



Designation: ~~D6545—18~~ D6545 – 22

Standard Test Method for Flammability of Textiles Used in Children’s Sleepwear¹

This standard is issued under the fixed designation D6545; 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 evaluates the relative flammability of textiles and garments intended for use in children’s sleepwear. The procedures of this test method follow testing and laundering procedures used to evaluate the flammability of children’s sleepwear contained in U.S. Federal Regulations 16 CFR 1615 and 1616.

1.2 A textile used in children’s sleepwear must be tested in its original state and after 50 laundering and drying cycles to assess the flame resistance of the textile relative to its use life.

1.3 This method is identical to the method outlined in the regulations 16 CFR 1615 or 1616. The regulation includes additional information such as sampling plans, record keeping requirements, and interpretations for compliance applicable to children’s sleepwear. Please consult 16 CFR 1615 and 1616 for these operations and interpretations.

1.4 The values stated in SI units are to be regarded as ~~the standard; inch-pound standard.~~ The values given in parentheses after SI units are provided for information only and are not considered standard.

1.5 *This test method is used to measure and describe the response of materials, products, or assemblies to heat and flame under controlled conditions, but does not by itself incorporate all factors required for fire hazard or fire risk assessment of the materials, products, or assemblies under actual fire conditions.*

1.6 *Fire testing is inherently hazardous. Adequate safeguards for personnel and property shall be employed in conducting these tests.*

1.7 *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, health, and environmental health practices and determines the applicability of regulatory limitations prior to use. Specific precautionary information is found in 8.5 and 9.5.*

1.8 *This international standard was developed in accordance with internationally recognized principles on standardization established in the Decision on Principles for the Development of International Standards, Guides and Recommendations issued by the World Trade Organization Technical Barriers to Trade (TBT) Committee.*

2. Referenced Documents

2.1 *ASTM Standards:*²

¹ This test method is under the jurisdiction of ASTM Committee D13 on Textiles and is the direct responsibility of Subcommittee D13.52 on Flammability. Current edition approved Jan. 1, 2018; June 1, 2022. Published March 2018; July 2022. Originally approved in 2000. Last previous edition approved in 2010 as D6545–10. DOI:10.1520/D6545-18. DOI:10.1520/D6545-22.

² For referenced ASTM standards, visit the ASTM website, www.astm.org, or contact ASTM Customer Service at service@astm.org. For *Annual Book of ASTM Standards* volume information, refer to the standard’s Document Summary page on the ASTM website.

[D123 Terminology Relating to Textiles](#)
[D1230 Test Method for Flammability of Apparel Textiles](#)
[D4391 Terminology Relating to The Burning Behavior of Textiles](#)
[E176 Terminology of Fire Standards](#)

2.2 *AATCC Test Method:*³

[AATCC Manual of International Test Methods and Procedures](#)
[LPI Home Laundering: Machine Washing](#)
~~[Glossary of AATCC Standard Terminology](#)~~
[M11 Glossary of AATCC Standard Terminology](#)
~~[AATCC Test Method 124 Appearance of Fabrics After Repeated Home Laundering](#)~~

2.3 *Federal Standards and Regulations:*

[16 CFR Part 1610 Standard for the Flammability of Clothing Textiles](#)⁴
[16 CFR Part 1611 Vinyl Plastic Film](#)⁴
[16 CFR Part 1615 Standard for the Flammability of Children’s Sleepwear: Sizes 0 through 6X](#)⁴
[16 CFR Part 1616 Standard for the Flammability of Children’s Sleepwear: Sizes 7 through 14](#)⁴
[Department of Commerce Voluntary Product Standard](#), previously identified as Commercial Standard, CS 151-50 “Body Measurements for the Sizing of Apparel for Infants, Babies, Toddlers, and Children”⁵

2.4 *ISO Standard:*⁶

[ISO 13943 Fire Safety — Vocabulary](#)

3. Terminology

3.1 *Definitions*—The following terms are relevant to this test method: char length; children’s sleepwear; fabric piece (piece); fabric production unit (unit); flame retardant; flame retardant treated; flammability; flammable textile; garment production unit (unit); infant garment; item.

3.2 For terms related to the burning behavior of textiles, see Terminology [D4391](#).

3.3 For terminology related to fire issues other than burning behavior of textiles, see Terminology [E176](#) and ISO 13943. In case of conflict, the terminology in [E176](#) will prevail.

3.4 For definitions of other terms used in this test method, refer to terminology terms related to laundering and drycleaning, see [Terminology](#) in the referenced AATCC test methods [Manual of International Test Methods and Procedures](#) and [M11](#).

3.5 For other terms related to textiles, see Terminology [D123](#); and AATCC [M11](#).

4. Summary of Test Method

4.1 This test method evaluates the extent of vertical flame spread of a textile after a flame is applied to the bottom edge of the specimen. The specimen is oriented vertically during the test and is exposed to a ~~38-mm~~ 38 mm (1.5-in.) flame for 3 s.

4.2 The extent of flame spread is determined by measuring the distance from the lower edge of the specimen to the point at which the specimen ceases to tear when subjected to a specified tearing load.

5. Significance and Use

5.1 This test method is suitable for evaluating flammability characteristics and laundering durability of textiles used in the manufacture of children’s sleepwear. It is not suitable for evaluating the flammability characteristics of textiles for other product applications or ignition scenarios.

³ Available from American Association of Textile Chemists and Colorists (AATCC), P.O. Box 12215, Research Triangle Park, NC 27709-2215, <http://www.aatcc.org>. Reference from the 1970 edition of the manual.

⁴ Available from U.S. Government Publishing Office, 732 N. Capitol Street, NW, Washington, DC 20401, <http://www.gpo.gov>.

⁵ Available from National Technical Information Service (NTIS), 5301 Shawnee Rd., Alexandria, VA 22312, <http://www.ntis.gov>.

⁶ Available from International Organization for Standardization (ISO), ISO Central Secretariat, Chemin de Blandonnet 8, CP 401, 1214 Vernier, Geneva, Switzerland, <https://www.iso.org>.

5.2 The procedure for flammability testing used in this test method is technically equivalent to those used in 16 CFR 1615 and 1616. This test method does not include detailed specimen sampling plans, or the regulatory and record keeping requirements cited in the federal regulations. Please consult 16 CFR 1615 and 1616 for information for these operations.

5.3 This test method is suitable for training technicians to conduct the federal test and can serve as a laboratory reference.

5.4 Test Method D6545 is very different from 16 CFR 1610 and from Test Method D1230.

6. Apparatus and Materials

6.1 *Test Chamber*—The test chamber shall be constructed of a steel or stainless steel cabinet with inside dimensions of 32.9 cm \pm 0.15 cm (12.94 in. \pm 0.06 in.) wide, 32.9 cm \pm 0.15 cm (12.94 in. \pm 0.06 in.) deep, and 76.2 cm \pm 0.15 cm (30 in. \pm 0.06 in.) high. The cabinet shall have a frame, perpendicular to the front of the cabinet, which permits the suspension of the specimen holder over the center of the base of the cabinet at such a height that the bottom of the specimen holder is 1.9 cm \pm 0.15 cm (0.75 in. \pm 0.06 in.) above the highest point of the barrel of the gas burner. The front of the cabinet shall be a close-fitting door with a glass insert to permit observation of the entire test. The inside rear vertical surface of the cabinet will be painted flat black to improve visibility of the burning specimen during the test. The cabinet floor can be covered with a piece of noncombustible paper, fabric, or film whose length and width are approximately 2.5 cm (1 in.) less than the cabinet floor dimensions. The cabinet to be used in this test method is illustrated in Fig. 1 and detailed in Figs. 1-4. A suitable flame height indicator is shown in Fig. 5.

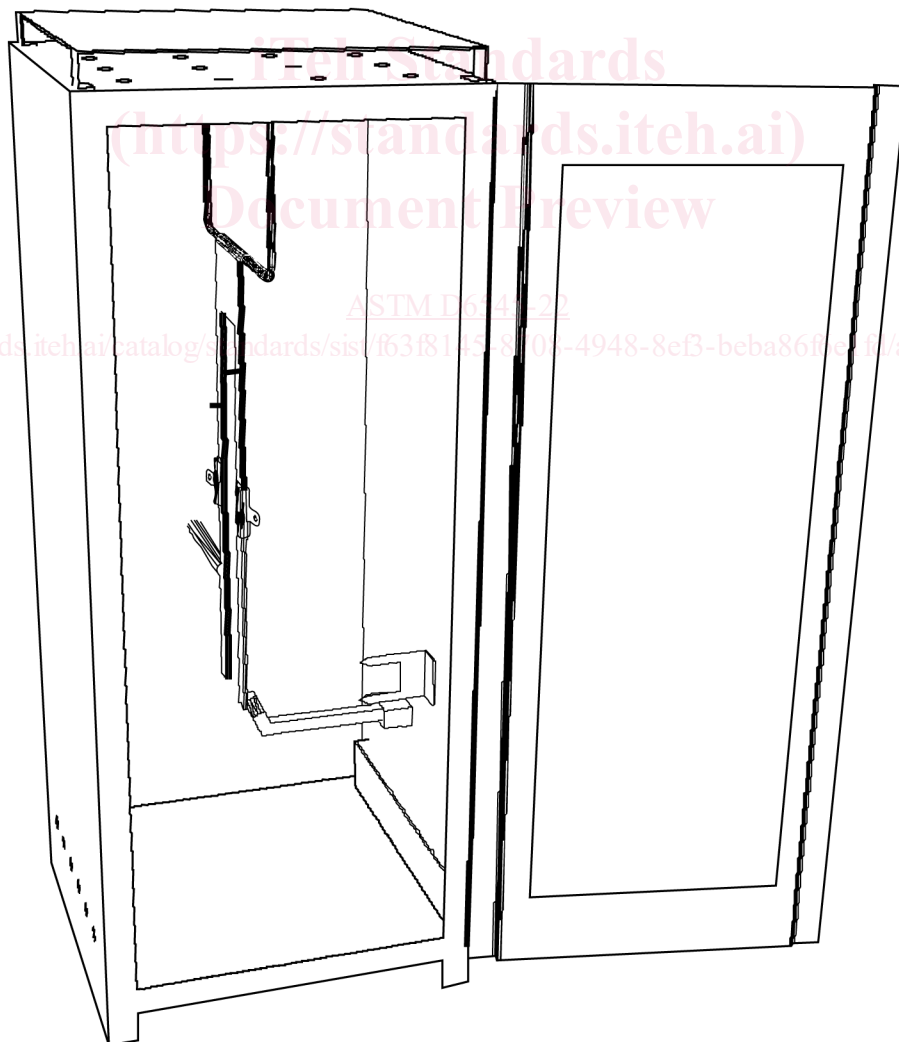


FIG. 1 Test Apparatus

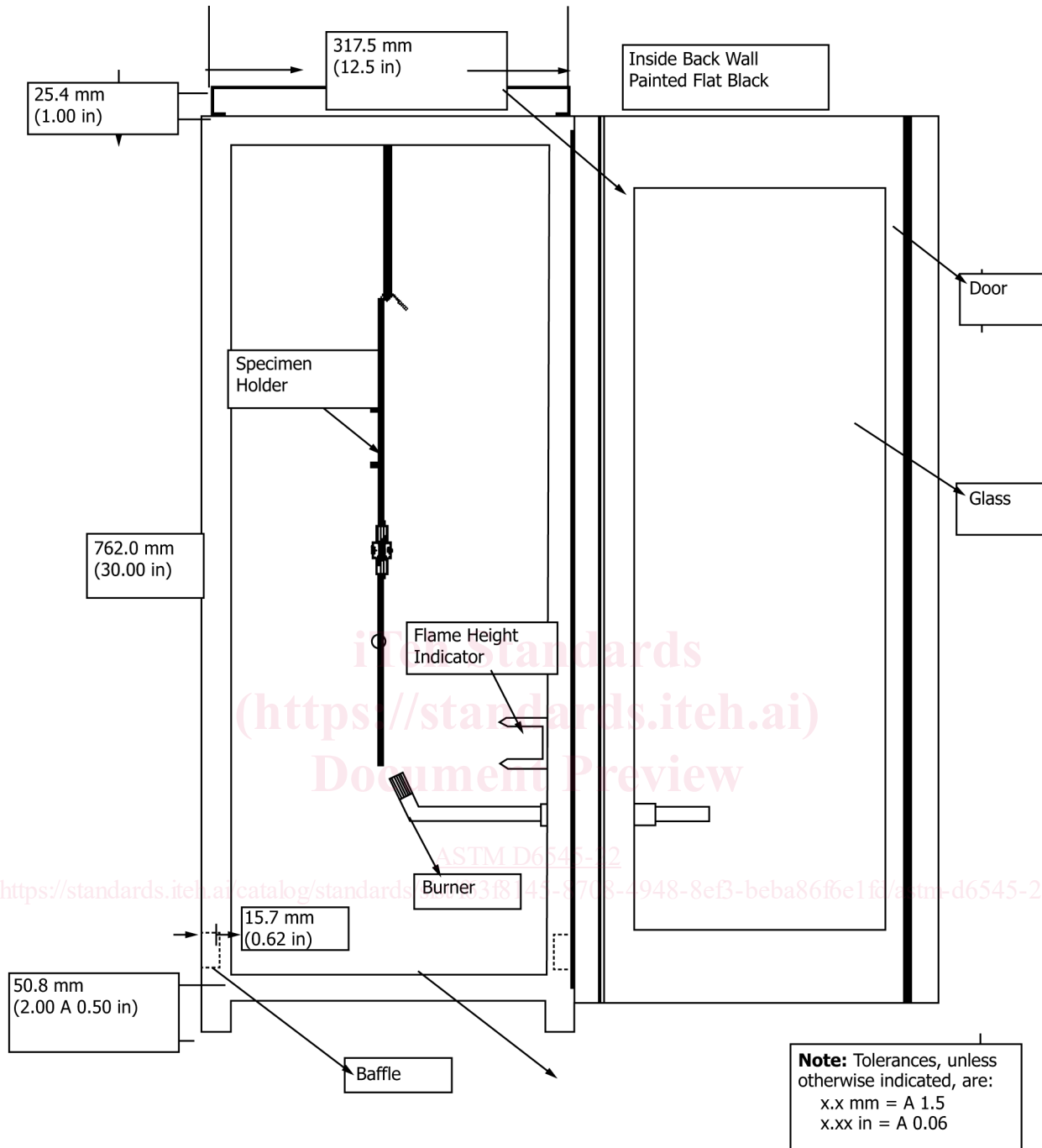
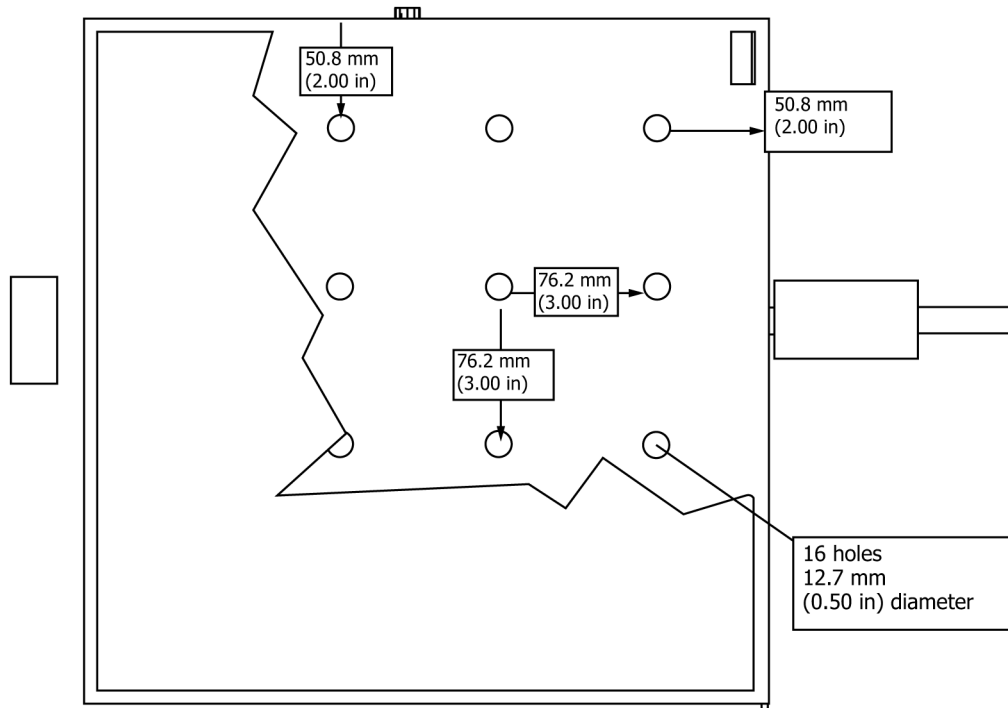


FIG. 2 Front View

6.2 *Specimen Holder, n*—The specimen holder is designed to permit suspension of the specimen in a fixed vertical position and to prevent curling of the specimen when the flame is applied. It shall consist of two U-shaped 0.19 cm (0.074 in.; 14-gauge USS) thick steel or stainless steel plates, 42.2 cm ± 0.15 cm (16.62 in. ± 0.06 in.) long, and 8.9 cm ± 0.15 cm (3.5 in. ± 0.06 in.) wide, with aligning pins. The openings in the plates shall be 35.6 cm (14 in. ± 0.06 in.) long and 5.1 cm ± 0.15 cm (2 in. ± 0.06 in.) wide. The specimen is fixed between the plates, which shall be held together with side clamps. The holder to be used in this test method is illustrated in Fig. 6.

6.3 *Burner, n*—The burner is substantially the same as that illustrated in Figs. 7 and 8. The burner will have the inside tube diameter of 1.1 cm (0.437 in.). The input line to the burner shall be equipped with a needle valve to provide a variable orifice to



Note: Tolerances, unless otherwise indicated, are:
 x.x mm = A 1.5
 x.xx in = A 0.06

FIG. 3 Top View

adjust the height of the flame. The barrel of the burner is positioned at an angle of 25° from the vertical. The burner is equipped with an adjustable stop collar so that it is quickly located correctly under the test specimen. The burner is connected to the gas source by rubber or other flexible tubing.

6.4 *Gas Supply System, n*—A pressure regulator to furnish gas to the burner will deliver a pressure of 129 mm ± 13 mm Hg (2½ lb/in.² ± ¼ lb/in.²) at the burner inlet.

6.5 *Gas, n*—The gas is at least 97 % pure methane.

6.6 *Hooks and Weights, n*—Metal hooks and weights are used to produce a series of loads for char length determinations. Suitable metal hooks consist of ~~1.1 mm~~ 1.1 mm (0.043-in.; No. 19 gauge) diameter steel or stainless steel wire, or equivalent, made from ~~7.6 cm~~ 7.6 cm (3-in.) lengths of the wire, bent 1.3 cm (0.5 in.) from one end to a 45° angle hook. The longer end of the wire is fastened around the neck of the weight to be used and the other in the lower end of each burned specimen to one side of the burned area. The requisite loads are given in [Table 1](#).

6.7 *Stopwatch*—A stopwatch or similar timing device is used to measure time to 0.1 s.

6.8 *Scale*—A linear scale graduated in millimetres or 0.1-in. divisions is used to measure char length.

6.9 *Circulating Air Oven*—A forced-circulation drying oven capable of maintaining the specimens at ~~105~~ 105 °C ± 2.8 °C (~~221~~ 221 °F ± 5 °F), is used to dry the specimen while mounted in the specimen holders.

6.10 *Desiccator*—An airtight and moisture-tight desiccating chamber is used for cooling mounted specimens after drying. Anhydrous silica gel will be used as the desiccant.

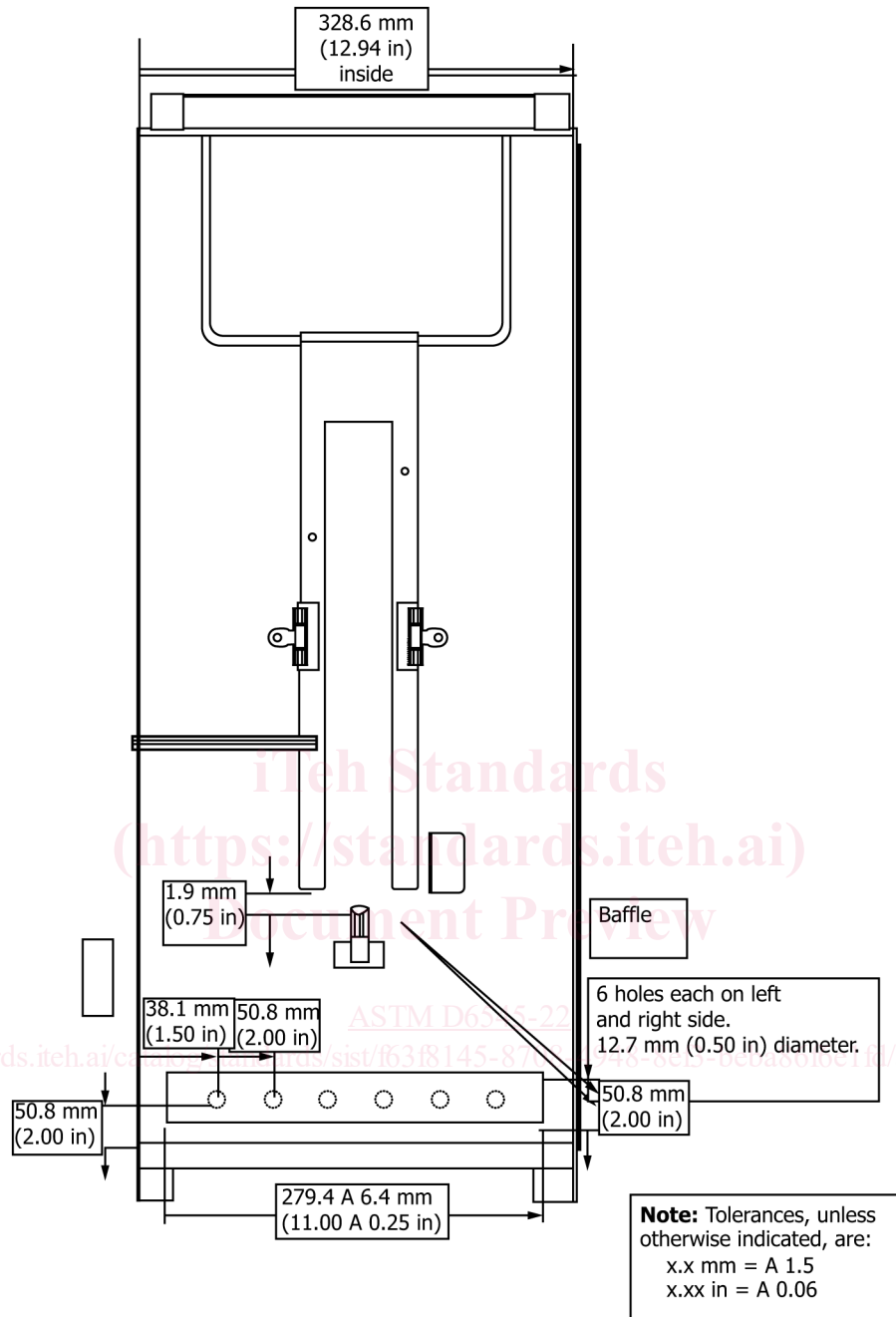


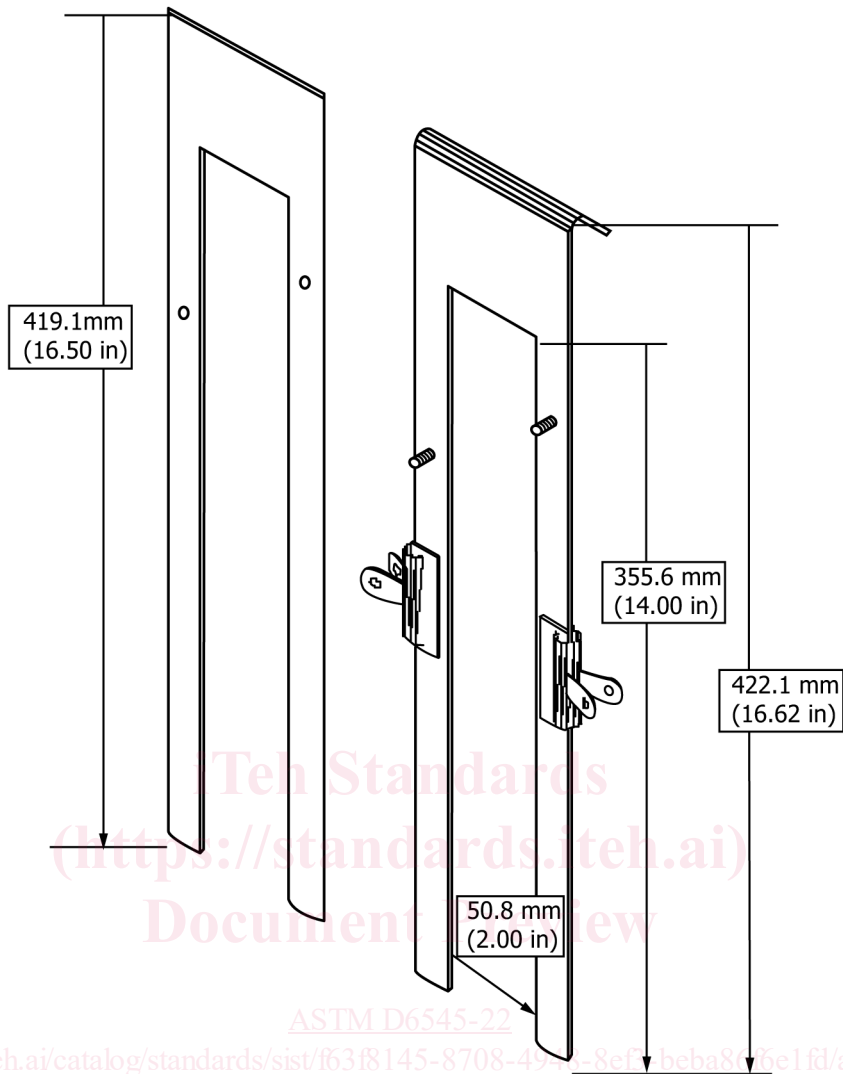
FIG. 4 Left-Side View (Left-Side Panel Removed)

6.11 *Hood*—A hood or other suitable enclosures are used to provide a draft-free environment surrounding the test chamber. The enclosure has a fan or other suitable means for exhausting smoke or toxic gases, or both, produced by testing.

7. Test Specimens and Sampling

7.1 *Test Specimen*—A section of fabric including prototype seams and prototype trims and production garments will be used for testing. The specimens will include a seam or trim.

7.2 *Sample*—Five test specimens cut from the appropriate fabric pieces, prototype seams or trims, or production garments, in accordance with the sampling plan in 16 CFR 1615 or 1616.



Material: Steel or stainless steel
 Thickness: 1.9 mm, (0.074 in; 14 gauge USS)

Notes: Tolerances, unless otherwise indicated, are:
 x.x mm = A 1.5
 x.xx in = A 0.06

FIG. 5 Sample Holder, Plate (Left) and Frame with Clips

7.3 Test specimens are cut to a length of 254 mm ± 3 mm (10 in. ± 0.1 in.) and a width of 89 mm ± 3 mm (3.5 in. ± 0.1 in.).

7.4 Two or three specimens are cut with their long dimension in the machine direction and three or two are cut with their long dimension in the cross-machine direction. Each group of five specimens then constitutes one sample. Individual determinations for each specimen, and the average of the sample set constitute the test result.

7.5 Fabrics used in the manufacture of children’s sleepwear are tested after the final stage of production and after the fabric has been laundered 50 times in accordance with the procedure in Section 10. Fabrics that have not been treated to be made flame-resistant, and where there will be multiple production runs of this fabric type, are not required to be tested after 50 launderings; provided that the first fabric production unit has met the flammability requirements of the federal standard both as produced and after 50 launderings.