

## CSA FLAME TESTS

The Canadian Electrical Code (CEC), published by the Canadian Standards Association, is the Canadian safety code for electrical installations that is adopted into law by each province and territory with amendments or local rules. The Code includes references to a stringent series of tests developed for flame testing of wires and cables. Cables are marked from FT1 to FT6, depending on which of the specified flame test requirements they fulfill.

### APPLICABLE STANDARDS

The CSA C22.2 No.2556 wire and cable test standard is the harmonized ANCE, CSA Group, and UL standard for Wire and Cable Test Procedures. This standard describes the apparatus, test procedures and formulas to be used in carrying out the tests and calculations required by wire and cable standards.

	FT1	FT2	FT4	FT5	FT6
Setup	Vertical	Horizontal	Vertical	Horizontal	Horizontal
Flame Output	3,000 BTU/hour	1,700 BTU/hour	70,000 BTU/hour	1,700 BTU/hour	300,000 BTU/hour
Duration	5 x 15 seconds	30 seconds	20 minutes	60 seconds	20 minutes
Pass/Fail Criteria	A finished conductor shall not convey flame or continue to burn for more than 60 seconds after five 15-second applications of the test flame. If more than 25 percent of the extended portion of the indicator is burned, the conductor shall be considered to have conveyed flame.	The length of the charred portion of the specimen of cord shall not exceed 100 mm nor shall it drop flaming particles.	Finished wires or cables shall not exhibit charred material beyond a length exceeding 1.5 m (5 ft.) from the lower edge of the burner face when subjected to the test.	The cable shall not have a length of burned area exceeding 150 mm and shall not continue to burn for more than four minutes when subjected to the flame test.	A flame travel distance not exceeding 1.52 m (5 ft.), a peak optical density of smoke not exceeding 0.5, and an average optical density not exceeding 0.15 are described as having adequate fire-resistant and low smoke-producing characteristics.
Applicable Standard(s)	CSA C22.2 No.38 CSA C22.2 No.75 CSA C68.5 CSA C68.10	CSA C22.2 No.49	CSA C22.2 No.38 CSA C22.2 No.51 CSA C22.2 No.75 CSA C22.2 No.123 CSA C22.2 No.131 CSA C22.2 No.230 CSA C68.10	CSA No.96	CSA C22.2 No.214 UL 444 NFPA 262

### FT1 Flame Test

**Test procedure:** Cables are subjected to a 15-second duration of a 3,000 BTU/hour flame five times.

**Pass/fail criteria:** A finished conductor shall not convey flame or continue to burn for more than 60 seconds after five 15-second applications of the test flame. If more than 25 percent of the extended portion of the indicator is burned, the conductor shall be considered to have conveyed flame.

### FT2 Flame Test

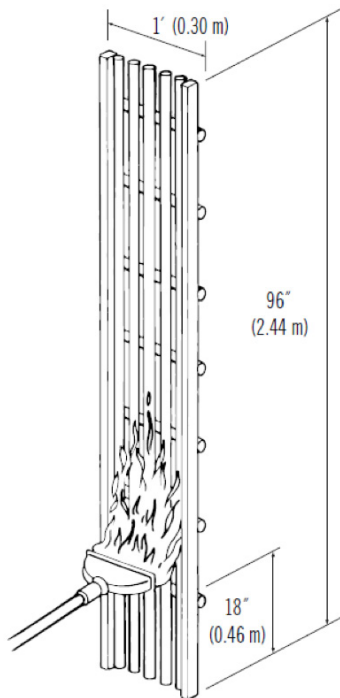
**Test procedure:** Cables are subjected to a 1,700 BTU/hour flame applied to a horizontal wire or cable sample for 30 seconds.

**Pass/fail criteria:** The length of the charred portion of the specimen of cord shall not exceed 100 mm nor shall it drop flaming particles. (Source: CSA C22.2 No.49)

### FT4 Flame Test

**Test procedure:** Cables are mounted on a vertical tray and exposed for 20 minutes to a 70,000 BTU/hour flame. This test is the same as the IEEE 1202 flame test and both are found in the UL 1685 document. Because of the reduced char height requirements, the FT4 and IEEE 1202 tests are slightly more difficult to pass than the UL 1685 vertical tray version.

**Pass/fail criteria:** Finished wires or cables shall not exhibit charred material beyond a length exceeding 1.5 m (5 ft.) from the lower edge of the burner face when subjected to the test. (Source: CSA C22.2 No.38)



### FT5 Flame Test

This flame test is applicable to portable power cables such as SHD-GC for use in surface or underground mining applications.

**Test procedure:** Three one-meter samples are required for this test and are set up horizontally. The specimens are heated with electric current (DC or AC voltage source) until the conductor temperature reaches  $205^{\circ}\text{C} \pm 5^{\circ}\text{C}$ . Once this conductor temperature has been reached, a 1,700 BTU/hour flame is applied for 60 seconds at the center of the

cable. Upon removing the flame, the current supply is also disconnected from the sample immediately.

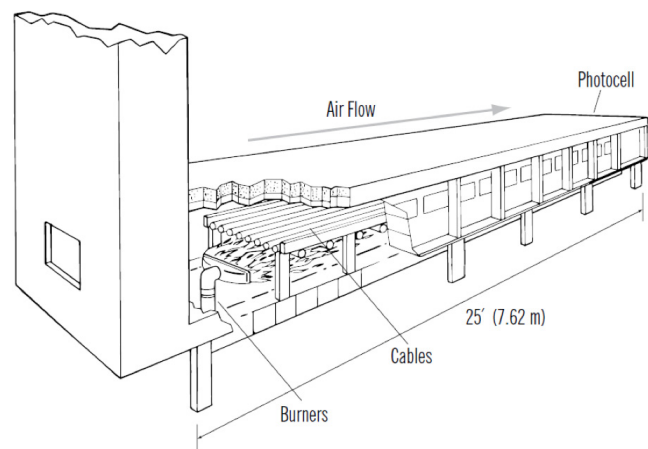
**Pass/fail criteria:** The cable shall not have a length of burned area exceeding 150 mm and shall not continue to burn for more than four minutes when subjected to the flame test. (Source: CSA No.96)

### FT6 Flame Test

The U.S. version of this test is known as the NFPA 262 “Steiner Tunnel” Flame Test (formerly UL 910), which measures flame spread and smoke generation in a simulated air handling plenum.

**Test procedure:** A 25-foot long Steiner Tunnel is used for the test with intake and exhaust ducts and a means of regulating flow velocity of air through the tunnel. Windows at 1-foot intervals allow for flame spread measurements, and an optical device in the exhaust of the chamber measures smoke density. The cable samples are mounted in a cable tray in one layer in the tunnel and the tunnel is sealed. Two circular burners are mounted vertically at the intake end of the tunnel just in front of the cable tray. Methane is burned along with a 240 ft./min. forced draft through the tunnel for twenty minutes, and the flame is extinguished. Flame spread and smoke density are monitored throughout the test.

**Pass/fail criteria:** A flame travel distance not exceeding 1.52 m (5 ft.), a peak optical density of smoke not exceeding 0.5 and an average optical density not exceeding 0.15 are described as having adequate fire-resistant and low smoke-producing characteristics. (Source: NFPA 262)



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