UL 1696 Mechanical Protection Tubing (MPT) and Fittings â€“ Vertical Flame Test Equipment

Description

6.4 Vertical flame

6.4.1 General

6.4.1.1 This test establishes the method for determining the resistance of MPT, fitting, or clamp to the vertical propagation of flame and dropping of flaming particles

Specimens shall be separately subjected to two 15-second applications of flame, with 15 seconds between each Raine application

6.4.1.2 Specimens shall be tested in accordance with 6 4 2 â€“ 6 4 7 See Figure 4 for essential dimensions for positioning MPT for the vertical flame test. See Figure 5 for essential dimensions for positioning a fitting or clamp for the vertical flame test.

6.4.1.3 If a range of colors is available, specimens of the most heavily pigmented light color (often white) and dark color (often black, including carbon black) in the color range shall be provided. When a certain

pigments (for example, red. yellow, or the like) are known to affect flammability characteristics, specimens of that color shall also be provided If a range of colors is not desired or available testing of a specific color is only considered representative of that color

6.4.1.4 MPT â€“ When tested as described in 6.4.2 â€“ 6 4.7. The MPT shall show no evidence of It.

a) Conveying fame along its length when the specimen shows more than 25 % of the indicator flag burned away or charred (soot that can be removed with a cloth or the fingers, and brown scorching, are to be ignored) after any of the two applications of flame, or,

b) Flaming or glowing particles or flaming drops at any time that ignite the cotton (flameless charring of the cotton is to be ignored) or.

C) Continues to name longer than 60 seconds after the second apphcation of the gas flame.

6.4.1.5 Fitting or Clamp â€“ When tested as described in 6 4 2 â€“ 6 4 7, the fitting or clamp shall show no evidence of.

a) Continues to flame longer than 60 seconds after the second application of the gas flame: or

b) Being completely consumed

6.4.2 Materials and reactants

6 4.2.1 Materials and reactants shall consist of the following

a) Methane. at 98 % minimum purity, having a heat content of 37 Â±1 Mj/m3 (1000 Â±30 Btu/m3) at 25 C and 101 kPa (14.7 psi): or natural gas. with a heat content of 37 Â±1 MJ/m3 (1000 Â±30 Btu/ft3) at 25 C and 101 kPa (14.7 psi).

b) Surgical cotton. dry and untreated, 6 â€“ 25 mm (0.25 â€“ 1 inch) thick,
c) Kraft paper, 94 g/m2 (60 lb) kraft paper with a nominal thickness of 0.13 mm (0.005 inch), gummed on one side: and

d) Bare steel wire, approximately 0.74 mm (0.029 inch) in diameter, shall be used for supporting the test specimens during the test.

6.4.3 Apparatus

6.4.3.1 The apparatus shall consist of the following

a) A three-sided sheet metal chamber â€“ 300 Â±50 mm (12 Â±2 inch) wide. 350 Â±50 mm (14 Â±2 inch) deep, and 600 Â±50 mm (24 Â±2 inch) high. open at the top and front. It shall have provision for centering a vertical test specimen of MPT, fitting, or clamp,

b) A draft-free chamber having a means for access and viewing that can be sealed. Each linear interior dimension of the chamber shall be at least 610 mm (24 inches). The interior volume of the chamber shall be at least 4 m3 (140 ft3), including the volume of an exhaust transition, if any. At least 2m3 (70 ft3) of this volume shall be above the point of impingement of the flame on the specimen, as space for the heat and smoke to accumulate so as not to influence the test.

c) An angle block (See Figure 6.) to place the burner at a 20 Â±1 degrees angle from the vertical position. The angle block shall be capable of moving the flame into position on the specimen. It shall also be capable of directing the flame away from the specimen beyond vertical, or withdrawing the flame a minimum distance of 150 mm (6 inches) from the specimen,

d) Laboratory stands or other supports used to secure the specimen These shall not create updrafts or impede the air supply to the flame. Regardless of the method employed, the specimen supports shall be 200 â€“ 230 mm (7 â€“ 9 inches) apart,

e) A length-measuring device accurate to 5 % of char length requirement:

f) A flame height gauge capable of measuring the specified flame heights.

g) A timing device capable of measuring the specified times in seconds. having a resolution of 1 second and an accuracy of Â±0.5 second: and

h) A laboratory burner conforming to ASTM 05025 or NMX-J-192-ANCE. suitable for the calorific value of the gas and having an inside diameter of 9.5 Â±0.3 mm (0.375 Â±0.01 inch) and a length of 100 Â±10 mm (4.0 Â±0.4 inch) above the primary-air inlets. The burner shall be calibrated in accordance

with ASTM 05207 or NMX-J-192-ANCE each time a cylinder of gas. when used. is changed or refilled, or any of the apparatus is changed.

6.4.4 Preparation of specimens

6.4.4.1 A minimum of three specimens of the smallest. intermediate, and largest size shall be taken from a sample of MPT. fittings. or clamps.

6.4.4.2 Specimens shall be conditioned at Room Temperature in accordance with 6.2

6.4.4.3 Specimens shall be prepared based on MPT or fitting or clamp:

A) MPT â€“ specimen shall have a length of 457 mm (18 inches) and drawn onto a fine bare spring steel music wire 890 mm (35 inches) in length. A strip of Kraft paper 12.5 Â±1 mm (0.5 Â±0.1 inch) wide shall be moistened just enough to facilitate adhesion. With the gum toward the specimen, the strip shall be wrapped once around the specimen, with its lower edge 254 Â±2 mm (10 Â±0.1 inch) above the point at which the inner blue cone of the flame impinges on the specimen, point B (See Figure 4.). The ends of the strip shall be pasted together evenly and trimmed to result in an indicator flag that projects nominally 20 mm (0.75 inch) opposite to the side to which the flame shall be applied.

B) Fitting or clamp â€“ specimen shall be secured by a fine bare spring steel music wire with its longitudinal axis vertical, having the threaded area positioned at the lowest point. in the center of the enclosure (See Figure 5.).

6.4.5 Procedure

6.4.5.1 The specimen. apparatus. and the surrounding air shall be at Room Temperature.

6.4.5.2 For MPT â€“ The specimen shall be mounted vertically in the supports in the chamber (See Figure 4.) The lower specimen support shall be located at least 76 mm (3 inches) below the point at which the inner blue cone of the flame shall impinge on the specimen. point B. The upper specimen support shall be located at least 50 mm (2 inches) above the top of the kraft paper flag.

6.4.5.3 For fittings or damps â€“ The specimen shall be secured by a fine bare spring steel music wire with its longitudinal axis vertical, having the threaded area positioned at the lowest point, in the center of the enclosure, mounted vertically in the supports in the chamber (See Figure 5.).

6.4.5.4 When testing a specimen of MPT, a flat, continuous horizontal layer of cotton shall be placed on the floor of the test chamber. centered on the vertical axis of the test specimen, extending 75 â€“ 100 mm (3- 4 inches) outward in all directions except in the direction of the burner, where it shall extend to just contact the angle block. The upper surface of the cotton shall be 235 Â±6 mm (9.25 Â±0.25 inch) below the point B at which the tip of the blue inner cone of the flame shall impinge on the specimen (See Figure 4.). These layers of cotton shall be arranged so as not to be disturbed during the performance of this test. There shall be no cotton on the burner. or on or under the angle block.

6.4.5.5 When testing a specimen of fitting or clamp. no cotton is required.

6.4.5.6 With the burner vertical. the height of the test flame shall be adjusted to 125 Â±10 mm (5.0 Â±0.4 inch), with an inner blue cone 40 Â±2 mm (1.6 Â±0.1 inch) in length. A gas-supply gauge pressure of 10-20

lbf/in2 or 69 â€“ 138 kPa or 690 â€“ 1380 mbar or 700 â€“ 1400 gf/cm2 has been found to be adequate to maintain the required flame. A cylinder shall not be used when this range of pressure is no longer

sustainable at Room Temperature. The burner shall then be positioned on the angle block, with its barrel at an angle of 20Â° to the vertical.

6.4.5.7 The motion of the angle block (to allow smooth removal of the flame from the specimen, and smooth reapphcation of the Raine) shall not disturb the layer of cotton on the Roor of the enclosure

The alignment of the angle block shall be such that the axis of the burner barrel and the Longitudinal axis of the specimen are in the same plane Point A is the point which intersects the longitudinal axis of the barrel with the plane of the tip of the barrel and shall be adjusted to 40 Â±2 mm (1.6 Â± 0.1 inch) from point B at which the extended Longitudinal axis of the barrel meets the outer surface of the specimen. Point B is the point at which the tip of the blue inner cone touches the center of the front of the specimen.

6.4.5.8 The angle block shall be moved into position such that the tip of the inner blue cone of the flame impinges on the outer surface of the specimen for 15 seconds, and is then moved away for 15 seconds. This cycle shall be repeated until 2 applications of the flame have been completed. In all cases, the movement of the angle block shall be smooth and quick, with minimum disturbance of the chamber air. If the specimen changes location due to heating or burning, or warping or bending, the position of the burner shall be adjusted so that the point of impingement remains on the same location of the specimen.

6.4.5.9 When any specimen emits flaming or glowing particles or flaming drops that fall outside the area of the testing surface covered by the cotton, or fall onto the wedge or burner, or both. the test results shall be discarded and the test repeated. For the repeat test. the area covered by the cotton may be increased, placed over the wedge. or both

6.4.5.10 When flaming of the specimen persists longer than 15 seconds after removal of the burner flame. the burner flame shall be reapplied regardless of whether flaming has ceased from the first application. If flaming ceases and only Glowing Combustion continues after 15 seconds, the burner flame shall be reapplied.

6.4.5.11 After the test is completed. the exhaust system shall be activated to remove all smoke and fumes from the chamber.

6.4.5.12 If only one of the three specimens tested fails to meet the requirements, six additional specimens shall be tested. All six additional specimens shall meet the requirements.

6.4.6 Results and calculations

6.4.6.1 During and after the test, the following shall be recorded:

a) The time for flaming of the specimen to self-extinguish, after the end of each application of the burner flame; and

b) For MPT â€“ percentage of the indicator flag burned away or charred (other than simply scorched or soot-covered: the portion of the kraft paper in contact with the specimen is not considered part of the flag): and

C) For MPT â€“ any ignition of the cotton. Flameless charring of the cotton shall be ignored; and

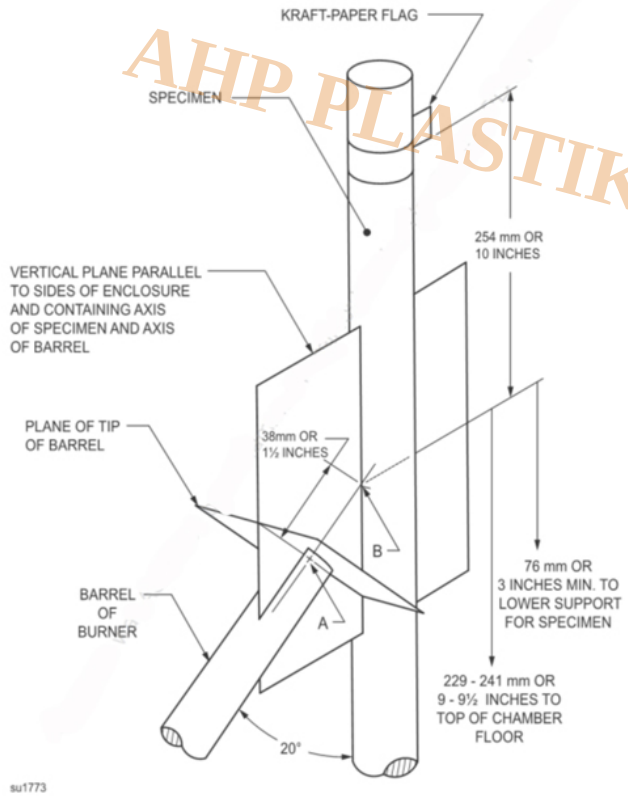
d) For fittings and clamps, the specimen has been completely consumed.

Figure 4

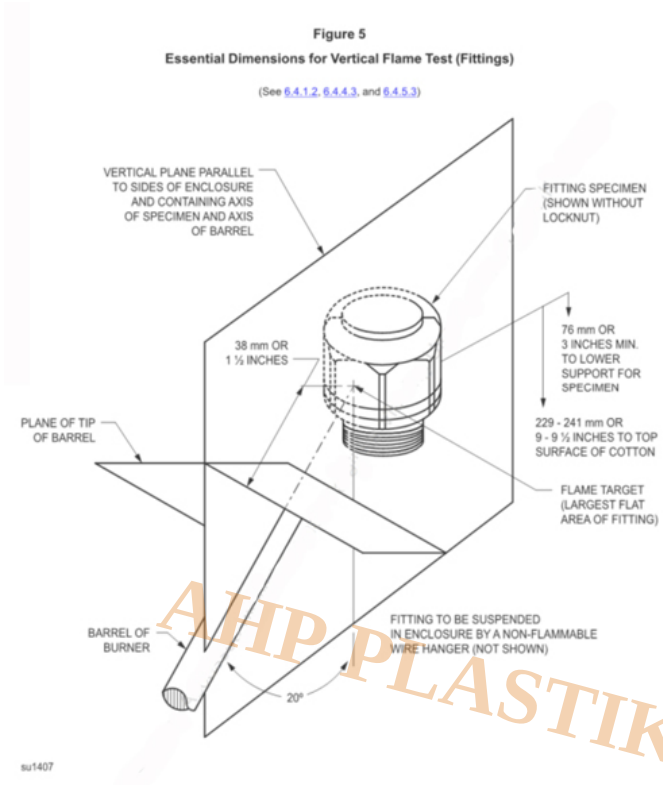
Essential Dimensions for Vertical Flame Test (MPT)

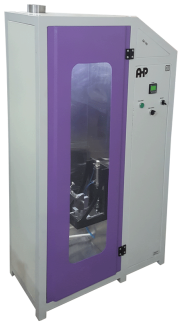
(See 6.4.1.2, 6.4.4.3, 6.4.5.2, and 6.4.5.4)

Proportions exaggerated for clarity of detail



The specimen shall be secured at both ends and supported in a manner that ensures it remains in a fixed position througho applications of the flame.





Flame Test Chamber According to UL 1696

- Chamber size â€“ 300 Â±50 mm (12 Â±2 inch) wide. 350 Â±50 mm (14 Â±2 inch) deep, and 600 Â±50 mm (24 Â±2 inch) high
- 20 Â±1 degrees angle block is included
- Laboratory burner conforming to ASTM 05025
- Machine is according to UL 1696
- Automatic application of flame
- Digital timer included
- Automatic timing control of the cycle
- Gas pressure indicator
- Gas flow indicator

Category

1. Equipment for Standards
2. Standards