



Designation: ~~D4151–18~~ D4151 – 23

Standard Test Method for Flammability of Blankets¹

This standard is issued under the fixed designation D4151; 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~~ Scope*

1.1 This test method provides a means to identify blanket fabrics which ignite easily and propagate flame across the surface.

1.2 This test method specifies the procedures described in the “Voluntary Blanket Flammability Standard” which has been used by the blanket industry in the United States since 1972.

1.3 *This standard 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.*

NOTE 1—This test method is not identical to 16 CFR Part 1610, Flammability of Clothing Textiles. Consumer Product Safety Commission regulations require that fabrics introduced into commerce meet the requirements of 16 CFR Part 1610.

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

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, health, and environmental practices and determine the applicability of regulatory limitations prior to use.*

1.6 *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

[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 Standard:*³

[M11 Glossary of AATCC Standard Terminology](#)

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; Aug. 1, 2023. Published February 2018; September 2023. Originally approved in 1982. Last previous edition approved in 2010 as D4151-10. DOI: 10.1520/D4151-18-18. DOI: 10.1520/D4151-23.

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.

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>.

*A Summary of Changes section appears at the end of this standard

2.3 *Federal Specification:*
[NNN-P-40b](#)⁴

2.4 *ISO Standard:*⁵
[ISO 13943 Fire safety](#)

3. Terminology

3.1 *Definitions:*

3.1.1 *blanket, n—*for bedding, an unquilted fabric covering designed primarily to provide thermal insulation.

3.1.1.1 *Discussion—*

Blankets may be made by any textile process from various types of fibers and may or may not have a raised fiber surface. Construction may be woven, knitted, flopped, or nonwoven.

3.1.1.2 *Discussion—*

Electric blankets include resistance heating wires and can provide heat as well as thermal insulation.

3.1.2 *flammability, n—*those characteristics of a material that pertain to its relative ease of ignition and relative ability to sustain combustion.

Note 2—In this test, evidence of ignition is shown by discoloration, charring, or burning of the paper monitor.

3.1.3 *ignition, n—*initiation of combustion.

3.1 For definitions of other textile terms used in this test method, refer to Terminology [The following terms are relevant to this standard: blanket, flammability, ignition.](#)~~D423.~~

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

3.1.2 For definitions related to textiles, see Terminology [D123](#) and AATCC M11. In case of conflict, the terminology in [D123](#) will prevail.

3.2 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.

4. Summary of Test Method

4.1 Specimens cut from the blanket fabric are prepared by brushing if they have a raised fiber surface and by drying. The dried specimen is held in a special apparatus, a standardized flame is applied to the surface for a specified time under controlled conditions, and burning, charring, or discoloration of a paper monitor is noted. Two classes of flammability are described.

4.1.1 A burn of sufficient intensity to discolor a paper monitor in specified contact with the surface of the test specimen indicates ignition of the blanket surface (see [11.4.1](#)).

5. Significance and Use

5.1 This test method for the determination of the flammability of blankets is considered satisfactory for acceptance testing of commercial shipments of blankets since this test method has been used extensively in the trade for acceptance testing.

5.2 This test method is intended to evaluate fabrics used in electric blankets without the resistance heating wires.

5.3 Fabrics are potentially combustible. Some fabrics when used for blankets are potentially dangerous to the user depending on the ease of ignition, rapidity, and intensity of burning. This test method addresses some of these characteristics.

⁴ Available from Standardization Documents Order Desk, Bldg. 4 Section D, 700 Robbins Ave., Philadelphia, PA 19111-5094, Attn: NPODS.

⁵ Available from International Organization for Standardization (ISO), ISO Central Secretariat, Chemin de Blandonnet 8, CP 401, 1214 Vernier, Geneva, Switzerland, <https://www.iso.org>.

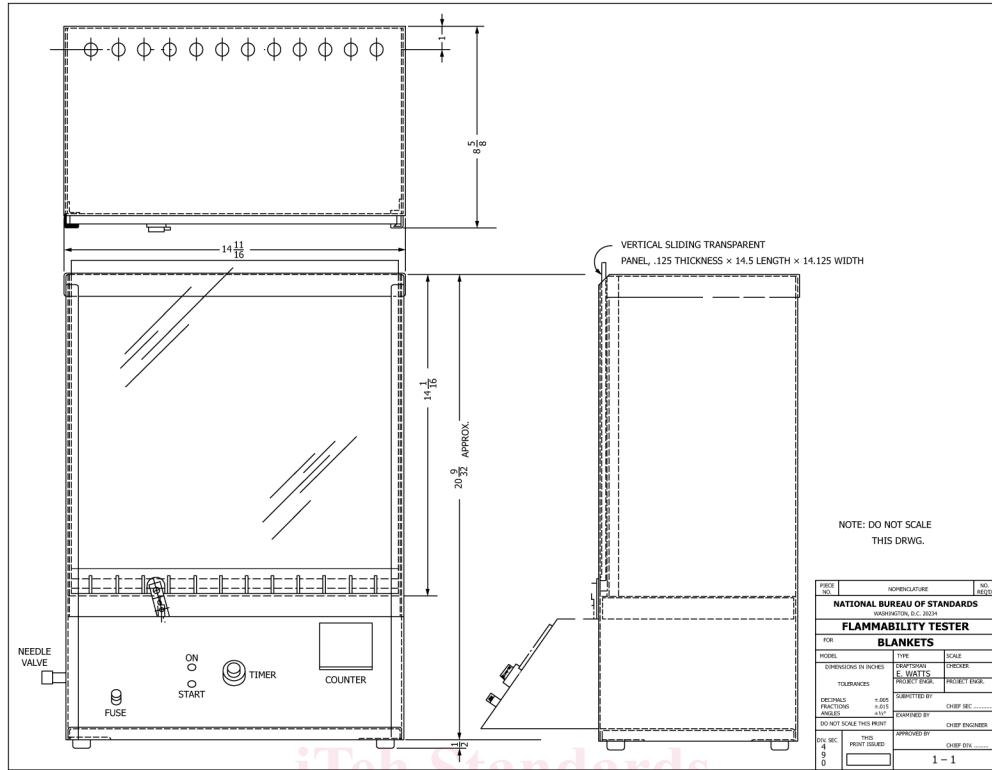


FIG. 1 Flammability Tester

6. Apparatus and Materials

6.1 *Flammability Tester*, as shown in Figs. 1-4 and described in A1.1.1, A1.1.2, and A1.1.9 of Test Method D1230.

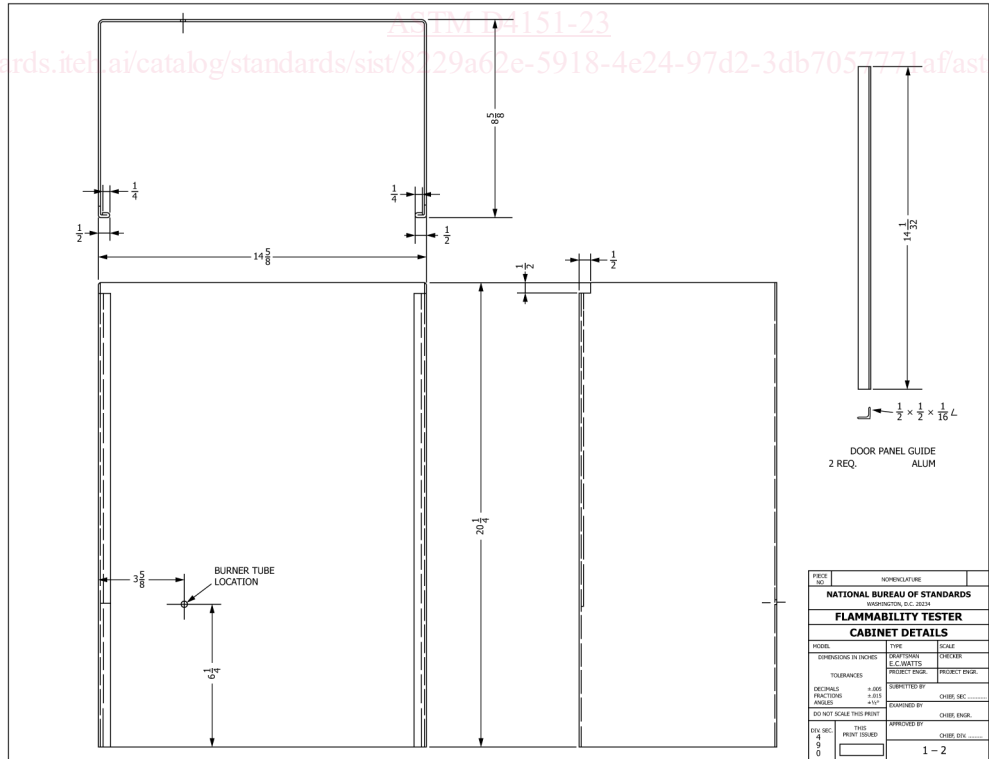


FIG. 2 Flammability Tester (Cabinet Details)

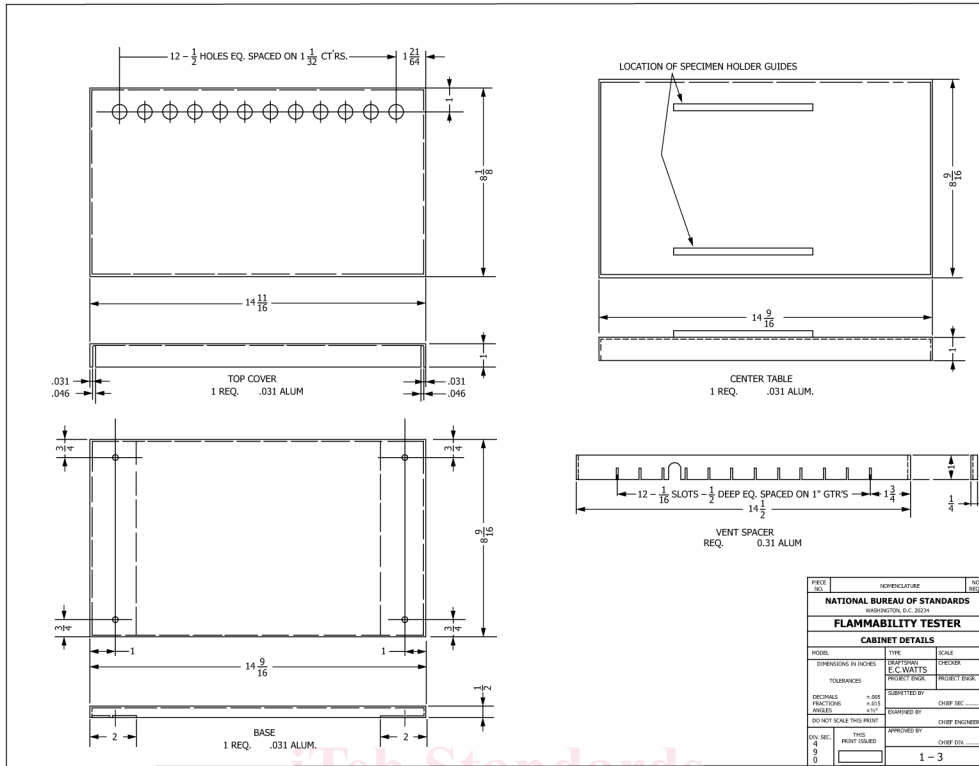


FIG. 3 Flammability Tester (Additional Cabinet Details)

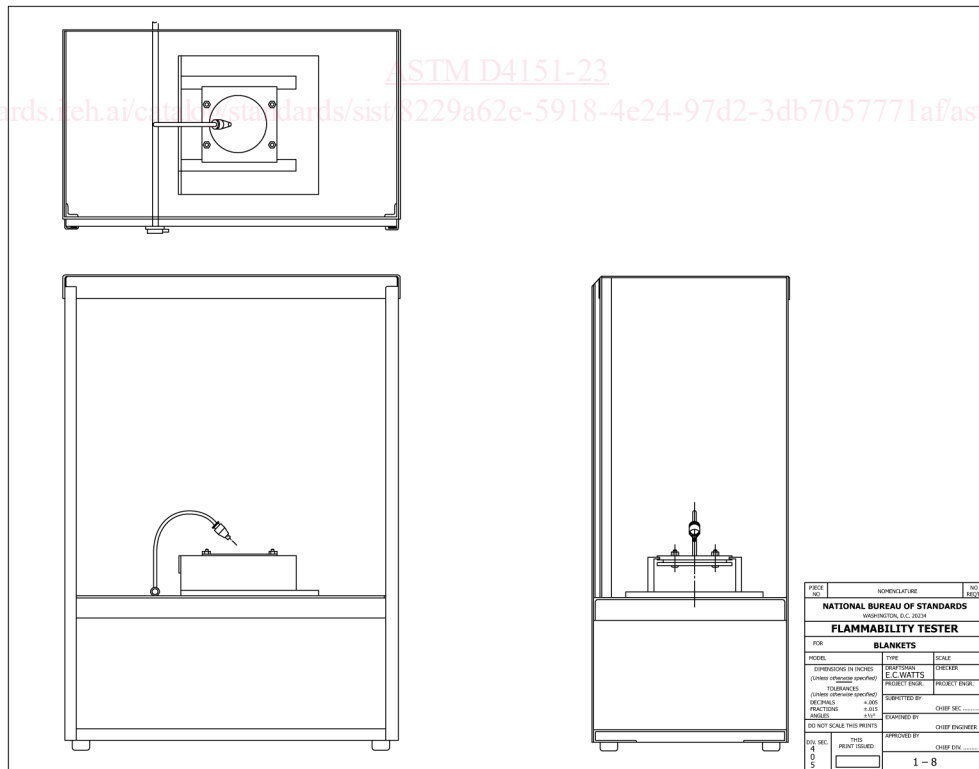


FIG. 4 Flammability Tester Arrangement

6.1.1 The test cabinet shall be equipped with a system to control the time of flame ~~impingement~~impingement on the specimen to ± 0.05 s. $1 \text{ s} \pm 0.05 \text{ s}$. A system found to be suitable is:

6.1.1.1 Adjustable electronic timer controlling a burner solenoid to activate the burner mechanism.

6.1.1.2 *Electronic Counter* (digital clock reading to 0.01 s), started by a switch that is activated by the burner mechanism when the burner is in the position to impinge flame on the specimen and is stopped when the burner retracts from the specimen.

~~NOTE 3—A flammability tester made for use in Test Method D1230 has to be modified when used with Test Method D4151 by changing the burner, specimen holder, and timing mechanism.~~

6.1.1.3 An electronic or mechanical timer, or equivalent, shall be used to record the burn time, and electro-mechanical devices (that is, servomotors, solenoids, micro-switches, and electronic controls and circuits, in addition to miscellaneous custom-made cams and rods, shock absorbing linkages, and various other electronic or mechanical components) shall be used to control and apply the flame impingement.

~~NOTE 2—A flammability tester made for use in Test Method D1230 has to be modified when used with Test Method D4151 by changing the burner, specimen holder, and timing mechanism.~~

6.2 *Specimen Holder and Base*, as shown in Figs. 5 and 6.

6.2.1 The base shall be mounted on the floor of the cabinet approximately center on both axes. The position of the base shall be adjustable along both the length and width axes of the flammability test cabinet.

6.3 *Burner*, as shown in Fig. 7.

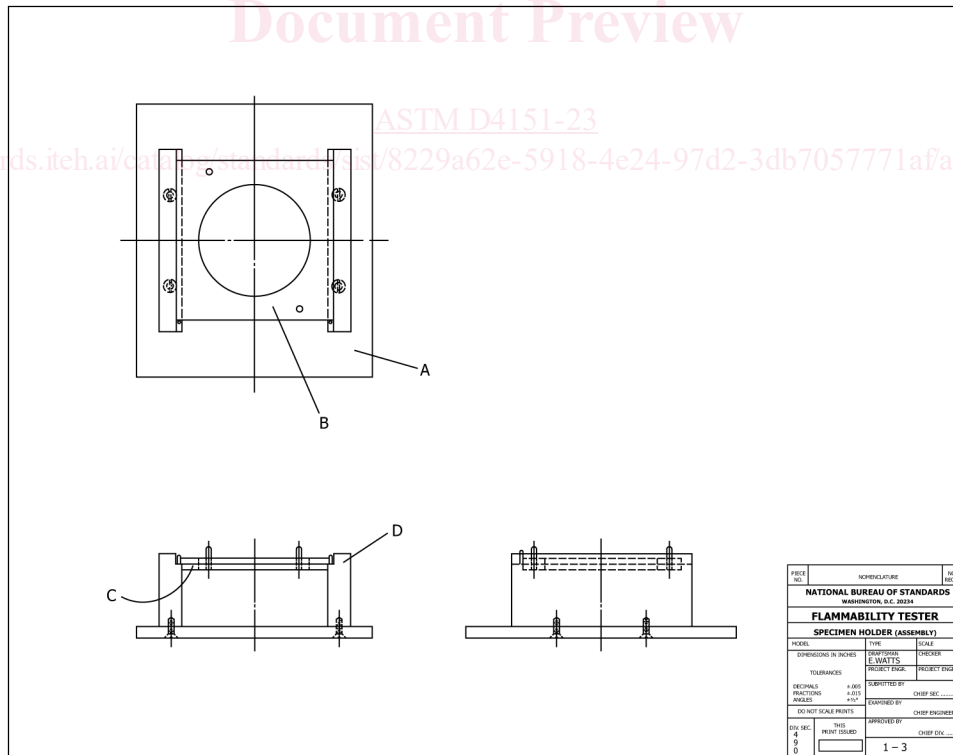


FIG. 5 Specimen Holder Assembly

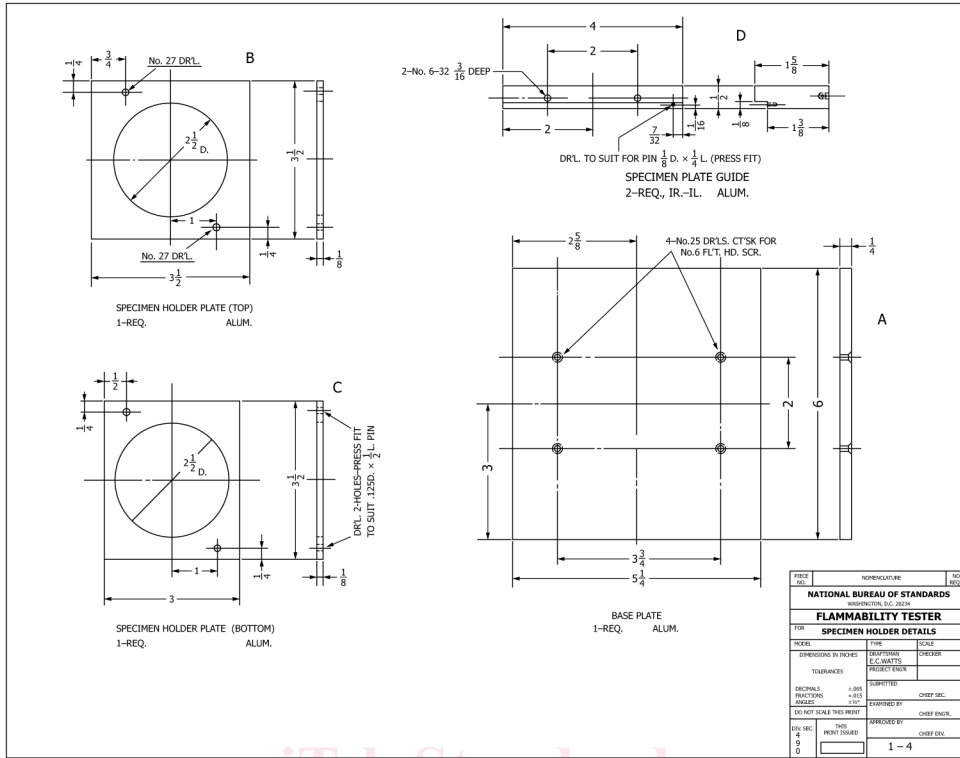


FIG. 6 Specimen Holder Details

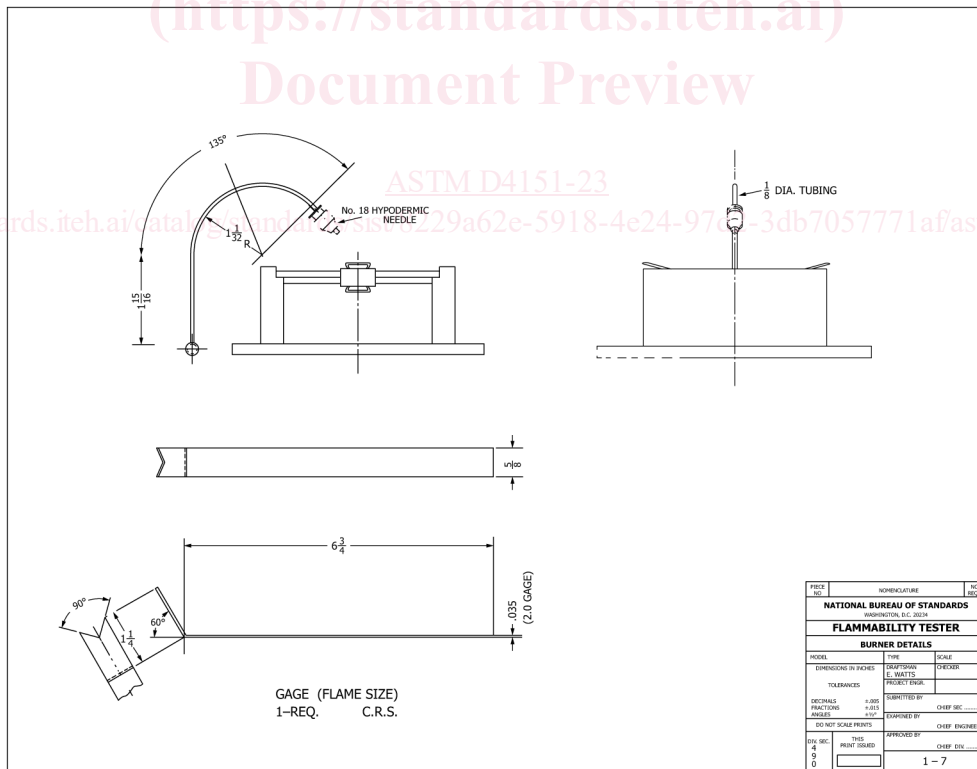


FIG. 7 Burner Details

6.3.1 The burner is a No. 18 hypodermic needle. The needle is cut off below the ferrule approximately 1.5 mm (1/16 in.) long. One end of an 3-mm (1/8-in.) OD copper tube approximately 200 mm (8 in.) long is soldered or cemented with epoxy adhesive into the ferrule of the hypodermic needle. The other end is soldered to the gas feeding tube which is part of the mechanism used to impinge the flame on the specimen (see Figs. 1-7).

6.4 Methane, technical grade (at least 97 % pure).

6.4.1 The gas line to the burner shall be equipped with a needle valve to control the flame length.

6.4.2 Gas is supplied to the burner at a pressure of 17.2 kPa ± 3.4 kPa (2.5 psig ± 0.5 psig) at the needle valve inlet.

6.5 Brushing Device, as shown in Fig. 8 and described in A1.2 of Test Method D1230, except that the brush rests on the carriage vertically with a pressure of 7575 g ± 10 g instead of 150 g as described in A1.2.1 of Test Method D1230.

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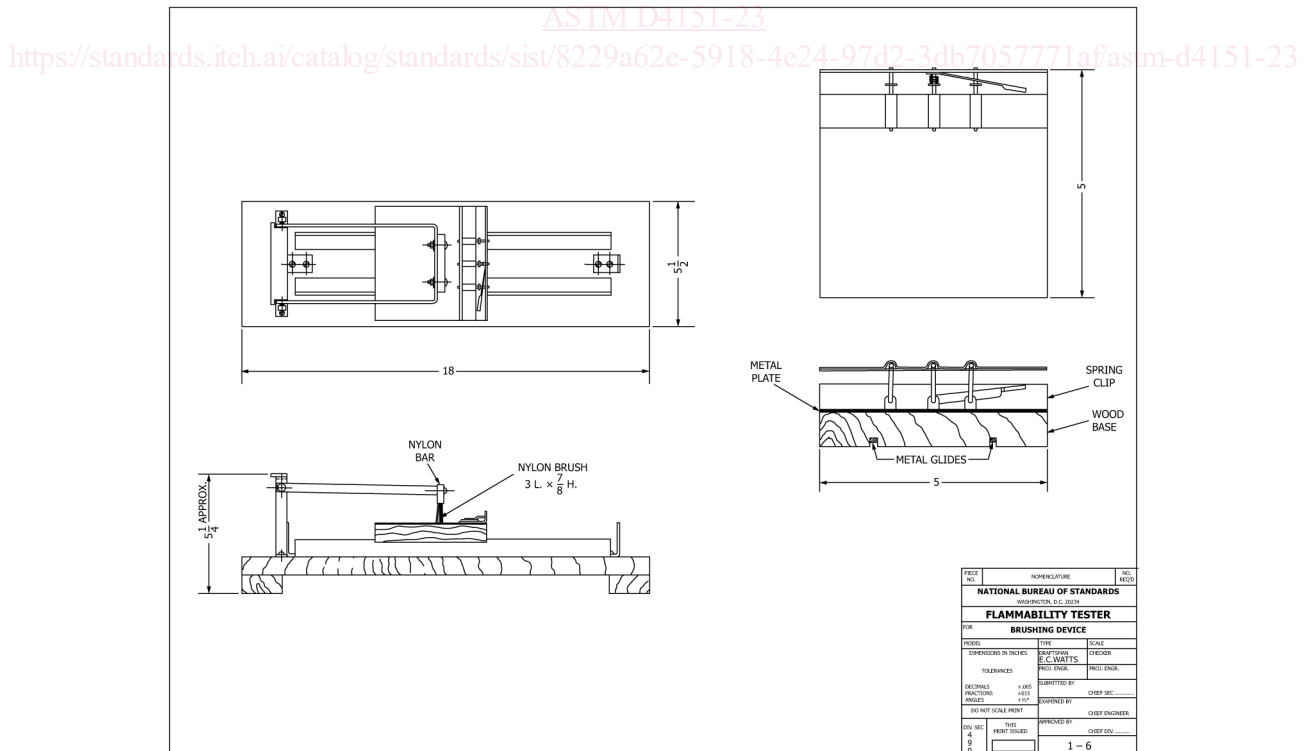


FIG. 8 Brushing Device