



Southwire®

# FLAME TEST BROCHURE



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## SOUTHWIRE COMPANY, LLC

Southwire Company, LLC is committed to providing our customers with solutions for every type of industrial environment, including those rugged environments found in heavy industrial and offshore markets. Many of these locations are considered hazardous by the National Electric Code (NEC) which defines a hazardous location as an area where a fire or explosion hazard may exist due to flammable gases, vapors, liquids, or combustible dust.

Fire is a significant concern for wire and cable applications. In addition to fire potentially causing the cable to fail, the burning of all non-metallic materials, including insulation, jackets, foils, and fillers, can create toxic and/or corrosive substances. The toxins can immediately and directly affect people who are near the smoke and fire, whereas the corrosive by-products of burned cables may not be detected for several weeks.

Flammability tests and determination of combustion products are critical in helping us and you as the consumer understand how fire spreads along the cable and potential threats to people and materials in the event of a cable fire.

Southwire conducts the following tests to determine:

- Flammability of non-metallic cable components
- Toxicity of fire by-products, especially the gases
- Spread of the fire along the cable
- Flue gas density in the event of fire
- Corrosiveness of the combustion gases

Please note that these tests are conducted under standardized conditions and do not reflect the individual behavior of installed cables and cable bundles in an actual fire.



# FLAMMABILITY & FIRE PROPAGATION

## IEC 60332-1-2 / EN 60332-1-2 / VG 95218-2 METHOD 1 / BS 4066 PART 1 / VDE 0482-332-1-2

**DESCRIPTION** Tests for electric and optical fiber cables under fire conditions – Part 1-2: Test for vertical flame propagation for a single insulated wire or cable procedure for 1 kW pre-mixed flame

**TEST SET-UP** The single cable under test is secured vertically and flamed with a burner at an angle of 45° to the vertical. Test apparatus acc. to IEC / EN 60332-1-1.

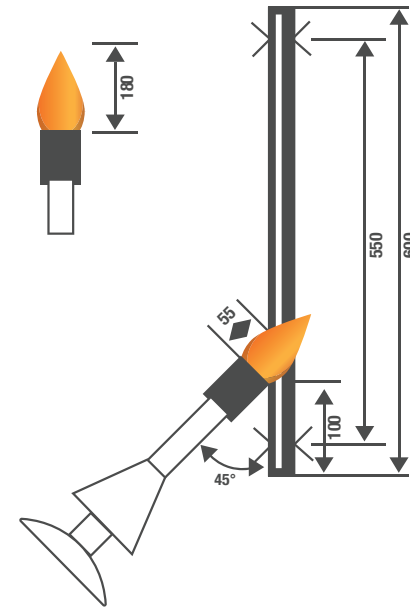
**FLAME TEMPERATURE** Determined by the stipulated setting of the burner flame.

**TEST DURATION**

- Cable with a diameter of  $D \leq 25$  mm: 60 +/- 2 sec
- Cable with a diameter of  $25 < D \leq 50$  mm: 120 +/- 2 sec
  - $50 < D < 75$  mm: 240 +/- 2 sec
  - $D > 75$  mm: 480 +/- 2 sec

**COMPLIANCE CRITERION**

- The fire damage must end at least 50 mm below the upper fixing clamp.
- The cable must be self-extinguishing.



## UL 2556 SECTION 9.3 (FT1) / SECTION 9.4 (VW-1) / UL 1581 SEC.1061 (CABLE FLAME)

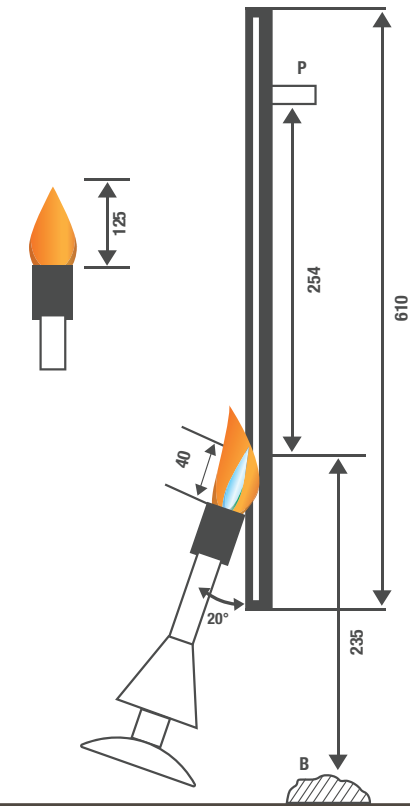
**TEST SET-UP** The cable is secured vertically and provided with a paper indicator flag (P, 10 x 20 mm). A burner is used to apply the flame and it is secured at an angle of 20° to the vertical.

**FLAME TEMPERATURE** Determined by the stipulated setting of the Tirril burner flame.

**TEST DURATION**

- Section 9.3: 5 cycles of flame application for 15 sec with a break of 15 sec
- Section 9.4: 5 cycles of flame application for 15 sec with a break of 15 sec and a maximum break of 60 sec
- Section 1061: 3 cycles of flame application for 60 sec with a break of 30 sec

**COMPLIANCE CRITERION** It is only permitted for the sample to continue burning for at most 60 seconds after the flame has been removed and for at most 25% of the paper indicator flag (P) to be burned. The cotton wadding (B) must not be ignited by dripping material. (Does not apply to the FT1 test)



## IEC 60332-2-2 / EN 60332-2-2 / VG 95218-2 METHOD 2 / BS 4066 PART 2 / VDE 0482-332-2-2

**DESCRIPTION** Tests on electric and optical fiber cables under fire conditions – Part 2-2: Test for vertical flame propagation of a single small insulated wire or cable procedure for diffusion flame

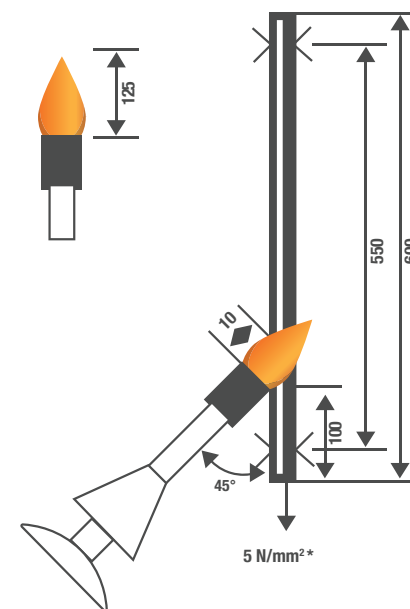
**TEST SET-UP** The single cable under test is secured vertically and flamed with a burner at an angle of 45° to the vertical. Test apparatus acc. to IEC / EN 60332-2-1.

**FLAME TEMPERATURE** Determined by the stipulated setting of the burner flame.

**TEST DURATION** 20 +/- 1 sec

**COMPLIANCE CRITERION**

- The fire damage must end at least 50 mm below the upper fixing clamp.
- The cable must be self-extinguishing.
- \* for cables with metallic conductors



## UL 1581 SECTION 1090 (H) / UL 2556 SECTION 9.1 (FT2)

**TEST SET-UP** The cable is secured horizontally and vertically and flamed with a burner (the burner is tilted at an angle of 20° for the FT2 test).

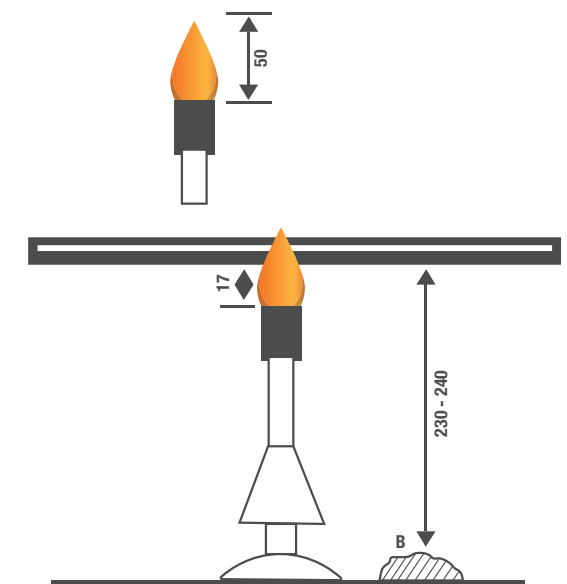
Cotton wadding (B) is placed next to the burner.

**FLAME TEMPERATURE** Determined by the stipulated setting of the burner flame.

**TEST DURATION** 30 sec

**COMPLIANCE CRITERION**

- The flame propagation speed must not exceed 25 mm/min.
- The cotton wadding (B) must not be ignited by dripping material.
- Section 1090: The rate of dispersion of the cable may not exceed 25 mm/min
- Section 9.1: The length of the carbonized part may not exceed 100 mm



# FLAMMABILITY & FIRE PROPAGATION

## IEC 60332-3 / EN 60332-3 / VDE 0482-332-3

**DESCRIPTION** Tests on electric and optical fiber cables under fire conditions. Test for vertical flamespread of vertically-mounted bunched wires or cables – Apparatus

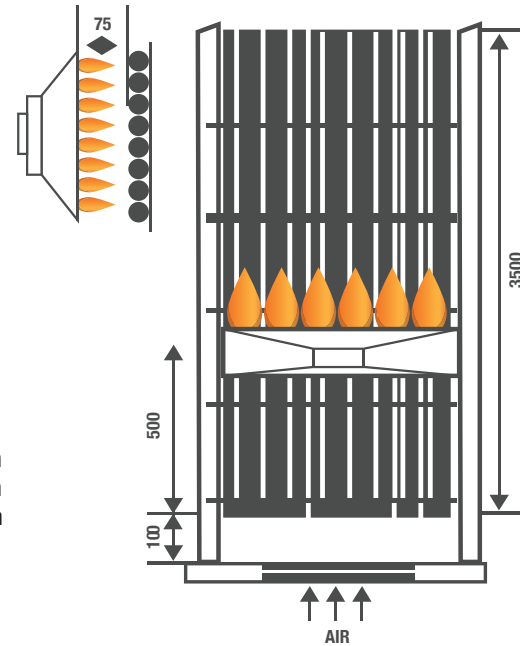
**TEST SET-UP** The cables are secured to a ladder, close together or spaced apart depending on the type of fire. The cables can be secured in several layers. Test apparatus acc. to IEC / EN 60332-3-10.

**FLAME TEMPERATURE** Determined by the stipulated quantity of propane gas and air.

**TEST DURATION**

- IEC Part 21/EN Part 21: Category A F/R for special applications only
- IEC Part 22/EN Part 22: Category A (7 l flammable material/m): 40 min
- IEC Part 23/EN Part 23: Category B (3.5 l flammable material/m): 40 min
- IEC Part 24/EN Part 24: Category C (1.5 l flammable material/m): 20 min
- IEC Part 25/EN Part 25: Category D (0.5 l flammable material/m): 20 min

**COMPLIANCE CRITERION** The visible area of fire damage to the cables must not exceed 2.5 m in height from the bottom edge of the burner.



## UL 1685 FT4 / IEEE 1202 / UL 2556 SECTION 9.6 METHOD 2 (CSA METHOD) / NMX-J-498 ANCE METHOD 2

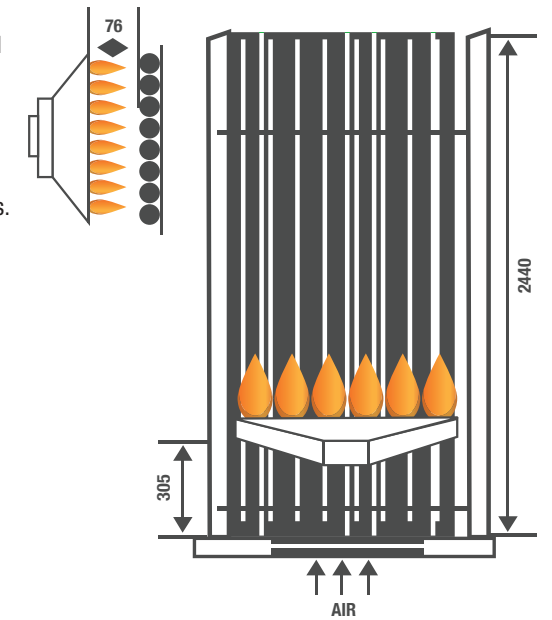
**DESCRIPTION** Vertical-tray fire propagation and smoke-release, test for electrical, and optical-fiber cables

**TEST SET-UP** The cables are secured to a ladder in a single layer (quantity depends on the diameter of the cable). The length of each sample is 2.44 m. Cables with a diameter of <13 mm are secured to the ladder in bundles. The burner is tilted at an angle of 20°.

**FLAME TEMPERATURE** Determined by the stipulated quantity of propane gas and air. The power equals 20.5 kW (70,000 Btu/hr)

**TEST DURATION** 20 minutes (2 tests to be performed)

**COMPLIANCE CRITERION** The area of fire damage to the cables must be less than 1.5 m (measured from the bottom edge of the burner nozzle).



## UL 1685 VERTICAL TRAY / UL 2556 SECTION 9.6 METHOD 1 (UL METHOD) / NMX-J-498 ANCE METHOD 1

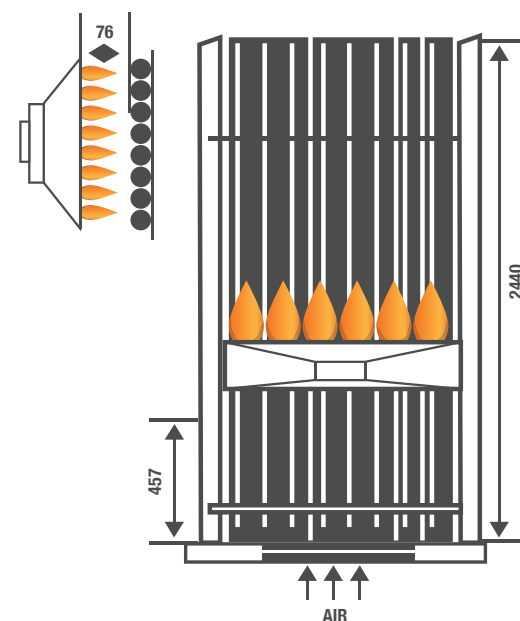
**DESCRIPTION** Vertical-tray fire propagation and smoke-release, test for electrical, and optical-fiber cables

**TEST SET-UP** The cables are secured to a ladder in a single layer (quantity depends on the diameter of the cable). The length of each sample is 2.44 m.

**FLAME TEMPERATURE** Determined by the stipulated quantity of propane gas and air. The power equals 20.5 kW (70,000 Btu/hr).

**TEST DURATION** 20 minutes (2 tests to be performed)

**COMPLIANCE CRITERION** The area of fire damage to the cables must be less than 2.44 m (measured from the bottom of the ladder).



## UL 1666 RISER

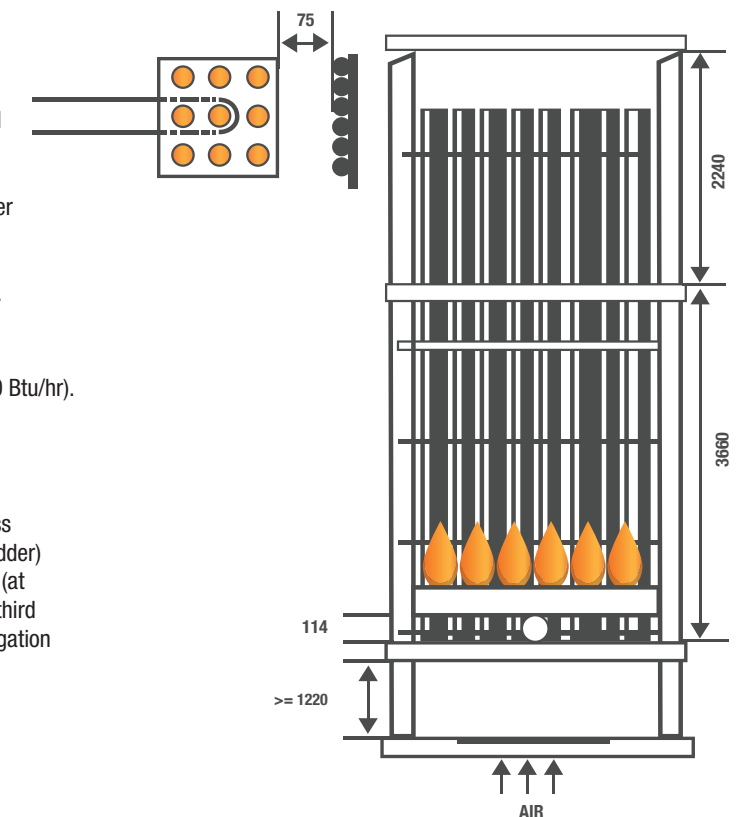
**DESCRIPTION** Test for flame propagation height of electrical and optical-fiber cables installed vertically in shafts

**TEST SET-UP** The cables are secured to a ladder in a single layer (quantity depends on the diameter of the cable). The length of each sample is 5.33 m. The flame is applied using a burner diffuser plate.

**FLAME TEMPERATURE** Determined by the stipulated quantity of propane gas and air. The power equals 154.5 kW (527,500 Btu/hr).

**TEST DURATION** 30 minutes (2 tests to be performed)

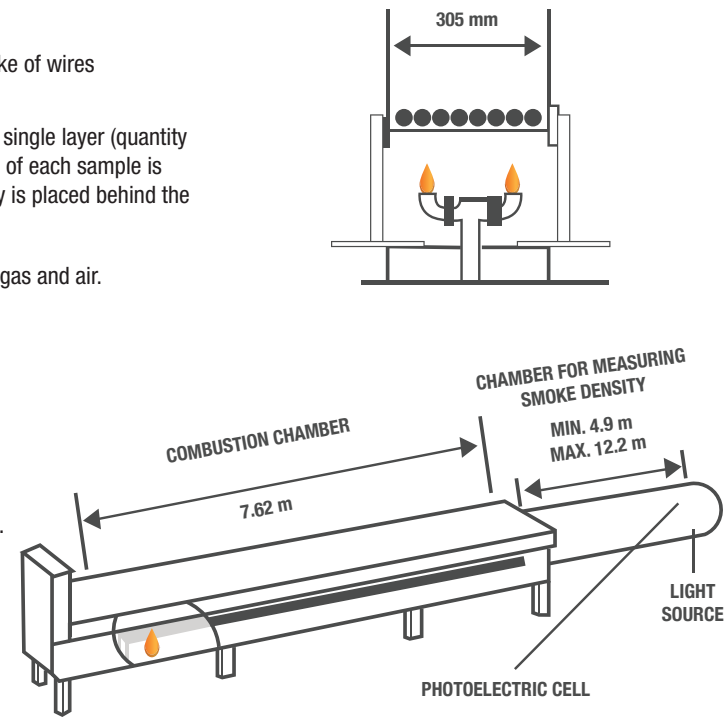
**COMPLIANCE CRITERION** The area of fire damage to the cables must be less than 3.66 m (measured from the bottom of the ladder) and the temperature of any of the thermocouples (at a height of 3.66 m) must not exceed 454.4 °C. A third test must be carried out if the difference in propagation height for the two tests is greater than 1.52 m.



# FLAMMABILITY & FIRE PROPAGATION

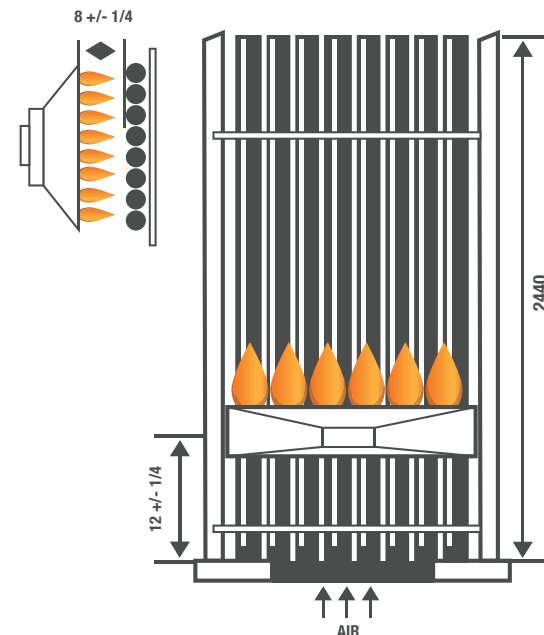
## NFPA 262 / FT6 STEINER-TUNNEL (UL 910)

<b>DESCRIPTION</b>	Standard method of test for flame travel and smoke of wires and cables for use in air-handling spaces
<b>TEST SET-UP</b>	The cables are secured to a horizontal ladder in a single layer (quantity depends on the diameter of the cable). The length of each sample is 7.32 m. A device for measuring the smoke density is placed behind the combustion chamber.
<b>FLAME TEMPERATURE</b>	Determined by the stipulated quantity of propane gas and air. The power equals 86 kW (294,000 Btu/hr).
<b>TEST DURATION</b>	20 minutes (2 tests to be performed)
<b>COMPLIANCE CRITERION</b>	The area of fire damage to the cables must not exceed 1.52 m. The mean optical density of the smoke produced must not exceed a value of 0.15. The maximum optical smoke density should not exceed 0.5 (light transmission of 32 %).



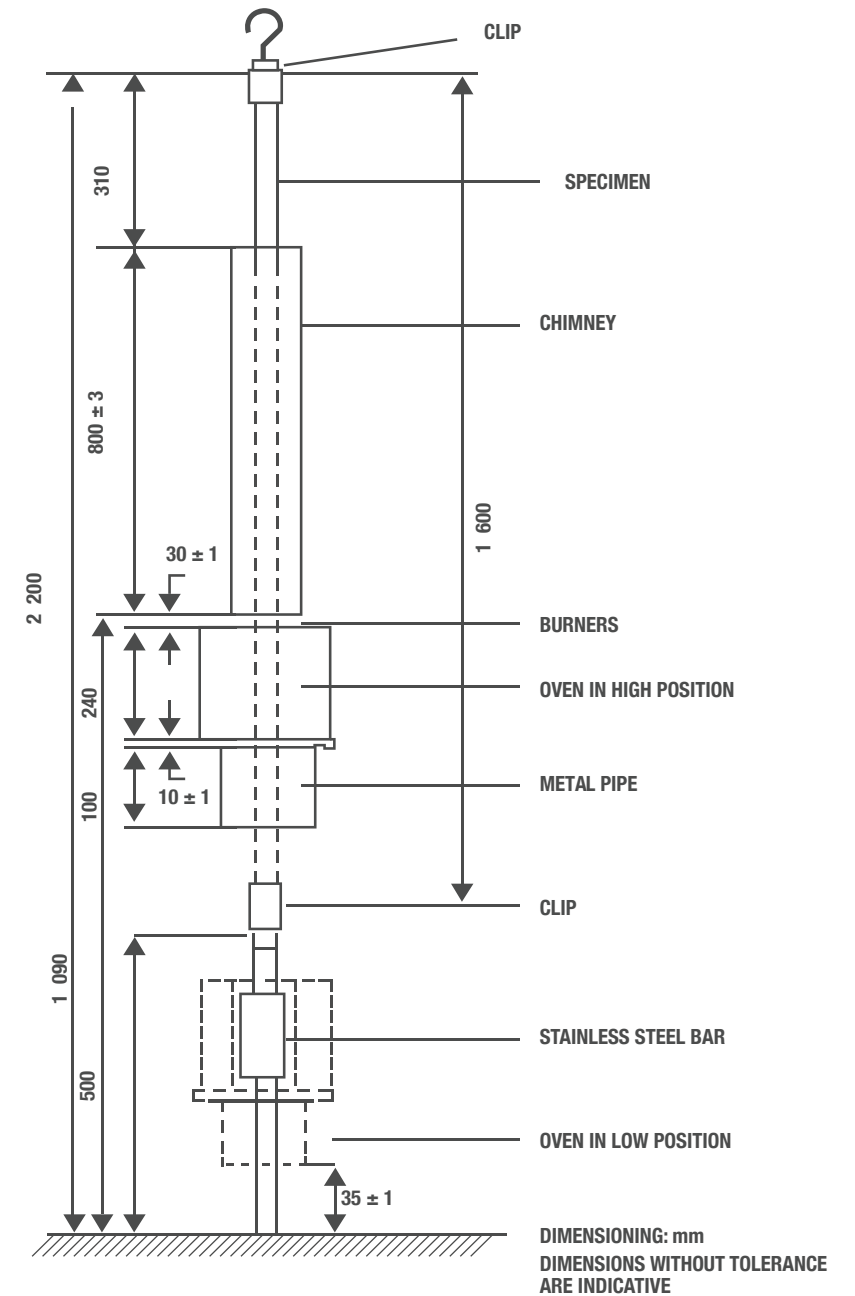
## ICEA T-29-520

<b>DESCRIPTION</b>	Guide for conducting a 210,000 BTU/HR Vertical Cable Tray Flame Test
<b>TEST SET-UP</b>	The cables are secured to a ladder in a single layer (quantity depends on the diameter of the cable). The length of each sample is 2.44 m. Cables with a diameter of <13 mm are secured to the ladder in bundles. The test tray should be a vertical ladder type steel cable tray 12 inches wide by 8 ft. long. The burner should be mounted horizontally 12 +/- 1/4 inches above the base of the tray with the burner face parallel with the back (rung side) of the tray and 8 +/- 1/4 inches from the nearest cable surface.
<b>FLAME TEMPERATURE</b>	Determined by the stipulated setting of the burner flame.
<b>TEST DURATION</b>	20 minutes
<b>COMPLIANCE CRITERION</b>	Not burn damage reached the top on any of the test specimens



## NMX-J-093-ANCE / NF C 32-070

<b>DESCRIPTION</b>	Mexican Standard test method to determine resistance to fire propagation on electrical conductors.
<b>TEST SET-UP</b>	Cables are set-up inside of a cabin in vertical position. Specimens length must be 1600 mm. Electrical oven must be able to run into two positions high/low. Chimney length must be 800 mm +/- 3.  Selection of the specimens 25 mm < D ≤ 75 mm (one conductor) 15 mm < D ≤ 25 mm (bundle of three conductors) D ≤ 15 mm (bundle of 7, 12, 19 or more conductors)
<b>OWEN TEMPERATURE</b>	Determined by the stipulated stabilization temperature.
<b>TEST DURATION</b>	30 minutes
<b>COMPLIANCE CRITERION</b>	The area of fire damage to the cables must not exceed or reach the top of the chimney length.







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# FLAME TEST BROCHURE



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