

Flame Ratings According to the National Electric Code (Plenum, Riser, and FT-4/FT-6): Matching the Right Cables to the Application

What are Flame Ratings?

There are many variations in cabling installations. Areas where fiber optic, twisted pair and coaxial cables need to be installed may include risers, plenums, conduits, and an assortment of ducts, and modular furniture pathways - and the cabling in these areas should not contribute to spreading a fire. A cable installer or network planner must be aware of the flame ratings of the cables to be installed in these areas, and the National Electrical Code (NEC) specifies the listing requirement for cables for a particular installation.

- The term **plenum** refers to any space used as part of an air-handling system. This includes heating/air-conditioning ducts and air returns. The NEC requires that exposed cables (those not in conduit) in plenums have adequate fire- and smoke-resistant characteristics.
- The term **riser** refers to a vertical pathway or space between floors. Cables within risers must have adequate fire- and smoke-resistance in order to prevent the spread of fire between floors. The NEC requirements for riser-rated cables are not as stringent as those for plenum.
- A third category, called **general-use**, refers to cables that may be installed on a single floor (it cannot be used in riser or plenum applications).

While the National Electrical Code (NEC) establishes flame ratings for cables, Underwriter's Laboratories (UL) and the National Fire Protection Association (NFPA) develop procedures for testing cables. Cable designs are tested and re-tested regularly at qualified locations such as Underwriter's Laboratories (UL) and Intertek Testing Services, the organization that issues the ETL Listed Mark.

Regardless of whether the cabling is fiber optic, twisted pair, or coaxial, the one key factor in determining flame rating is the material that is used to protect the copper or fiber conductor. The jacket material serves as a protective covering from the environment and also adds to the overall flame retardant properties of the cable.

Plenum	Riser	General
NEC Communications Cable Code: CMP	NEC Communications Cable Code: CMR	NEC Communications Cable Code: CMG and CM
NFPA-262 flame test	UL-1666 flame test	UL-1685 (includes two types of flame tests: FT-4 for a CMG rating, and Vertical Tray for a CM rating)
Canadian Rating: FT-6		Canadian Rating: FT-4

There are several different sections of the NEC code that provide detailed requirements for communications cables. Requirements for copper communications cables are listed in Article 800, and fiber requirements are listed in Article 770. Requirements for coaxial cable are listed in Articles 800, 820, and 725. These sections also provide complete listings of permitted substitutions for the various cable types.

Cable Type (Listing Marks)	Use	Permitted Substitutions
Copper (CMP)	Plenum	CMP
Copper (CMR)	Riser	CMP
Copper (CMG/CM)	General	CMP, CMR, MPG, MP
Fiber (OFNP/OFCP)	Plenum	OFNP
Fiber (OFNR/OFCR)	Riser	OFNP, OFCP
Fiber (OFNG/OFCG)	General	OFNP, OFCP, OFNR, OFCR
Coaxial (CATVP)	Plenum	CMP*
Coaxial (CATVR)	Riser	CATVP, CMP*, CMR*
Coaxial (CATV)	General	CATVP, CMP*, CATVR, CMR*, CMG*, CM*

*Coax only

Flame Tests

Underwriter's Laboratories (UL) and the NFPA developed standard test methods for the characteristics described by the NEC. To receive a plenum, riser, or general-use flame rating, the different types of cables are tested and observed under strictly controlled conditions.

The **NFPA-262 flame test** serves as the standard for plenum-rated cables, formerly known as the UL-910 or Steiner Tunnel flame test. It provides the most stringent requirements of all the tests. Cables that pass this test receive the highest rating. The test is designed to simulate the conditions within heating/air-conditioning ducts and air returns. Drafting that might occur during a fire is simulated by a fan putting out a 240 ft/min draft. Smoke is measured by a photocell installed in the exhaust duct.

To qualify for a plenum rating, cables must have a flame spread of less than 5 feet beyond the ignition point using the NFPA-262 flame test. In 1999, the Canadian and U.S. codes were harmonized to equalize the Canadian FT-6 requirements and the NEC requirements for plenum cable.

The **UL-1666 flame test** simulates a vertical shaft, twelve feet high between the ignition point and the floor above. To qualify for a riser rating, cables must have a flame spread of less than 12 feet beyond the ignition point using the UL-1666 flame test.

The **UL-1685** defines two standard tests (which include FT-4/CMG and Vertical Tray/CM) that use vertical cable trays and an ignition point to measure the fire and smoke damage to the cable. In order to qualify for the FT-4/CMG general-use rating, the cable must not spread fire to the top of the tray and the damage length must be less than 4 feet, 11 inches. In order to qualify for the Vertical Tray/CM general-use rating, the cable must not spread fire to the top of the tray and the damage length must be less than 8 feet.

The UL-1685 test is sometimes referred to as the Vertical Tray flame test. FT-4 refers to a rating that is between CMR Riser and CM general-use.



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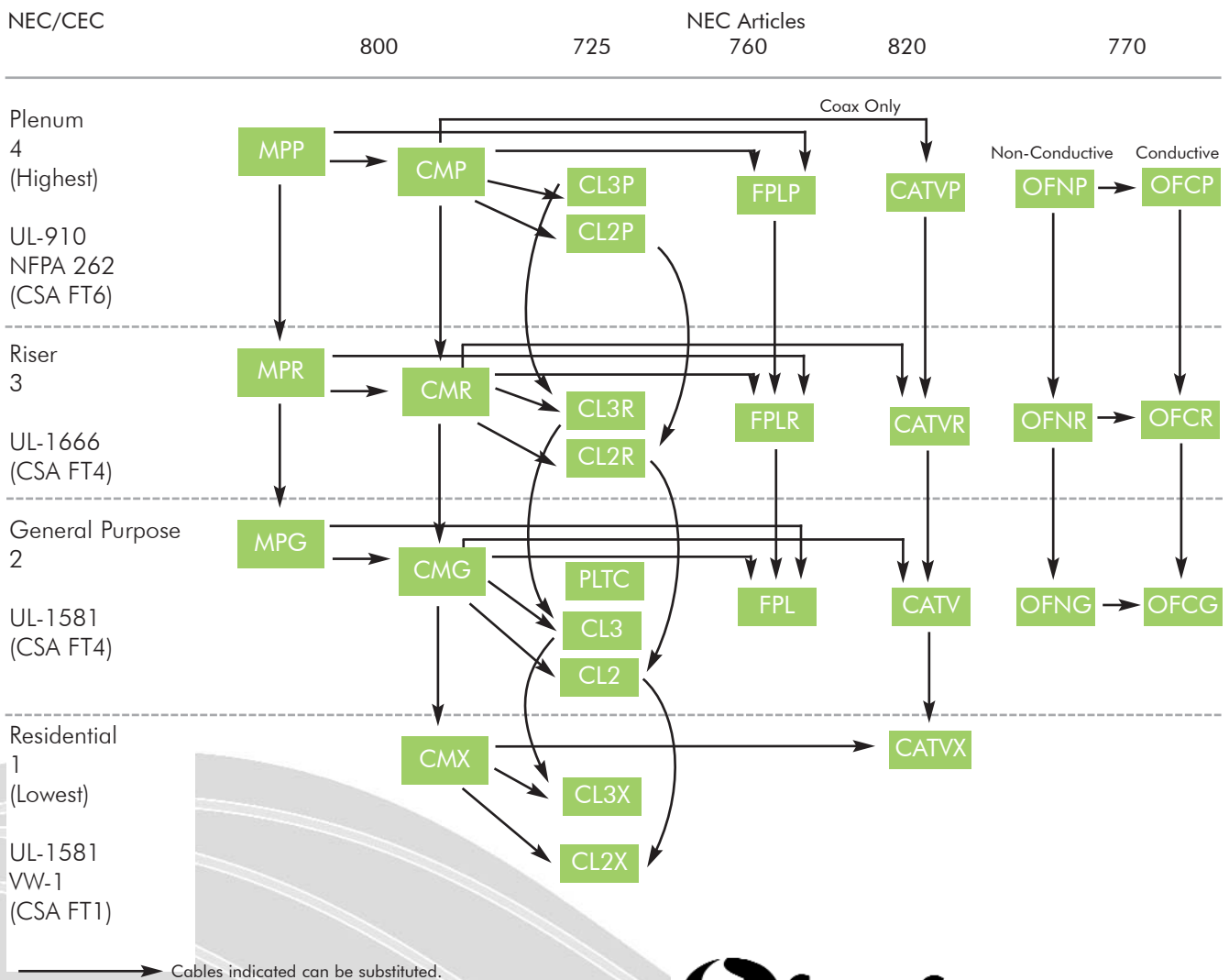
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Paint Can Chip Away at Flame Ratings

While there may be no code that prohibits it, there could be disastrous consequences to painting over indoor cables. Jacketing materials used in indoor cables are permeable to fluids and will be adversely affected by any type of moisture. More importantly, then cables should not be painted because paint draws the flames along the length of the cables.

Cable Fire Ratings Matrix

Types:	MPP, MPR, MPG, MP	=	Multipurpose Cables
Types:	CMP, CMR, CMG, CM, CMX	=	Communication Cables
Types:	CL3P, CL3R, CL3, CL3X, CL2P, CL2R, CL2, CL2X	=	Class 2 and Class 3 Remote Control, Signaling, and Power Limited Cables
Types:	FPLP, FPLR, FPL	=	Power Limited Fire Alarm Cables
Types:	CATVP, CATVR, CATV, CATVX	=	CATV and Radio Distribution Cables
Types:	OFNP, OFNR, OFNG, OFN	=	Nonconductive Fiber Optic Cables
Types:	OFCP, OFCR, OFCG, OFC	=	Conductive Fiber Optic Cables
Types:	PLTC	=	Power Limited Tray Cables



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