

FLAME RESISTANCE OF CLOTH; VERTICAL

1. SCOPE

1.1 This method is intended for use in determining the resistance of cloth to flame and glow propagation and tendency to char. It is designated primarily for cellulosic fabrics treated with a flame retardant, but may be utilized in other applications as specified in applicable procurement documents. In addition to the vertical position of the sample and flame exposure conditions common to tests of this type, the method defines gas composition, burner, cabinet, temperature and humidity test conditions since it is designed primarily for interlaboratory testing of the same material.

2. TEST SPECIMEN

2.1 The specimen shall be a rectangle of cloth 2 3/4 inches (7.0 cm) by 12 inches (30.5 cm) with the long dimension parallel to either the warp or filling direction of the cloth. No two warp specimens shall contain the same warp yarns, and no two filling specimens shall contain the same filling yarn.

3. NUMBER OF DETERMINATIONS

3.1 Unless otherwise specified in the material specification, five specimens from each of the warp and filling directions shall be tested from each sample unit.

4. APPARATUS

4.1 Cabinet. A cabinet and accessories, fabricated in accordance with the requirements specified in figures 5903A, B, and C. Galvanized sheet metal or other suitable metal shall be used. The entire inside back wall of the cabinet shall be painted black to facilitate the viewing of the test specimen and pilot flame.

4.2 Burner. The burner shall be equipped with a variable orifice to adjust the flame height, a barrel having a 3/8 inch (9.5 mm) inside diameter and a pilot light.

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4.2.1 The burner may be constructed by combining a 3/8 inch (9.5 mm) inside diameter barrel $3 \pm 1/4$ inches (76.2 ± 6.4 mm) long from a fixed orifice burner with a base from a variable orifice burner.

4.2.2 The pilot light tube shall have a diameter of approximately 1/16 inch (1.6 mm) and shall be spaced 1/8 inch (3.2 mm) away from the burner edge with a pilot flame 1/8 inch (3.2 mm) long.

4.2.3 The necessary gas connections and the applicable plumbing shall be as specified in Figure 5903D except that a solenoid valve may be used in lieu of the stopcock valve to which the burner is attached. The stopcock valve or solenoid valve, whichever is used, shall be capable of being fully opened or fully closed in 0.1 second.

4.2.4 On the side of the barrel of the burner, opposite the pilot light there shall be a metal rod of approximately 1/8 inch (3.2 mm) diameter spaced 1/2 inch (12.7 mm) from the barrel and extending above the burner. The rod shall have two 5/16 inch (7.9 mm) prongs marking the distances of 3/4 inch (19 mm) and 1 1/2 inches (38.1 mm) above the top of the burner.

4.2.5 The burner shall be fixed in a position so that the center of the barrel of the burner is directly below the center of the specimen.

4.3 A control valve system with a delivery rate designed to furnish gas to the burner under a pressure of $2 \frac{1}{2} \pm 1/4$ lbs. ($1.1 \text{ kg} \pm 0.1 \text{ kg}$) per square inch at the burner inlet (see 7.1). The manufacturer's recommended delivery rate for the valve system shall include the required pressure to the tip.

4.4 A synthetic gas mixture of the following composition within the following limits (analyzed at standard conditions): 55 ± 3 percent hydrogen, 24 ± 1 percent methane, 3 ± 1 percent ethane, and 18 ± 1 percent carbon monoxide, which will give a specific gravity of 0.365 ± 0.018 (air = 1) and a B.T.U. content of 540 ± 20 per cubic foot (dry basis) at 21°C.

4.5 Metal hooks and weights to produce a series of total loads to determine length of char. The metal hooks shall consist of No. 19 gage steel wire or equivalent and shall be made from 3 inch (76.2 mm) lengths of the wire and bent 1/2 inch (12.7 mm) from one end to a 45 degree hook. One end of the hook shall be fastened around the neck of weight to be used.

4.6 Stop second.

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4.6 Stop watch or other device to measure the burning time to 0.2 second.

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4.7 Scale, graduated in 0.1 inch (1 mm) to measure the length of char.

5. PROCEDURE

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5.1 The material undergoing test shall be evaluated for the characteristics specified in the applicable procurement document, i.e. after-flame time, after-glow time and char length on each specimen as applicable.

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5.2 All specimens to be tested shall be at moisture equilibrium under standard atmospheric conditions in accordance with Section 4 of this Standard. Each specimen to be tested shall be exposed to the test flame within 20 seconds after removal from the standard atmosphere.

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5.2.1 In case of dispute all testing will be conducted under Standard Atmospheric Conditions in accordance with Section 4 of this Standard.

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5.3 The specimen in its holder shall be suspended vertically in the cabinet in such a manner that the entire length of the specimen is exposed and the lower end is 3/4 inch (19 mm) above the top of the gas burner. The apparatus shall be set up in a draft free area.

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5.4 Prior to inserting the specimen, the pilot flame shall be adjusted to approximately 1/8 inch (3.2 mm) in height measured from its lowest point to the tip. The burner flame shall be adjusted by means of the needle valve in the base of the burner to give a flame height of 1 1/2 inches (38.1 mm) with the stopcock fully open and the air supply to the burner shut off and taped. The 1 1/2 inch (38.1 mm) flame height is obtained by adjusting the valve so that the uppermost portion (tip) of the flame is level with the tip of the metal prong (see Figure 5903B) specified for adjustment of flame height. It is an important aspect of the evaluation that the flame height be adjusted with the tip of the flame level with the tip of the metal prong. After inserting the specimen, the stopcock shall be fully opened, and the burner flame applied vertically at the middle of the lower edge of the specimen for 12 seconds and the burner turned off. The cabinet door shall remain shut during testing.

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METHOD 5903.2

5.5 The after-flame time shall be the time the specimen continues to flame after the burner flame is shut off.

5.6 The after-glow time shall be the time the specimen continues to glow after it has ceased to flame. If the specimen glows more than 30 sec., the specimen holder containing the specimen shall be removed from the test cabinet without any unnecessary rate of movement of the specimen which will fan the glow, and suspended in a draft-free area in the same vertical position as in the test cabinet. When more than one glowing specimen is suspended outside the test apparatus, the specimens shall be spaced at least six inches (15.3 cm) apart. The specimens shall remain stationary until all glowing has ceased. The glow shall not be extinguished even when the after-glow time is not being determined.

5.7 After each specimen is removed, the test cabinet shall be cleared of fumes and smoke prior to testing the next specimen.

5.8 After both flaming and glowing have ceased, the char length shall be measured. The char length shall be the distance from the end of the specimen, which was exposed to the flame, to the end of a tear (made lengthwise) of the specimen through the center of the charred area as follows: The specimen shall be folded lengthwise and creased by hand along a line through the highest peak of the charred area. The hook shall be inserted in the specimen (or a hole, 1/4 inch (6.4 mm) diameter or less, punched out for the hook) at one side of the charred area 1/4 inch (6.4 mm) from the adjacent outside edge and 1/4 inch (6.4 mm) in from the lower end. A weight of sufficient size such that the weight and hook together shall equal the total tearing load required in 5.9.1 shall be attached to the hook.

5.9 A tearing force shall be applied gently to the specimen by grasping the corner of the cloth at the opposite edge of the char from the load and raising the specimen and weight clear of the supporting surface. The end of the tear shall be marked off on the edge and the char length measurement made along the undamaged edge.

5.9.1 Loads for determining char length. The specific load applicable to the weight of the test cloth shall be as follows:

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7. NOTES

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Specified weight per square yard of cloth before any fire retardent treatment or coating - ounces	Total tearing weight for determining the charred length - pound
2.0 to 6.0	0.25
Over 6.0 to 15.0	0.5
Over 15.0 to 23.0	0.75
Over 23.0	1.0

5.10 The after-flame time and after-glow time of the specimen shall be recorded to the nearest 0.2 second and the char length to the nearest 0.1 inch (1 mm).

6. REPORT

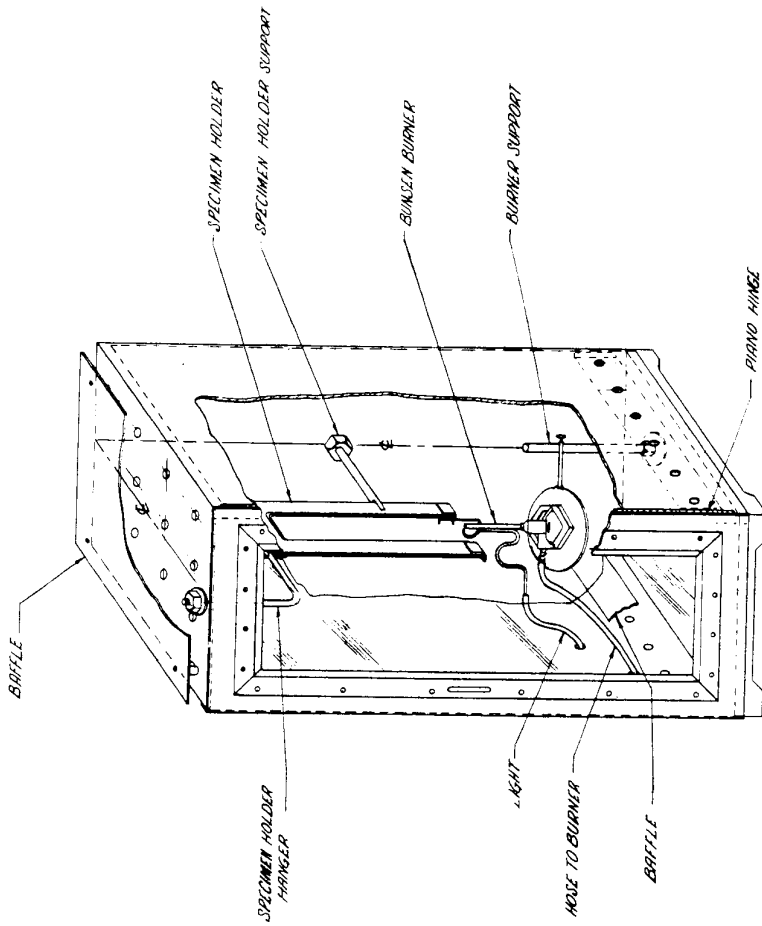
6.1 The after-flame time, after-glow time and char length of the sample unit shall be the average of the results obtained from the individual specimens tested. All values obtained from the individual specimens shall be recorded.

6.2 The after-flame time and after-glow shall be reported to the nearest 0.2 second and the char length to the nearest 0.1 inch (1 mm).

7. NOTES

7.1 The gas mixture described and the regulator valve system, models L-350 and 70 with hose and fittings connected in series and used in the development of this method may be obtained from Matheson Gas Products, P.O. Box 85, East Rutherford, New Jersey 07073.

7.2 The test cabinet of the type described, in this test method may be obtained from U. S. Testing Company, 1941 Park Avenue, Hoboken, New Jersey 07030.



ILLUSTRATION

FIGURE 5903A - Vertical flame resistance textile apparatus.



ILLUSTRATION

FIGURE 5903A - Vertical flame resistance textile apparatus.

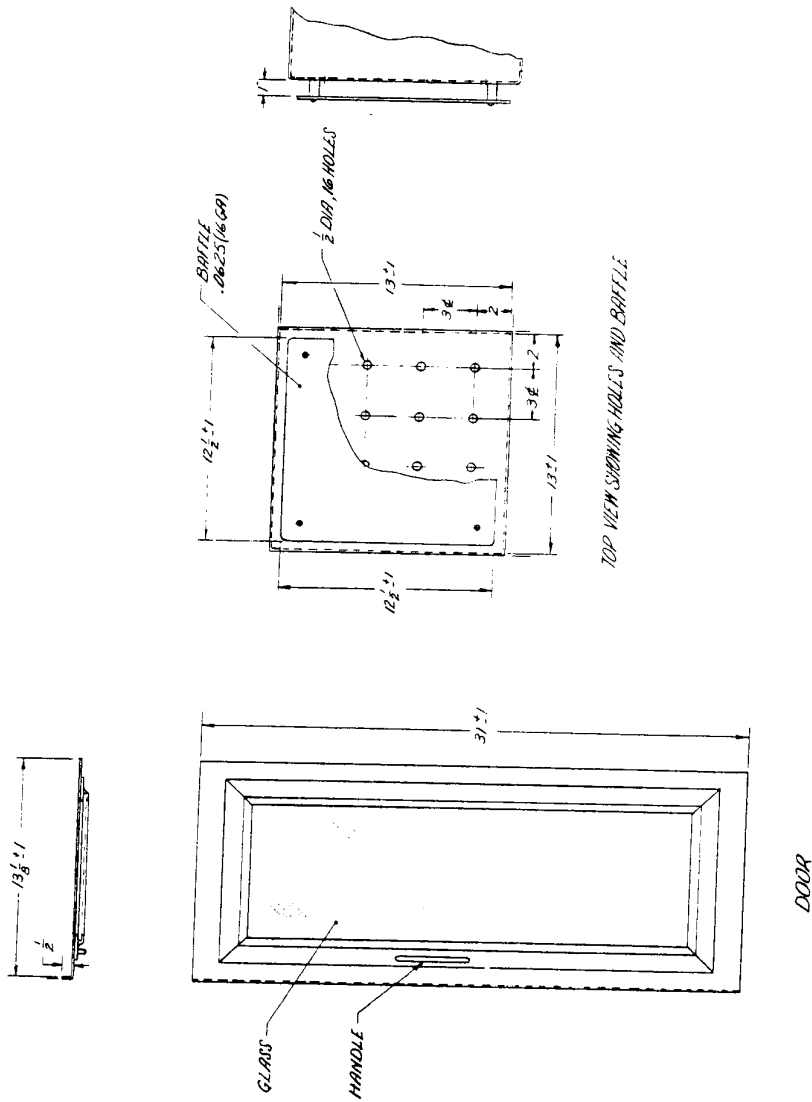


FIGURE 5903B - Vertical flame resistance textile apparatus, door and top view w/baffle.

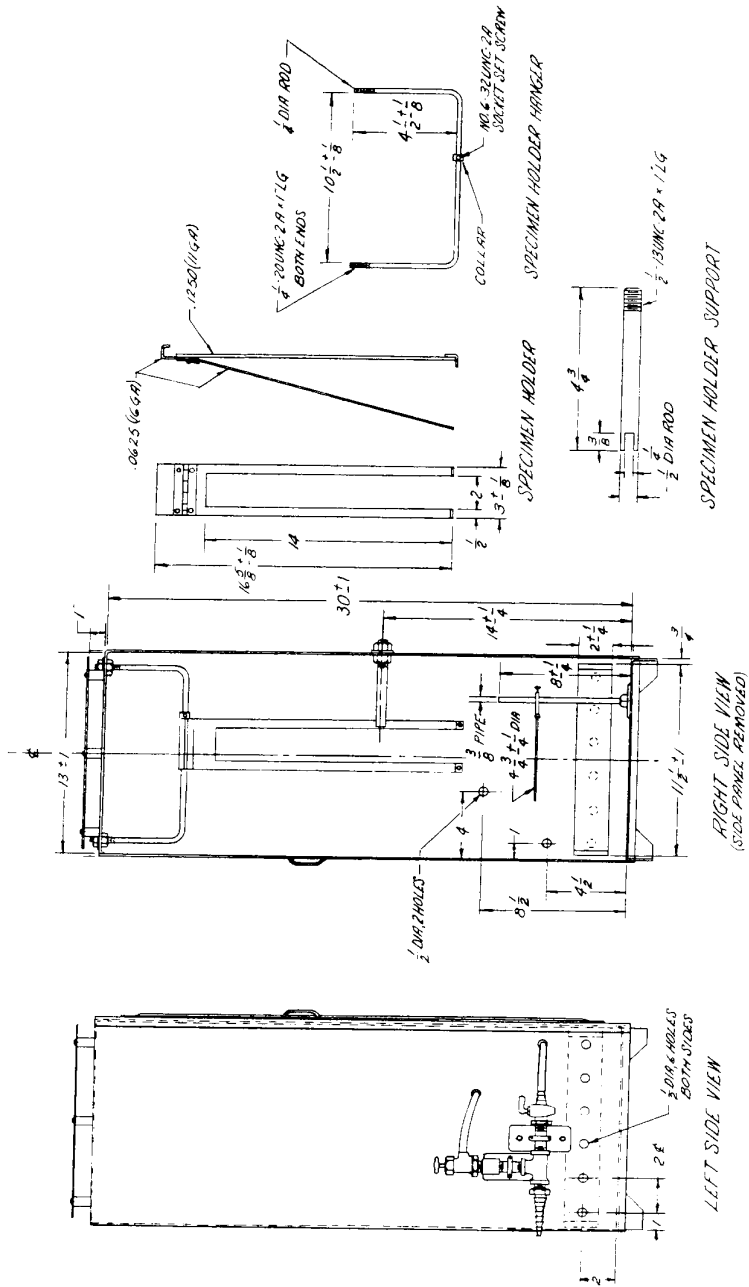


FIGURE 5903C - Vertical flame resistance textile apparatus, views and details.

