



Designation: D 4830 – 98

Standard Test Methods for Characterizing Thermoplastic Fabrics Used in Roofing and Waterproofing¹

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1. Scope

1.1 These test methods cover the procedures for characterizing thermoplastic fabrics (for example polyester, polyamide, polypropylene, etc.) used in prefabricated roofing and waterproofing membranes.

1.2 Procedures appear in the following order:

	Section
Unit Mass	3
Thickness	4
Breaking Load, Elongation and Work-to-Break	5
Trapezoid Tearing Strength	6
Puncture Strength	7
Static Heat Stability	8
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1.3 *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 76 Specification for Tensile Testing Machines for Textiles²
- D 123 Terminology Relating to Textiles²
- D 885 Test Methods for Tire Cords, Tire Cord Fabrics, and Industrial Filament Yarns Made from Man-Made Organic-Base Fibers²
- D 1117 Test Methods for Nonwoven Fabrics²
- D 1776 Practice for Conditioning Textiles for Testing²
- D 4354 Practice for Sampling of Geosynthetics for Testing³
- D 5035 Test Method for Breaking Strength and Elongation of Textile Fabrics (Strip Method)⁴
- D 5729 Test Method for Thickness of Nonwoven Fabrics⁴
- D 5733 Test Method for Tearing Strength of Nonwoven Fabrics by the Trapezoid Procedure⁴

¹ These test methods are under the jurisdiction of ASTM Committee D08 on Roofing, Waterproofing, and Bituminous Materials and are the direct responsibility of Subcommittee D08.04 on Fabrics for Bituminous Roofing and Waterproofing. Current edition approved Jan. 10, 1998. Published September 1998. Originally published as D 4830 – 88. Last previous edition D 4830 – 95.

² Annual Book of ASTM Standards, Vol 07.01.

³ Annual Book of ASTM Standards, Vol 04.09.

⁴ Annual Book of ASTM Standards, Vol 07.02.

E 1 Specification for ASTM Thermometers⁵

E 18 Test Methods for Rockwell Hardness and Rockwell Superficial Hardness of Metallic Materials⁶

3. Unit Mass

3.1 Determine the unit mass of the fabric using procedures described in Test Methods D 1117. Report in g/m² or oz/yd².

4. Thickness

4.1 Determine fabric thickness following procedures described in Test Method D 5729.

5. Breaking Load, Elongation, and Work-to-Break

5.1 Determine the breaking load and elongation by the cut strip method described in Test Method D 5035 with the following exceptions:

5.1.1 *Test Specimens*—Cut each specimen 51 ± 1 mm (2.0 ± 0.05 in.) wide and 203 ± 1 mm (8.0 ± 0.05 in.) long. The gage length shall be 152 ± 1 mm (6.0 ± 0.05 in.).

5.1.2 *Apparatus*—The apparatus shall be a CRE (Constant Rate of Extension) machine described in Specification D 76. The machine will be set for an extension rate of 5 mm/s or 12 in./min.

5.2 *Calculation*—Report textile conditions and the average breaking load in N/m or lbf/in. and the elongation at break in percent.

5.3 *Work-to-Break*—The procedure and calculation shall be as described in Test Methods D 885 with the exception that the load-elongation curve will be from specimens used in determining breaking load and elongation as described in 5.1 and 5.2.

6. Trapezoid Tearing Strength

6.1 Determine trapezoid tearing strength of the fabric following procedures described in Test Method D 5733.

7. Puncture Strength

7.1 Scope:

7.1.1 This test method is used to measure the puncture strength of thermoplastic fabrics used in roofing.

⁵ Annual Book of ASTM Standards, Vol 14.03.

⁶ Annual Book of ASTM Standards, Vol 03.01.

7.1.2 This procedure is applicable to conditioned fabrics.

7.2 Summary of Method:

7.2.1 A specimen of the fabric is clamped without tension between grooved, circular plates of a ring clamp attachment secured in a tensile testing machine. A force is exerted against the center of the specimen by a solid steel rod attached to the load indicator until rupture occurs.

7.3 Significance and Use:

7.3.1 Puncture failures are recognized in the roofing industry. Puncture strength is felt to reflect the fabric's ability to withstand aggregate or ballast stone penetration. This test method is used to obtain the relative puncture resistance of various fabrics.

7.4 Apparatus:

7.4.1 *Tensile Testing Machine*, of the constant-rate-of-extension type (CRE), with autographic recorder conforming to the requirements of Specification D 76.

7.4.2 *Ring Clamp Attachment*, consisting of concentric grooved plates with an internal diameter of 44.45 ± 0.025 mm (1.750 ± 0.001 in.), capable of clamping fabrics without slippage.

7.4.3 *Solid Steel Rod*, with a hardness in the range of Rockwell C (HRC) 50 to 60, with a diameter of 7.938 ± 0.013 mm (0.3125 ± 0.0005 in.) and a hemispherical end with a radius of 3.970 ± 0.013 mm (0.1563 ± 0.0005 in.) for contacting the fabric surface (see Fig. 1). The surface of the hemispherical end should be smooth and polished to a surface smoothness of $RMS \leq 8$. (RMS is the root-mean-square method of describing surface smoothness.)⁷

7.5 Sampling, Number of Specimens, and Selection of Samples:

7.5.1 *Lot Sample*—As a lot sample for acceptance testing, take at random the number of rolls of fabric directed in an applicable material specification or other agreement between the purchaser and the supplier, such as agreement to sample as directed in Practice D 4354. Consider rolls of fabric to be the primary sampling units.

7.5.2 *Laboratory Sample*—Take, for the laboratory sample, a sample extending the width of the fabric and approximately 1.0 m (39 in.) along with the selvage from each roll in the lot sample. The sample may be taken from the end portion of a roll provided there is no evidence that it is distorted or different from other portions of the roll. In cases of dispute, take a sample that will exclude fabric from the outer wrap of the roll or the inner wrap around the core.

7.5.3 Unless otherwise agreed upon or specified in applicable material specifications, test a number of specimens from each laboratory sample that will give a precision of $\pm 5\%$ at a probability level of 90%, not to exceed ten specimens per sample.

7.6 Preparation of Test Specimen:

7.6.1 Each specimen shall be cut 76 by 76 mm (3.0 by 3.0 in.) to ensure proper clamping. Specimens should be taken on the diagonal across the sample so that no two specimens will contain the same machine direction and cross machine direc-

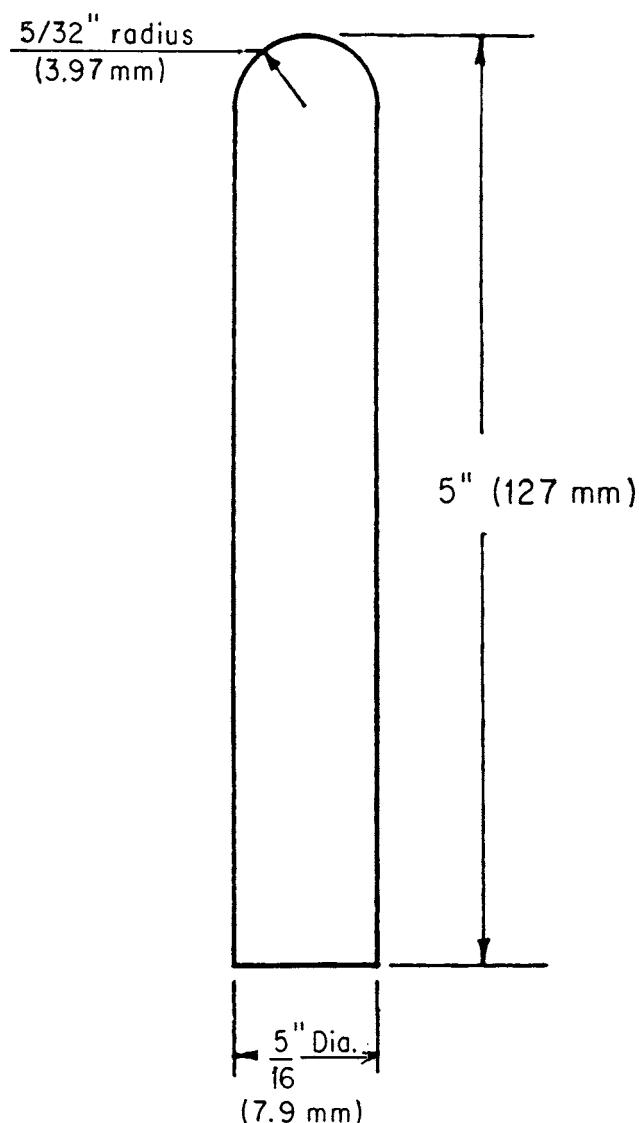


FIG. 1 Steel Rod

tion yarns or fibers. Unless otherwise specified, no specimen should be taken within 51 mm (2.0 in.) of the selvage or edge.

7.7 Conditioning:

7.7.1 Condition the specimens as directed in Practice D 1776.

7.8 Procedure:

7.8.1 All testing must be conducted at standard textile laboratory conditions as required in Practice D 1776.

7.8.2 Select the load range of the tensile testing machine such that the rupture occurs between 15 and 85% of the full-scale load.

7.8.3 Center and secure the specimen between the grooved plates, ensuring that the fabric extends beyond the outer edges of the plates.

7.8.4 *Measurement of Rupturing Load*—Test at a machine speed of 5 mm/s or 12 in./min until the puncture rod completely ruptures the specimen. Read the puncture strength as the greatest force in N (lbf) registered on the recording instrument during the test.

⁷ See *Machinery's Handbook*, 19th ed., Industrial Press, H. L. Horton, ed.