wire types such as THHN/THWN, XHHW and RHH/RHW. Article 392 does allow these types to be installed as power conductors if they are larger than 1/0 and marked for use in tray. Ground wires must be larger than 4 AWG but are not required to be marked.

Wiring Method	Article
Armored cable: Type AC	320
CATV cables	820
Class 2 and Class 3 cables	725
Communications cables	800
Communications raceways	725, 770, and 800
Electrical metallic tubing: Type EMT	358
Electrical nonmetallic tubing: Type ENT	362
Fire alarm cables	760
Flexible metal conduit: Type FMC	348
Flexible metallic tubing: Type FMT	360
Instrumentation tray cable: Type ITC	727
Intermediate metal conduit: Type IMC	342
Liquidtight flexible metal conduit: Type LFMC	350
Liquidtight flexible nonmetallic conduit: Type LFNC	356
Metal-clad cable: Type MC 330	330
Mineral-insulated, metal-sheathed cable: Type MI 332	332
Network-powered broadband communications cables	830
Nonmetallic-sheathed cable: Types NM, NMC, and NMS	334
Nonpower-limited fire alarm cable	760
Optical fiber cables	770
Other factory-assembled, multiconductor, control, signal or power cables that are specifically approved for installation in cable trays	
Power and control tray cable: Type TC	336
Power-limited fire alarm cable	760
Power-limited tray cable	725
Rigid metal conduit: Type RMC	344
Rigid polyvinyl chloride conduit: Type PVC	352
Reinforced thermosetting resin conduit: Type RTRC	255
Service-entrance cable: Types SE and USE	338
Underground feeder and branch-circuit cable: Type UF	340

Table 1: Table 392.10(A) Wiring Methods from Article 392 of the NEC

## FLAME TESTING REQUIREMENTS

The fire resistance is tested by using standardized flame tests. The most common flame test is UL 1685 *Vertical-Tray Fire-Propagation and Smoke-Release Test for Electrical and Optical-Fiber Cables*. This test involves loading multiple cables in a vertical section of cable tray and igniting the cable at the base of the tray. The cable passes the test if it does not propagate the fire. See Figure 1 for a diagram of the test. This same test is used to test single-conductor power cables 1/0AWG and larger for use in cable tray, tray cable (TC), power-limited tray cable (PLTC), instrumentation tray cable (ITC), and fire alarm (FPL), communication cables (CM) and fiber (OFN). Many end-users don't realize that 300 V cables and fiber cables are tested in the same fire test as large power cables and 600 V tray cable. Because of this finding, a cable with the proper fire rating is usually not an issue.

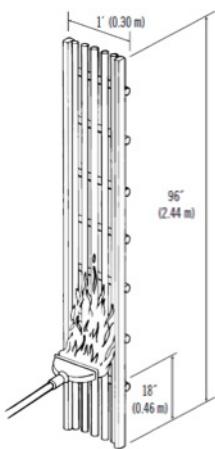


Figure 1 – Diagram of UL 1685 vertical tray flame test from the Anixter Technical Handbook.

## MECHANICAL TESTING REQUIREMENTS

The mechanical requirements for cables are found in the relevant product standards and are established by minimum required values for the tensile strength and elongation, both aged and unaged, of the jacket and insulation polymers and by things like crush and impact testing. For some applications, the minimum values allowed by the standards are not seen as sufficient. Often, in industrial applications, products are available that exceed the minimum requirements. Common examples include industrial Ethernet and industrial fiber cable.

## APPLICATION REQUIREMENTS

Depending on the cable tray type and cable, there are various requirements for spacing and loading cables per Article 392. These requirements are based on the allowable cable fill area in a cable tray.

There are also requirements that circuits of different voltage classes be separated in tray. For example, a common request is for a 600 V Category-rated cable. Due to issues with things such as connectors and electrical performance, a true 600 V cable does not exist, and it is often not the best solution from an overall design or cost basis. There are some products on the market that attempt to offer an alternative solution, but typically things such as metallic separators or raceways that don't cause secondary issues can be used instead.