

CABLE FLAME TESTS

FACTORY MUTUAL CABLE FIRE PROPAGATION TEST

A unique test standard whereby a Fire Propagation Index (FPI) is determined based upon a combination heat release and ignition test. The FPI is used to determine a 1, 2, or 3 Group rating. The lower Group ratings are the better performing cables.

ICEA T-29-520 VERTICAL-TRAY FLAME TEST (210,000 BTU)

Similar to 70,000 BTU per hour test but heat source increased to 210,000 BTU per hour.

IEEE 383 VERTICAL FLAME TEST

The Institute of Electrical and Electronic Engineers (IEEE) has established IEEE-383, "IEEE Standards for Type Test of Class IE Electric Cables, Field Splices and Connections for Nuclear Generation Stations". Although originally intended for cables essential for emergency operations in nuclear power plants, this test procedure is used for other non-nuclear installations.

In the IEEE-383 fire test cables are supported by a one-foot wide vertical rack eight feet high. The cables are positioned in the center six inches off the rack, spaced one-half cable diameter apart. A ten inch ribbon burner fuel with an air-propane mixture ignites the cable with a 21 kW (70,000 BTU/hr) flame. The burner is positioned two feet above the floor and 9 to 12 inches of cable are exposed to the direct flames for 20 minutes. Cables on which flame extends above the top of the eight foot rack fail this test. NELPIA (ANI) test is a (210,000 BTU/hr) vertical flame test corner configuration.

Flammability Tests	BTU/hr	Locations
IEEE 1202	70,000	General Purpose
UL 1581 (VW-1)	(Bunsen Burner)	Residential & Non-Residential in Conduit
UL 1581 (Vertical Tray)	70,000 (IEEE 383)	General Purpose
UL 1666 (Vertical Chamber)	527,500	Riser and General Purpose
UL 1685	70,000	General Purpose
UL 910 (Steiner Tunnel)	70,000	Air Plenums & General Purpose

UL-910 PLENUM TEST (NFPA 262)

A plenum is defined as any space used as part of an air-handling system. This includes heating/air conditioning ducts and air returns, which frequently include the space between suspended ceilings and the floor above in modern office buildings. The National Electrical Code (NEC) requires that exposed cables (those not in conduit) in plenums be listed as "having adequate fire-resistant and low-smoke producing characteristics...".

A "Standard For Test Method For Fire and Smoke Characteristics of Cables Used in Air-Handling Spaces", was developed by Underwriters Laboratories (UL) to classify cables for this NEC requirement. This test is performed in a 25 foot Stein Tunnel test furnace (also specified in ASTM E-84 test for building materials). Designed to match the rigors of the application, this test is quite demanding.

In the UL-910 test, a single layer of 24 foot lengths of cable are supported by a one foot wide cable rack, which is filled with cables. The cables are ignited by an 88 kW (300,000 BTU/hr) methane flame. Flame spread is aided by a 240 ft/minute draft. During the 20 minute test, flame spread is observed through small windows spaced one foot apart. Smoke is measured by a photocell installed in the exhaust duct.

To qualify, cables must have a flame spread of less than 5 feet beyond the end of the 4-1/2 foot ignition flame, a peak optical density of 0.5 max (33% light transmission) and a max average optical density of 0.15 (70% light transmission).

UL RISER TEST (UL 1666)

Underwriters Laboratories (UL) has established a fire test facility for the purpose of listing cables that meet NEC requirements.

This test chamber is an eight by four simulated shaft, twelve feet high between the source of ignition and the floor above. A very large propane burner, 145 kW (495,000 BTU/hr) is ignited for a period of 30 minutes. Flames must not extend above the 12 foot mark if the cable is to be UL Classified for this duty.

UL VW-1 VERTICAL WIRE FLAME TEST (UL 1581)

The purpose of the UL VW-1 Vertical Wire Flame Test is to screen out flammable wires. The ignition source is small (under 1kW) and is applied for only 75 seconds.

In the UL VW-1 Flame Test, a tirrill burner (similar to a Bunsen burner) is used as the ignition source. The wire sample is mounted and the flame is applied for 15 seconds and then removed. The flame is then reapplied, either after 15 seconds or when the sample ceases to flame (whichever is longer), for a total of five 15-second applications. After the above procedure is completed, a wire sample that passes this test must not burn for more than one minute and must not burn more than 25% of an indicator flag. In addition, surgical cotton at the base of the burner must not be ignited.