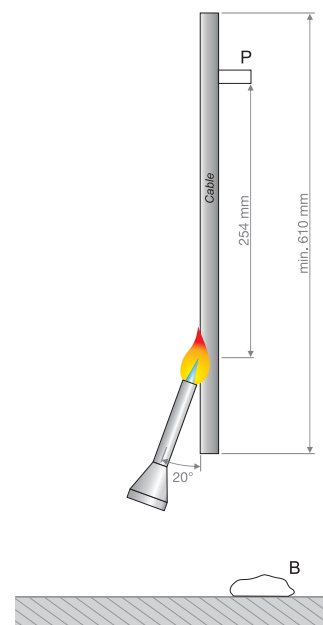


Appendix N. Cables and wires' flame resistance tests

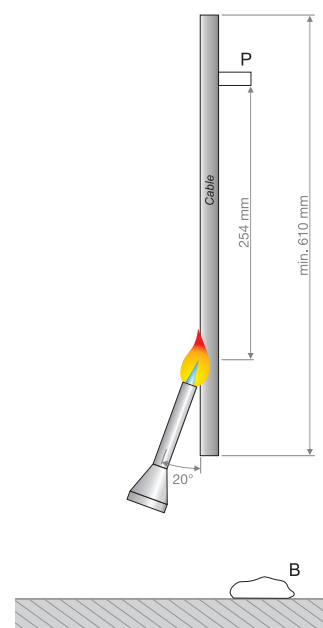
Flammability tests and determination of combustion products are vital to cable technology. They provide information on how fire spreads along the cable as well as on the potential threats to people and materials in the event of a cable fire.

In order to make sure that a particular cable meets the necessary flammability requirements, a wide range of different testing procedures are often used. These procedures are typically performed in either the vertical or horizontal orientation, on single cables or on group cables.

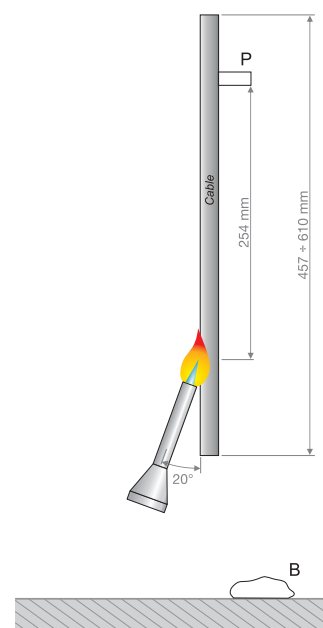
Test method	UL 1581 – Par. 1080 – VW-1 (Vertical Specimen) Flame test UL 2556 – Par. 9.4 – FV-2/VW-1	
Description	The cable is secured vertically. A burner is used to apply the flame and it is secured at an angle of 20° in respect to the vertical.	
Duration	15 s of flame application and 15 s of pause for 5 cycles. When flaming of the specimen persists longer than 15 s after removal of the burner flame, the burner flame shall not be re-applied until immediately after the flaming ceases.	
Compliance	The paper indicator flag (P) shall not be burned more than 25% and the specimen shall not continue to burn for more than 60 s. Dripping material shall not ignite the cotton wool underneath (B).	



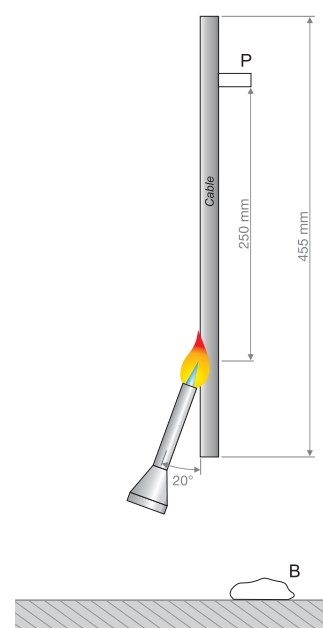
Test method	UL 1581 – Par. 1060 – Vertical Flame UL 2556 – Par. 9.5 – FV-1/Vertical flame	
Description	The cable is secured vertically. A burner is used to apply the flame and it is secured at an angle of 20° in respect to the vertical.	
Duration	15 s of flame application and 15 s of pause for 5 cycles. The burner flame shall be re-applied after 15 s, regardless of whether flaming of the specimen persists longer than 15 s.	
Compliance	The paper indicator flag (P) shall not be burned more than 25% and the specimen shall not continue to burn for more than 60 s. Dripping material shall not ignite the cotton wool underneath (B).	



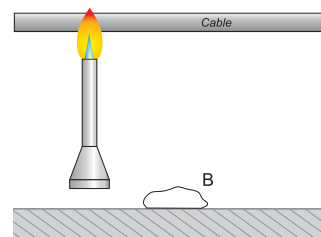
Test method	UL 1581 – Par. 1060 – FT1 UL 2556 – Par. 9.3 – FT1	
Description	The cable is secured vertically. A burner is used to apply the flame and it is secured at an angle of 20° in respect to the vertical.	
Duration	15 s of flame application and 15 s of pause for 5 cycles. The burner flame shall be reapplied after 15 s, regardless of whether flaming of the specimen persists longer than 15 s.	
Compliance	The paper indicator flag (P) shall not be burned more than 25% and the specimen shall not continue to burn for more than 60 s. Dripping material or the ignition of the cotton wool underneath (B) are ignored for the compliance of this test.	



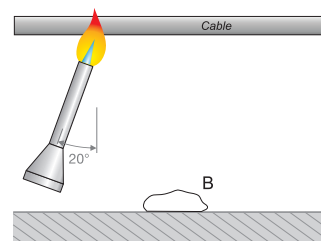
Test method	UL 1581 – Par. 1061 – Cable Flame test	
Description	The cable is secured vertically. A burner is used to apply the flame and it is secured at an angle of 20° in respect to the vertical.	
Duration	60 s of flame application and 30 s of pause for 3 cycles. The burner flame shall be reapplied after 30 s, regardless of whether flaming of the specimen persists longer than 30 s.	
Compliance	The paper indicator flag (P) shall not be burned more than 25% and the specimen shall not continue to burn for more than 60 s. Dripping material shall not ignite the cotton wool underneath (B).	



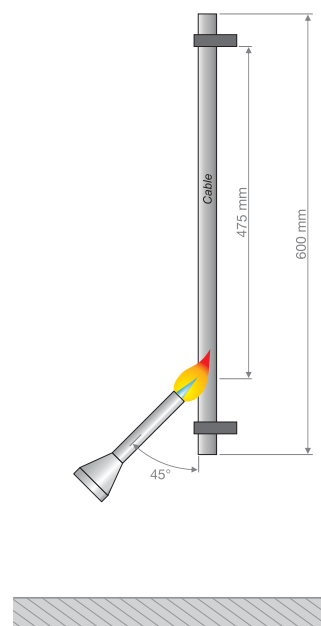
Test method	UL 1581 – Par. 1090 – Horizontal-Specimen Appliance-Wire Flame Test	
Description	The cable is secured horizontally. A burner is used to apply the flame and it is secured vertically.	
Duration	30 s of flame application.	
Compliance	The flame propagation speed must not exceed 25 mm/min. Dripping material shall not ignite the cotton wool (B) placed next to the burner.	



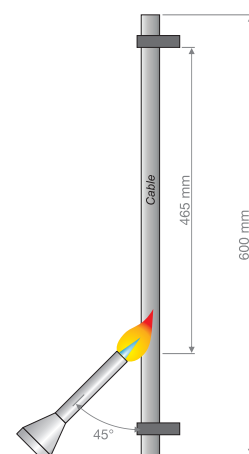
Test method	UL 1581 – Par. 1100 – Horizontal-Specimen / FT2 Flame Test UL 2556 – Par. 9.1 – FT2/FH/Horizontal flame	
Description	The cable is secured horizontally. A burner is used to apply the flame and it is secured at an angle of 20° in respect to the vertical.	
Duration	30 s of flame application.	
Compliance	The length of the carbonized specimen has to be no greater than 100 mm. Dripping material shall not ignite the cotton wool (B) placed next to the burner.	



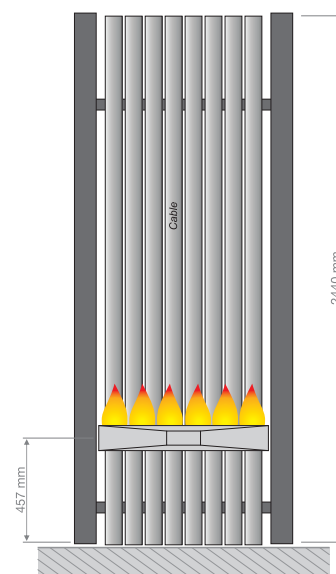
Test method	IEC 60332-1-2 / EN 60332-1-2	
Description	The cable is secured vertically. A burner is used to apply the flame and it is secured at an angle of 45° in respect to the vertical.	
Duration	Based on the cable diameter: 60 s ($D \leq 25$ mm), 120 s ($25 < D \leq 50$ mm), 240 s ($50 < D \leq 75$ mm), 480 s ($D > 75$ mm)	
Compliance	The fire damage must end at least 50 mm below the upper fixing clamp. The cable must be self-extinguishing.	



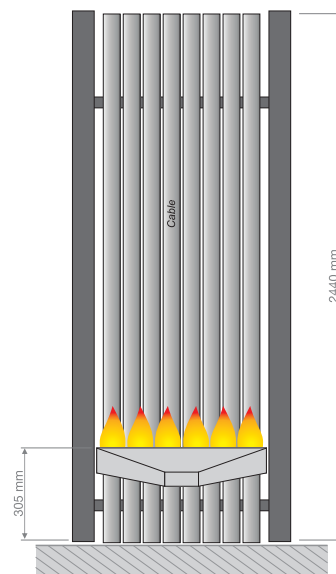
Test method	IEC 60332-2-2 / EN 60332-2-2	
Description	The cable is secured vertically. A burner is used to apply the flame and it is secured at an angle of 45° in respect to the vertical.	
Duration	20 s	
Compliance	The fire damage must end at least 50 mm below the upper fixing clamp. The cable must be self-extinguishing	



Test method	UL 2556 – Par. 9.6 – Vertical tray (Method 1) UL 1581 – Par. 1160 – Vertical Tray Flame Test UL 1685	
Description	The cables are secured vertically to a ladder in a single layer. A burner is used to apply the flame and it is secured horizontally.	
Duration	20 min of flame application for 2 tests.	
Compliance	The damage height of all specimens shall be less than 2440 mm when measured from the bottom of the tray.	



Test method	UL 2556 – Par. 9.6 – FT4 (Method 2)	
Description	The cables are secured vertically to a ladder in a single layer. A burner is used to apply the flame and it is secured at an angle of 20° in respect to the vertical.	
Duration	20 min of flame application for 2 tests.	
Compliance	The damage height of all specimens shall be less than 1500 mm when measured from the bottom edge of the burner.	



Test method	IEC 60332-3-24 / EN 60332-3-24	
Description	The cables are secured vertically to a ladder also in several layers. A burner is used to apply the flame and it is secured horizontally.	
Duration	20 min	
Compliance	The damage height of all specimens shall be less than 2500 mm when measured from the bottom of the tray.	

