

Copper Wire and Cable Transmission & NEC Fire Ratings

NEC FIRE RESISTANCE RATINGS

Article 800 of the National Electrical Code (NEC), also known as NFPA 70, covers requirements for low-voltage communications cables. The NEC requires that cables used in premises, both commercial and residential, be “listed for the purpose” by a Nationally Recognized Test Laboratory (NRTL, pronounced “nurtle”). Other countries have similar requirements. UL (Underwriters Laboratories Inc.) is the most recognized listing agency in the US. UL 444 is the overall specification used to identify the requirements for listed communications cables.

Many of the fire resistance test procedures called out in UL 444 are written by UL. However, other laboratories, such as ITS (Intertek Testing Services) and CSA (Canadian Standards Association), can also provide listing compliance to the NEC.

Five levels of fire resistance are specified. These are outlined below, from most stringent to least. The ratings are hierarchical, i.e., from a fire resistance standpoint, a higher rating can be substituted for any lower rating, but not vice versa.

NEC Designation	CSA Equivalent	Common Term	Test	Comments
CMP	FT6	Communications Plenum	NFPA 262	<ul style="list-style-type: none"> Cable must have resistance to flame spread and reduced smoke generating properties Cable is approved for placement in air handling ducts and chambers (plenums) without the use of fireproof conduit Purpose of the rating is to lessen the transmission of fire and visible smoke to unaffected parts of the building Toxic or corrosive elements of the smoke are not measured Equivalent to Canadian FT6 rating
CMR	N/A	Communications Riser	UL 1666	<ul style="list-style-type: none"> Cable must not transmit flame from one floor to another when placed vertically in a building shaft (riser) Equivalent to Canadian FT4 rating
CMG	FT4	Communications General Use	CSA C22.2 No. 0.3-M (Vertical Tray)	<ul style="list-style-type: none"> Cable may not transmit flame for more than 4 feet, 11 inches Cable shall not penetrate floors or ceilings (i.e. cable may only be used within a single floor) Designation was added as a part of the harmonization efforts between U.S. and Canadian standards
CM	N/A	Communications General Purpose	UL 1581 (Vertical Tray)	<ul style="list-style-type: none"> Cable may not transmit flame for more than 4 feet, 11 inches Cable shall not penetrate floors or ceilings (i.e. cable may only be used within a single floor)
CMX	FT1	Communications Limited Purpose	UL 1581 VW-1 (Vertical Wire)	<ul style="list-style-type: none"> Cable meets the least stringent flame spread requirements of all ratings For residential use, but can only be installed in one and two-family (duplex) housing units Often rated with optional UL requirements for outdoor use*

*These “outdoor” requirements are limited to some cold temperature properties and UV resistance. They do not qualify a cable to be substituted for an Outside Plant (OSP) cable. For example, they have no protection against the intrusion of water, which can destroy a cable’s transmission properties and physically degrade a cable as well. The purpose of the “outdoor” rating is to ensure the cable can withstand outdoor exposure in the short run between the Network Interface Unit and the point of entry into the interior of the home.

BALANCED TWISTED PAIR TRANSMISSION CATEGORIES

In response to growing demand for data applications, premises cable performance has evolved such that several categories of transmission performance for balanced twisted pair cables have been developed.

These categories are detailed below. The categories are hierarchical, i.e., a higher category can be substituted for any lower category, but not vice versa.

Category	Maximum Bandwidth	Common Applications	Specifications	Comments
CAT 6A	500 MHz	10GBASE-T (IEEE 802.3an)	ANSI/TIA-568-C.2 ANSI/ICEA S-90-661	<ul style="list-style-type: none"> Designed for reduced alien crosstalk
CAT 6	250 MHz	1000BASE-T		<ul style="list-style-type: none"> Doubles the bandwidth of CAT 5e and vastly improves signal-to-noise margins
CAT 5e	100 MHz	1000BASE-T		<ul style="list-style-type: none"> Characterized by tightly twisted pairs to reduce crosstalk loss Proposed FCC minimum category requirement effective 2020
CAT 5	100 MHz	100BASE-T 100 Mbps TPDDI 622 Mbps ATM		<ul style="list-style-type: none"> No longer recognized as an appropriate medium for commercial networking installations (replaced by CAT 5e or higher)
CAT 3	16 MHz	10BASE-T Analog Voice Telecom Closet Wiring		<ul style="list-style-type: none"> Minimum allowed by the FCC for horizontal cable in commercial and residential voice and data applications Market trend is to abandon CAT 3 in favor of installing CAT 5e or higher for both data and voice