

Chapter 18

Recommended Procedure for the 4-Ply Horizontal Flammability Test For Aircraft Blankets

18.1 Scope

This test method is intended for use in determining the resistance of blankets to flame when tested in the horizontal position and exposed to the Bunsen burner for 12 seconds.

18.2 Definitions

18.2.1 Ignition Time

Ignition time is the length of time the burner flame is applied to the specimen. It is 12 seconds for this test.

18.2.2 Flame Time

Flame time is the time in seconds that the specimen continues to flame after the burner flame is removed from beneath the specimen. Surface burning that results in a glow but not in a flame is not included.

18.2.3 Drip Flame Time

Drip flame time is the time in seconds that any flaming material continues to flame after falling from the specimen to the floor of the chamber. If no material falls from the specimen, the drip flame time is reported to be zero (0) seconds, and the notation "No Drip" is reported. If there is more than one drip, the drip flame time reported is that of the longest flaming drip. If succeeding flaming drips reignite earlier drips that flamed, the drip flame time reported is the total of all flaming drips.

18.3 Test Apparatus

18.3.1 Test Cabinet

The test will be conducted in a draft-free cabinet fabricated in accordance with figures 18-1, 18-2, and 18-3, or other equivalent enclosures acceptable to the FAA. A hole may be drilled into a wall to accommodate the test fixture. It is suggested that the cabinet be located inside an exhaust hood to facilitate clearing the cabinet of smoke after each test. Stainless steel or other corrosion resistant metal 0.04 inch (1 mm) thick will be used for the bottom surface of the chamber.

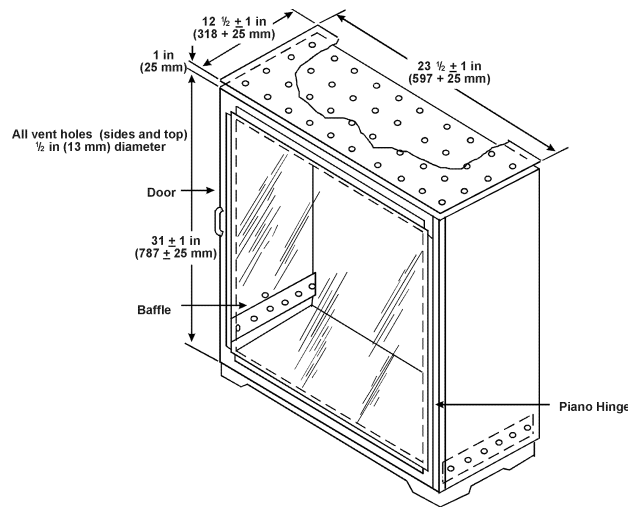


Figure 18-1. Sketch of Bunsen Burner Test Cabinet

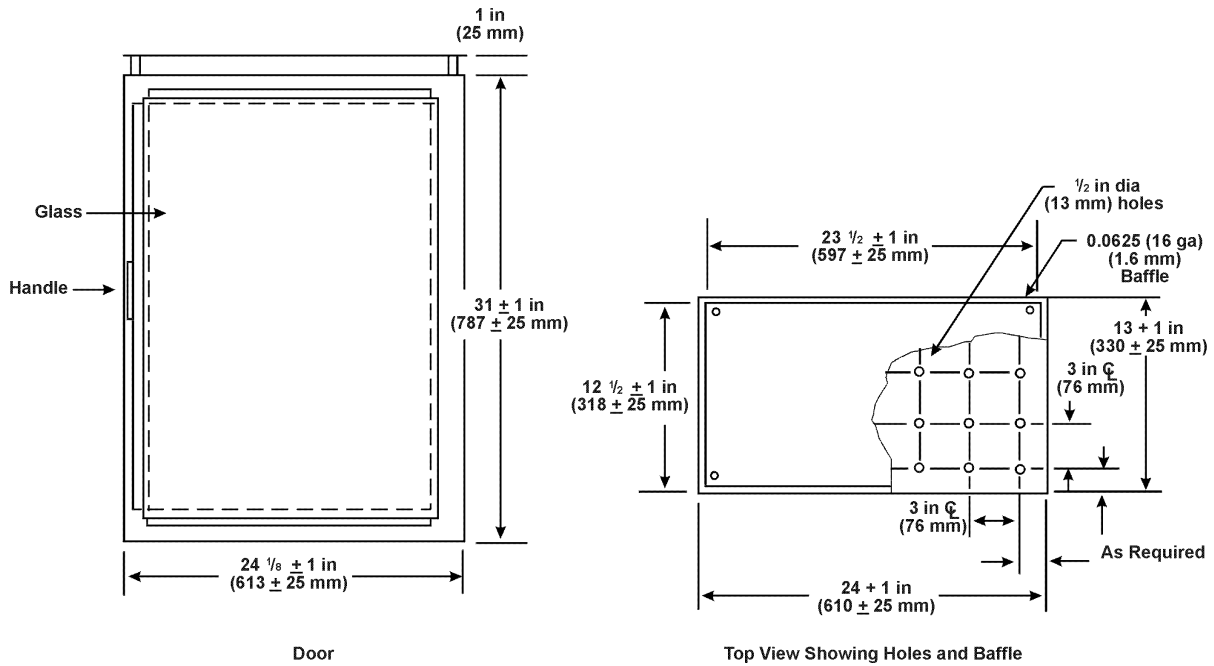


Figure 18-2. Front and Top View of Bunsen Burner Test Cabinet

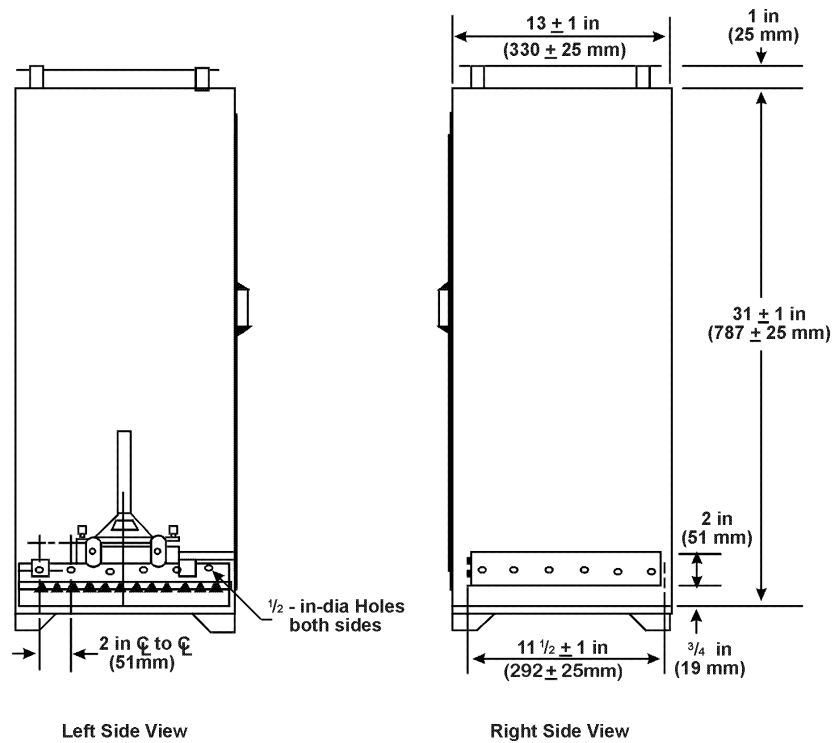


Figure 18-3. Side Views of Bunsen Burner Test Cabinet

18.3.2 Specimen Holder

The specimen holder will be fabricated of corrosion-resistant metal, as shown in figure 18-4. This is the same holder used for the 45-degree test specified in FAR 25.855.

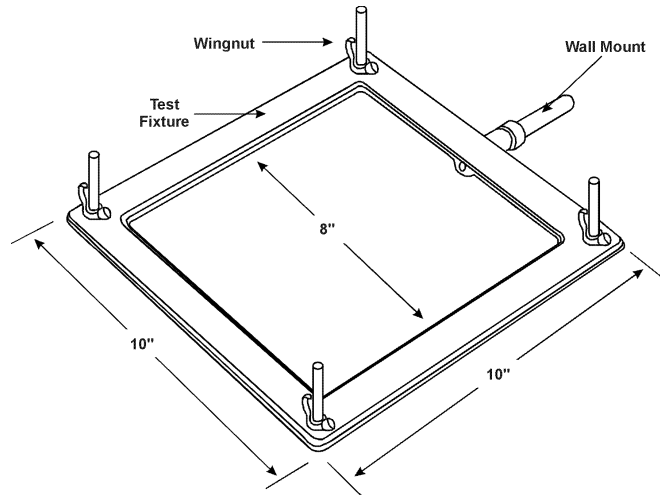


Figure 18-4. Horizontal Test Fixture

18.3.3 Burner

The burner shall be a Bunsen or Tirrill type, have a 3/8-inch (10-mm) inside diameter barrel and be equipped with a needle valve located at the bottom of the burner barrel to adjust the gas flow rate and, thereby, adjust the flame height. There should be a means provided to move the burner into and out of test position when the cabinet door is closed.

18.3.3.1 Burner Fuel

Methane gas (99 percent minimum purity) or other burner fuel acceptable to the FAA will be used. Methane is the preferred fuel. It can be used without adding air through the aspirating holes at the bottom of the burner flame barrel, i.e., a pure diffusion flame may be used.

18.3.3.2 Plumbing for Gas Supply

The necessary gas connections and the applicable plumbing are essentially as shown in figure 18-5. A control valve system with a delivery rate designed to furnish gas to the burner under pressure of $2 \frac{1}{2} \pm \frac{1}{4}$ psi (17 ± 2 kPa) at the burner inlet should be installed between the gas supply and the burner.

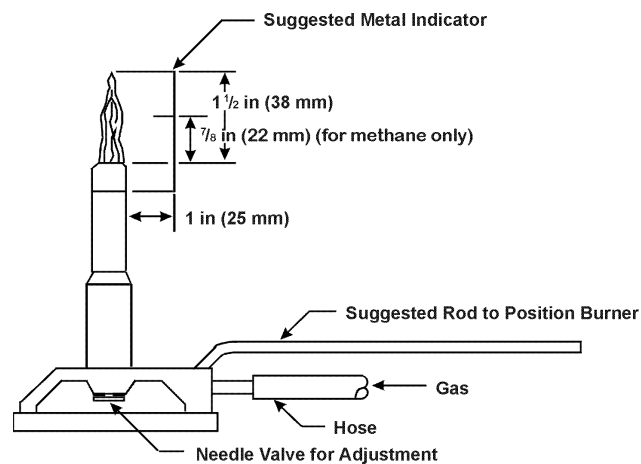


Figure 18-5. Burner Plumbing and Burner Flame Height Indicator

18.3.3.3 Flame Height Indicator

A removable height indicator aids in setting the height of the flame. A suitable indicator has a prong extending 1.5 inches (38 mm) above the top of the burner barrel and spaced 1 inch (25 mm) from the burner barrel, as shown in figure 18-5. If using methane as the burner fuel, it is desirable to have two prongs for measuring the flame height, one prong to indicate the height of the inner cone of the flame, and one prong to indicate the height of the tip of the flame. For methane, it has been determined that when the height of the inner flame is 1.5 inches (38 mm) long the proper flame profile is achieved.

18.3.4 Timer

A stopwatch or other device calibrated to the nearest 0.1 second shall be used to measure the time of application of the burner flame, the flame time, and the drip flame time.

18.4 Test Specimens

18.4.1 Specimen Selection

Specimens tested should be cut from new aircraft blankets. If each side of a blanket is composed of a different material, then each side must be tested.

18.4.2 Specimen Number

At least three specimens will be prepared and tested.

18.4.3 Specimen Size

An 8- by 8-inch specimen is the exposed sample size, however, an 11- by 11-inch specimen should be cut in order to pull the specimen taut once secured in the test fixture. The excess material can be trimmed off.

18.4.4 Specimen Thickness

The specimen will be of four-ply configuration. This may be accomplished by folding the blanket in half and then folding it again or by stacking four individual blanket specimens cut to size. This also includes blankets with decorative appliqués.

18.5 Conditioning

18.5.1 Condition specimens at $70^{\circ} \pm 5^{\circ}\text{F}$ ($21^{\circ} \pm 3^{\circ}\text{C}$) and $50\% \pm 5\%$ relative humidity for 24 hours minimum. Remove only one specimen at a time from the conditioning environment immediately before testing.

18.6 Procedure

18.6.1 Burner Adjustment

18.6.1.1 If using methane as the burner fuel, ensure that the air supply to the burner is shut off.

18.6.1.2 Open the stopcock in the gas line fully and light the burner.

18.6.1.3 Adjust the needle valve on the burner to give the proper 1.5-inch (38-mm) flame height and remove the flame height indicator.

18.6.2 Test Procedure

18.6.2.1 Insert the specimen fixture with specimen in place into the test cabinet. The bottom of the specimen should be 3/4 inch above the level at the top of the burner. When testing two-sided blankets, the “nap” side (the downy or fuzzy surface of the fabric) should be exposed to the flame.

- 18.6.2.2 Close the cabinet door, and keep it closed during the test.
- 18.6.2.3 The timer must be started immediately upon positioning the burner. Position the burner so that it is directly under the geometric center of the test specimen. This is shown in figure 18-6.

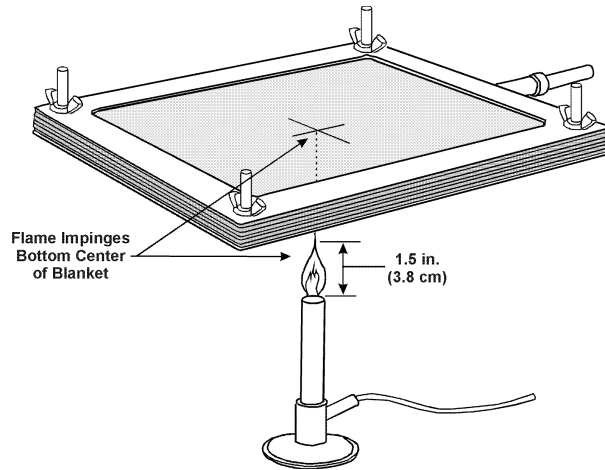


Figure 18-6. Horizontal Test Fixture with Four-Ply Blanket Sample

- 18.6.2.4 Apply the flame for 12 seconds and then withdraw it by moving the burner at least 3 inches (76 mm) from the specimen or by turning the gas off. If the flame extinguishes during the ignition time for any reason, the test will be rerun.
- 18.6.2.5 If flaming material falls from the test specimen, determine the drip flame time for the specimen.
- 18.6.2.6 Determine the flame time for the specimen.
- 18.6.2.7 After all flaming ceases, the cabinet door should be opened slowly to clear the test cabinet of fumes and smoke. The exhaust fan may be turned on to facilitate clearing the smoke and fumes.
- 18.6.2.8 Remove any material that fell from the specimen to the bottom of the cabinet. If necessary, clean the test cabinet window prior to testing the next specimen.

18.7 Report

18.7.1 Material Identification

Fully identify the material tested including fiber type and type of FR treatment, if known.

18.7.2 Test Results

18.7.2.1 Ignition Time

Report the ignition time.

18.7.2.2 Flame Time

Report the flame time for each specimen tested. Determine and record the average value for flame time.

18.7.2.3 Drip Flame Time

Report the drip flame time for each specimen tested. Determine and record the average value for drip flame time. For specimens that have no drips, record zero (0) for the drip flame time and also record "No Drips."

18.8 Requirements

18.8.1 Flame Time

The average flame time for all of the specimens tested will not exceed 15 seconds.

18.8.2 Drip Flame Time

The average drip extinguishing time for all of the specimens tested will not exceed 5 seconds.

Chapter 18 Supplement

This supplement contains advisory material pertinent to referenced paragraphs.

18.3 Since this test method employs the 45-degree test fixture, the test cabinet called out is the cabinet used for 45-degree testing. Suitable test chambers of the type described are manufactured by U.S. Testing Co., 1415 Park Ave., Hoboken, New Jersey 07030; Atlas Electric Devices Co., 4114 N. Ravenswood Ave., Chicago, Illinois 60613; and The Govmark Organization Inc., P.O. Box 807, Bellmore, New York 11710. As stated in the test method, it is permissible to use other draft-free cabinets acceptable to the FAA. One such cabinet is the Horizontal Vertical Flame Chamber manufactured by Atlas Electric Devices (see above for address).

Draft free implies a condition of no air currents in a closed in space. A test cabinet other than one fabricated in accordance with figures 18-1 to 18-3 may be found to be acceptable after review by the FAA. One way of determining whether the cabinet is draft free is to place a smoldering and smoking material, such as a lighted cigarette in the test cabinet, then closing the door and observing the behavior of the smoke for signs of drafts.

The entire inside back wall of the chamber may be painted flat black to facilitate viewing the test specimen.

18.3.2 The specimen holder used is the same holder used for the 45-degree Bunsen burner test with the exception of the mounting stud. Other specimen holders are acceptable provided the test criteria is met.

18.3.3 A suitable burner is available from Rascher & Betzold Inc., 5410 N. Damen Ave., Chicago, Illinois 60625, Catalog No. R3726A.

If the test cabinet is equipped with a glove box, it is permissible to manually move the burner into test position.

18.3.3.1 A phenomenon that some labs have experienced is a sharp decrease in flame temperature after about three-fourths of the gas originally in the cylinder has been used. This has occurred primarily in labs that have single-stage regulators on their gas cylinders. Single-stage regulators differ from two-stage regulators in that control of the discharge pressure is not as accurate. Few designs should maintain constant or near constant discharge pressures over the full range of cylinder pressures. Therefore, it is necessary to make adjustments periodically to allow for decreasing inlet pressures. Even the slightest drop in pressure can affect the flow rate of gas through the burner orifice. This, in turn, can cause temperature variation. By using a two-stage regulator or adjusting pressure on a single-stage regulator as the cylinder gets low, this problem can essentially be eliminated.

18.3.3.3 The tip of the methane flame is blue, transparent, and difficult to see. It is more easily seen if there is no light on the flame, as in a darkened room. The inner cone of the flame is, however, more visible and easily seen and can be used to monitor flame height. When the flame height (blue transparent tip) is set to 1.5 inches, the height of the inner cone has been found to vary slightly from burner to burner, but is generally about 7/8 inch. Therefore, if the inner cone height is used to monitor flame height, the inner cone height needs to be established for that burner.

18.5 It is recommended that only one specimen be removed at a time from the conditioning chamber prior to subjection to the flame. Some facilities, however, have conditioning chambers located in areas remote from the testing area. In this case, it is permissible to remove more than one specimen at a time if each specimen is covered or carried in a container and protected until the specimen is subjected to the flame.

18.5.1 Industry standard conditioning for textiles is 65 percent relative humidity and 70°F.

18.6.2.2 It is important to note that the test should be watched carefully while it is being conducted. This applies to all samples.

18.6.2.7 The operator should refer to the facility's safety manual for further information dealing with smoke and flammability by-products.