



Standard Test Method for Flammability of Sleeping Bags¹

This standard is issued under the fixed designation F 1955; the number immediately following the designation indicates the year of original adoption or, in the case of revision, the year of last revision. A number in parentheses indicates the year of last reapproval. A superscript epsilon (ϵ) indicates an editorial change since the last revision or reapproval.

1. Scope

1.1 This test method provides a means to measure the end use flammability, for example, burn rate of sleeping bags which use various materials and constructions in their manufacture, and provides labeling requirements to facilitate the identification of products conforming to this test method.

1.2 This test method defines the procedures described in the flammability standard CPAI-75 which has been the accepted standard in the sleeping bag industry in the U.S. for over 30 years.

1.3 The values stated in SI units are to be regarded as standard. Inch-pound units are provided for information only.

1.4 *This standard should be used to measure and describe the properties of materials, products, or assemblies in response to heat and flame under controlled laboratory conditions and should not be used to describe or appraise the fire hazard or fire risk of materials, products, or assemblies under actual fire conditions. However, results of this test may be used as elements of a fire-risk assessment which takes into account all of the factors which are pertinent to an assessment of the fire hazard of a particular end use.*

1.5 *This standard does not purport to address all of the safety concerns, if any, associated with its use. It is the responsibility of the user of this standard to establish appropriate safety and health practices and determine the applicability of regulatory limitations prior to use.*

2. Referenced Documents

2.1 ASTM Standards:

D 123 Terminology Relating to Textiles²

D 1776 Practice for Conditioning Textiles for Testing²

2.2 *Industrial Fabrics Association International Standard:*³
Specification CPAI-75 A Rate of Burn Standard for Sleeping Bags

3. Terminology

3.1 Definitions:

3.1.1 *burn rate, n*—the distance traveled by a flame on a burning material or product during a specified time under specified conditions.

3.1.2 *sleeping bag, n*—a structure made of down, synthetic fiberfill, shell fabrics, and/or other materials that is designed for thermal protection while sleeping (for example, outdoors, tent, cabin).

3.2 For definitions of other textile or flammability terminology used in this test method, see Terminology D 123.

4. Summary of Test Method

4.1 Ten specimens are cut from individual sleeping bags or a physically accurate facsimile. Five are laundered three times in accordance with the manufacturer's instructions. Each of the specimens are then placed in a special apparatus. A standardized flame is applied to the folded edge for a specified time under controlled conditions and the burn rate is calculated to determine if the specimens meet specification requirements.

5. Significance and Use

5.1 This test method is considered satisfactory for the acceptance of commercial shipments of sleeping bags since this test method has been used extensively in the trade for acceptance.

5.2 Many fabrics due to physical makeup or the finishing processes are combustible to some degree. Some combustible fabrics when used for sleeping bags are potentially dangerous to the user because of ease of ignition and burn rate. One of these characteristics can be measured with this test method. It must be understood, however, that no guarantee can be given and none is implied that sleeping bags achieving this standard for flammability will not be hazardous under certain conditions.

5.3 Finishes and fabric surface changes can exert a large effect on flammability. Therefore, sleeping bags are tested before as well as after laundering or dry cleaning in accordance with the manufacturer's instructions.

5.4 This test method is applicable to all sleeping bags.

6. Sampling

6.1 *Lot Size*—A lot shall be considered the size of the contract between the buyer and the supplier unless otherwise agreed upon between the supplier and the buyer.

6.2 All specimens should be selected randomly from the lot.

¹ This test method is under the jurisdiction of ASTM Committee F-8 on Sports Equipment and Facilities and is the direct responsibility of Subcommittee F08.22 on Sleeping Bags.

Current edition approved Jan. 10, 1999. Published May 1999.

² *Annual Book of ASTM Standards* Vol. 07.01.

³ Support for Specification CPAI-75 is to be discontinued by the Industrial Fabrics Association International and replaced with Test Method F 1955.

6.3 *Sample Unit*—A sample unit shall consist of ten specimens.

7. Conditions for Testing

7.1 Tests to determine the burn rate shall be performed under or upon immediate removal from standard atmospheric conditions and on specimens in moisture equilibrium under standard atmospheric conditions as stated in Practice D 1776 as related to textile test specimens.

7.2 All testing shall be performed in a draft-free environment.

8. Apparatus and Materials

8.1 *Test Chamber*—A test chamber similar to that shown in Fig. 1 shall be used under or in some type of exhaust or fume hood to allow for the venting of the fumes and smoke associated with the test method.

8.2 *Support Frame*—A support frame conforming to Fig. 2 shall be used. It shall be constructed of 3-mm (1/8 in.) steel.

8.3 *Hold-Down Plate*—A hold down plate conforming to Fig. 3 shall be used. It shall be constructed of 3-mm (1/8 in.) steel.

8.4 *Spacers and Clamps*—A spacer and clamping arrangement shall be used which is capable of positioning the hold-down plate with its bottom surface 25 mm (1 in.) above the top surface of the support frame, so that it will hold the test specimen at a 25 mm (1 in.) thickness on the two sides and the back.

8.5 *Thread*—#50 white mercerized cotton thread.

8.6 *Tape*, for fastening the thread to the frame. (Alternate methods of accomplishing this, such as small clips, may also be used.)

8.7 *Weights*, for attachment to the timing threads (see Note 1).

NOTE 1—Small clamp-type paper clips work well as weights.

8.8 *Burner*—A Bunsen burner with a tube 10 mm (3/8 in.) in inside diameter shall be used. The gas adjusting valve is set to provide a flame, with the tube vertical, 38 mm (1 1/2 in.) in height. The air inlet to the burner is closed.

8.9 *Gas*—The gas used shall be methane gas of a technical grade of 97 % pure or better.

8.10 *Stopwatch*—A stopwatch or other timing device shall be used which is capable of measuring the burning time to 0.2 s.

9. Preparation and Conditioning of Test Specimens

9.1 *Specimen*—The specimen shall be taken from the sleeping bag as shown in Fig. 4 and shall have a finished size of 30 cm (12 in.) by 36 cm (14 in.). In the event that it is impossible to cut an actual sample from a sleeping bag due to its construction, a 30-cm (12-in.) by 71-cm (28-in.) facsimile may be constructed and folded. All components shall be used in their correct positions and amounts.

9.2 *Laundering*—Five of the ten specimens tested shall be laundered and dried three times in accordance with the procedures recommended by the manufacturer.

9.3 *Compression*—Samples shall be compressed to one half their original loft for 24 h prior to testing (see Note 2).

NOTE 2—An easy method of accomplishing this is to stack a number of specimens in a box and compress them all to half their original height under a board or plate held down by pins through the side of the box, etc.

| ITEM | NO. REQUIRED | DESCRIPTION, CM (IN) |
|------|--------------|--|
| 1. | 4 | CORNER ANGLE, 2.5 X 71.1 (1 X 28) |
| 2. | 4 | WINDOW FRAME, 7.6 X 71.1 (3 X 28) |
| 3. | 4 | FRAME SPACER, 4.45 X 10.2 (1-3/4 X 4) |
| 4. | 4 | WINDOW SEAT, 3.18 X 10.2 (1-1/4 X 4) |
| 5. | 1 | WINDOW - HEAT RESISTANT GLASS 0.476 X 50.8 X 50.8 (3/16 X 20 X 20) |
| 6. | 3 | PANEL, 60.96 X 60.96 (24 X 24) |
| 7. | 1 | TOP PLATE, 62.0 X 66.0 (24-1/2 X 26) |
| 8. | 2 | CHAIN, 61 (24) |
| 9. | 2 | WINDOW STOP RODS, 6 MM DIA. X 10 CM (1/4 DIA X 4) |
| 10. | 4 | S HOOKS |
| 11. | 22 | BOLT WITH NUT, 6 MM - 25 X 2 CM (1/4-20 X 3/4) |
| 12. | 6 | BOLT WITH NUT, 10 MM - 32 X 1 CM (10 - 24 X 1/2) |
| 13. | 2 | HOLE, 6 MM DIA (1/4 IN DIA) |

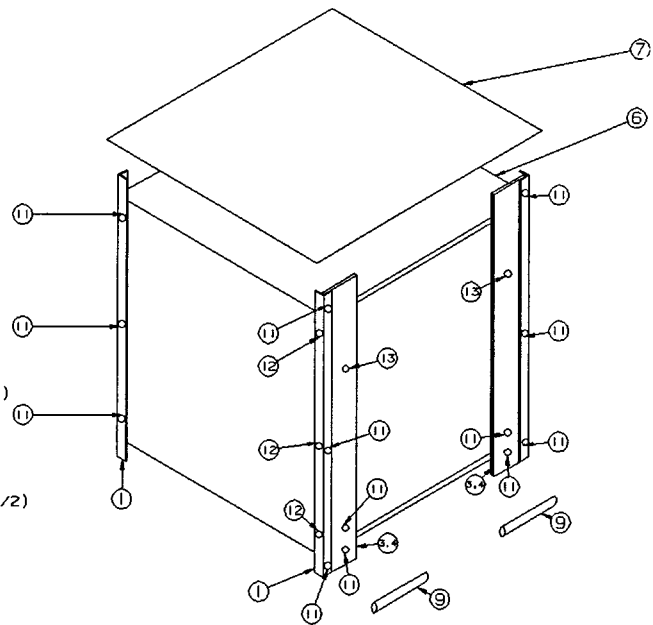
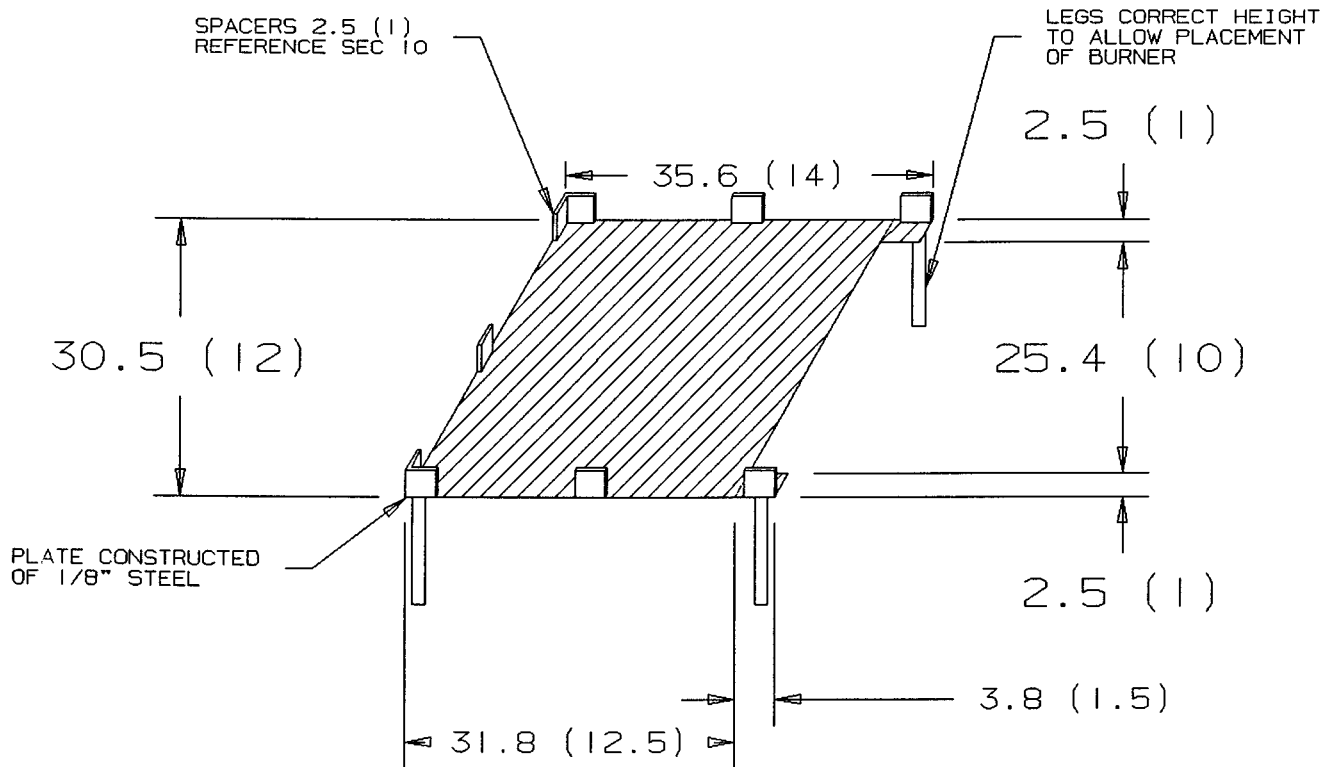


FIG. 1 Test Cabinet

DIMENSION IN CM (IN)



* NOTE - FOLDED EDGE OF SAMPLE TO BE EVEN WITH THIS EDGE OF FRAME FOR TESTING

FIG. 2 Support Frame

9.4 *Re-Lofting*—Following the 24-h compression period, the specimens shall be allowed a minimum of 1 h to regain their loft before tests are conducted.

10. Procedure

10.1 Mount the specimen horizontally on the support frame with the sewn sides and end held at 2.5-cm (1-in.) thickness by the U-shaped hold-down frame, spacers, and clamps with the folded end of the specimen positioned at the open end of the U-shaped frame.

10.2 Attach two #50 white mercerized cotton threads to one edge of the frame at points 3.8 cm (1½ in.) and 28 cm (11½ in.) back from the open end, for example, with 25 cm (10 in.) in between, and stretch across the specimen, attaching small weights to the overhanging ends of the threads. Timing will begin and end as the respective threads burn through and their weights drop.

10.3 With the flame adjusted as in 8.9 and the frame with mounted specimen in the test chamber, position the burner so that the center of the burner tip is 1.9 cm (¾ in.) below the center of the edge of the exposed end of the specimen.

10.4 Lower the test chamber door.

10.5 Expose the specimen to the flame for 30 s to force ignition (see Section 11).

10.6 Begin timing when the flame spread burns through the first thread causing the weights to fall. Continue timing until the flame spread burns through the second thread causing the weights to fall or the flame extinguishes itself before reaching the second thread. Stop the timing at this point.

10.7 The technician conducting this test method shall note on the report the amount of time which has elapsed and the distance that the flame has traveled. Repeat these procedures for the remaining nine test specimens.

11. Interferences

11.1 *Draft*—Uncontrolled air movement within the test chamber while tests are being performed can impact the test results severely, as noted in 7.2.

11.1.1 The most reproducible results are produced when the fan in the fume or exhaust hood is turned off, or down if a variable speed fan is used, during the 30-s ignition period.

DIMENSION IN CM (IN)

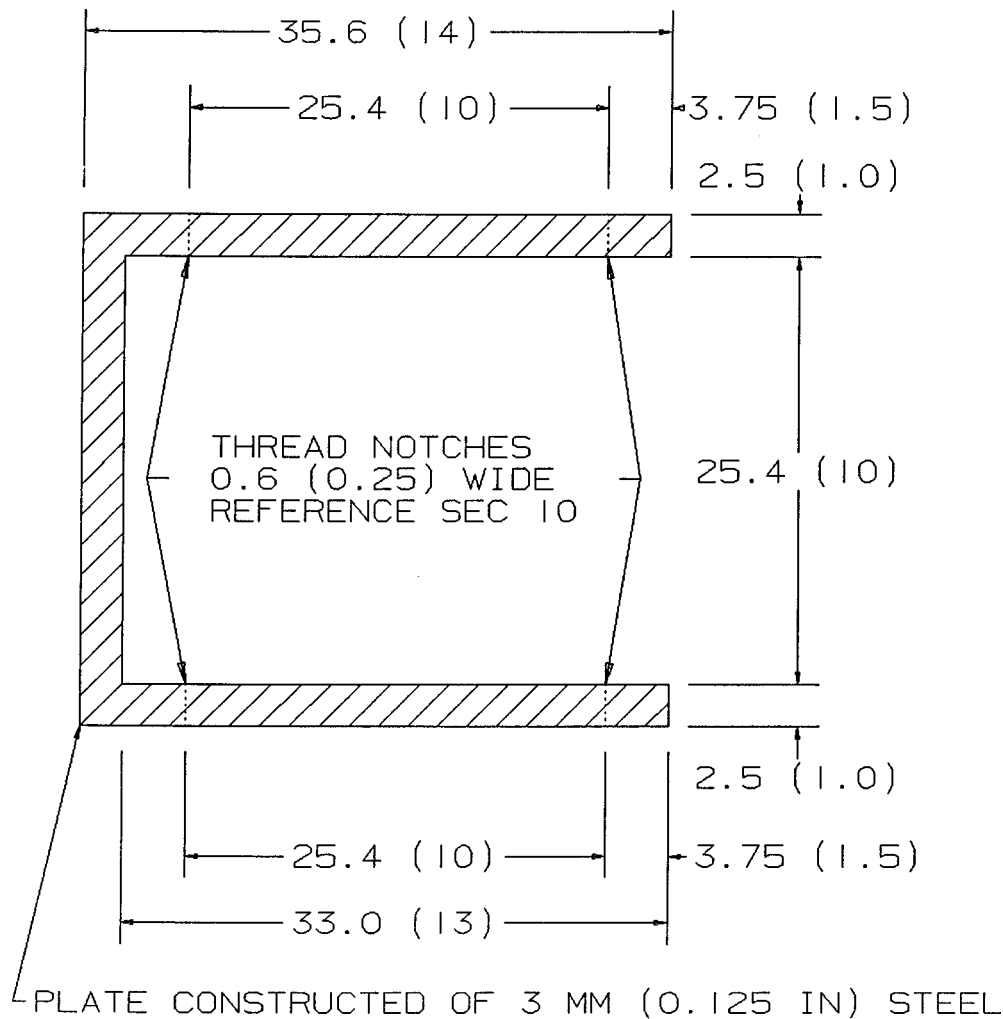


FIG. 3 Hold-Down Plate

11.1.2 If exhaust of the fumes becomes necessary during the actual burn time, the technician shall watch for any visible changes in the flaming, or increased burn rates, and either turn the fan down or off as necessary to avoid incorrect test results.

12. Calculation

12.1 *Burn Rate*—To calculate the burn rate use the following formula:

$$\text{burn rate} = 60 \times (D \div T) \tag{1}$$

where:

- D* = distance the flame travels, cm (in.), and
- T* = time for the flame to travel *D* cm (in.), s.

13. Report

13.1 *Performance Requirements*—When subjected to the test described in Section 10, the average burn rate shall not exceed 15 cm/min (6 in./min). No individual specimen shall have a burn rate of more than 20 cm (8 in.).

13.2 *Test Results*—The results of the test shall be given in a pass/fail statement.

13.3 *Labeling of Sleeping Bag*—A label or labels shall be permanently affixed to each sleeping bag containing the following information:

13.3.1 *Certification*—A statement that this sleeping bag conforms to the requirements of ASTM Test Method F 1955.

13.3.2 NOTE—SLEEPING BAGS WILL BURN. KEEP AWAY FROM FIRE SOURCES.

14. Precision and Bias

14.1 *Precision*—When tested in conformance to the criteria for certification as stated in the procedure, no justifiable statements can be made on the precision of this test method since the test results are pass/fail.

14.2 *Bias*—The true value of the flammability of a sleeping bag can only be described in the terms of a test method. Within this limitation, this test method has no known bias.

15. Keywords

- 15.1 burn rate; flammability; sleeping bag

DIMENSION IN CM (IN)

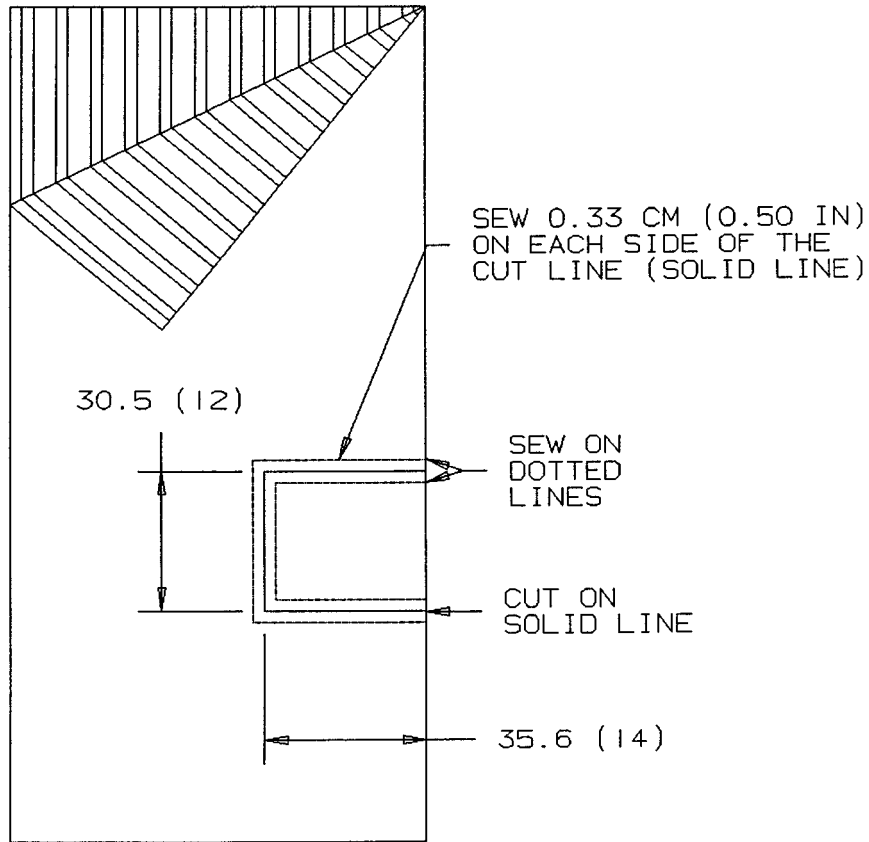


FIG. 4 Test Specimen

ASTM International takes no position respecting the validity of any patent rights asserted in connection with any item mentioned in this standard. Users of this standard are expressly advised that determination of the validity of any such patent rights, and the risk of infringement of such rights, are entirely their own responsibility.

This standard is subject to revision at any time by the responsible technical committee and must be reviewed every five years and if not revised, either reapproved or withdrawn. Your comments are invited either for revision of this standard or for additional standards and should be addressed to ASTM International Headquarters. Your comments will receive careful consideration at a meeting of the responsible technical committee, which you may attend. If you feel that your comments have not received a fair hearing you should make your views known to the ASTM Committee on Standards, at the address shown below.

This standard is copyrighted by ASTM International, 100 Barr Harbor Drive, PO Box C700, West Conshohocken, PA 19428-2959, United States. Individual reprints (single or multiple copies) of this standard may be obtained by contacting ASTM at the above address or at 610-832-9585 (phone), 610-832-9555 (fax), or service@astm.org (e-mail); or through the ASTM website (www.astm.org).