



Standard Specification for Thermoplastic Fabrics Used in Hot-Applied Roofing and Waterproofing¹

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1. Scope

1.1 This specification covers thermoplastic fabrics such as polyester, polyester/polyamide bicomponent, or composites with fiber glass or polyester scrims that can be used during the construction of hot-applied roofing and waterproofing.

1.2 This specification is intended as a material specification. Issues regarding the suitability of specific roof constructions or application techniques are beyond the scope of this specification.

1.3 The specified tests and property values used to characterize the respective fabrics are intended to establish minimum properties. In-place system design criteria or performance attributes are factors beyond the scope of this material specification.

1.4 The values stated in inch-pound units are to be regarded as the standard. The values given in parentheses are for information only.

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 Textile Materials²
- D 1079 Terminology Relating to Roofing, Waterproofing, and Bituminous Materials³
- D 1117 Test Methods for Nonwoven Fabrics²
- D 1776 Practice for Conditioning Textiles for Testing²
- D 1777 Test Method for Measuring Thickness of Textile Materials²
- D 4830 Test Methods for Characterizing Thermoplastic Fabrics Used In Roofing and Waterproofing³
- D 5035 Test Method for Breaking Force and Elongation of Textile Fabrics (Strip Method)⁴

¹ This specification is under the jurisdiction of ASTM Committee D-8 on Roofing, Waterproofing, and Bituminous Materials and is the direct responsibility of Subcommittee D08.04 on Fabrics for Bituminous Roofing and Waterproofing.

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² Annual Book of ASTM Standards, Vol 07.01.

³ Annual Book of ASTM Standards, Vol 04.04.

⁴ Annual Book of ASTM Standards, Vol 07.02.

D 5733 Test Method for Tearing Strength of Nonwoven Fabrics by the Trapezoid Procedure⁴

E 1 Specification for ASTM Thermometers⁵

2.2 *Other Standard:*

AATCC Test Set No. 128, Wrinkle Recovery Test⁶

3. Terminology

3.1 *Definitions*—For definitions of terms used in this specification, refer to Terminologies D 1079 and D 123.

4. Classification

4.1 The thermoplastic fabrics covered by this specification are of the following general constructions and compositions. Each is a separate class or type, differentiated by polymer type, a combination of polymers, or the manufacturing process, or some combination thereof:

- 4.1.1 *Type I*—Polyester spunbonded with resin, unneeded;
- 4.1.2 *Type II*—Polyester spunbonded with resin, needed;
- 4.1.3 *Type III*—Polyester mat plus fiber glass scrim and resin; and
- 4.1.4 *Type IV*—Polyester core/polyamide sheath bicomponent spunbonded.

5. Materials and Manufacture

5.1 The fabric shall be a uniform, thin, porous mat of the primary thermoplastic polymer, with or without the addition of reinforcing stranded glass or thermoplastic yarns. Chemically bonding with a water-resistant resin or thermally bonding with other thermoplastic polymers shall be permitted.

6. Physical Properties, Thickness, and Mass

6.1 Fabrics shall conform to the thickness, mass, and physical properties presented in Table 1.

7. Unit Mass

7.1 Determine the unit mass of the fabric using the procedures described in Test Methods D 1117.

8. Workmanship, Finish, and Appearance

8.1 The finished material shall be free of visible defects

⁵ Annual Book of ASTM Standards, Vol 14.03.

⁶ Available from American Association of Textile Chemists and Colorists, P.O. Box 12215, Research Triangle Park, NC 27709.

TABLE 1 Physical Properties of Thermoplastic Fabrics for Use in Hot-Applied Roofing and Waterproofing

Properties	Types			
	I	II	III	IV
Unit mass, nominal, oz/yd ² (g/m ²) (lb/100 ft ²)	4.6 (155) (3.2)	4.1 (140) (2.8)	3.7 (125) (2.6)	9.6 (327) (6.7)
Thickness, mils (mm), min	16 (0.42)	20 (0.51)	16 (0.41)	36 (0.92)
Breaking load, lbf/in. (kN/m), min, MD and CD	50 (8.8)	30 (5.2)	117 (20.5)	85 (14.9)
Elongation, % min, MD and CD	46	25	3.3	34
Trapezoid tearing strength, lbf (N), min, MD and CD	35 (155)	24 (107)	7 (31)	57 (256)
Puncture strength, lbf (N), min	52 (231)	38 (169)	12 (53)	71 (316)
Appearance rating (AATCC Test Set No. 128), pass (4 and 5) and fail (1 to 3)	Pass	Pass	Pass	Pass
Heat distortion stability, % change max, MD and CD	2	2	0.2	2

such as ragged or untrue edges, folds, creases, wrinkles, tears, and holes.

9. Sampling

9.1 Sample the material and determine the properties enumerated in this specification in accordance with the test procedures referenced and presented herein.

10. Thickness

10.1 Determine the thickness of the fabric using the procedures described in Test Method D 1777.

11. Breaking Load and Elongation

11.1 Determine the breaking load and elongation by the cut strip method described in Test Methods D 4830 and D 5035. The preferred SI unit for breaking load is kN/m.

12. Trapezoid Tearing Strength

12.1 Determine the trapezoid tearing strength using the procedures described in Test Method D 5733.

13. Puncture Strength

13.1 Determine the puncture strength using the procedures described in Test Methods D 4830.

14. Heat Distortion/Stability

14.1 *Scope*—This test method, which uses hot silicone oil, is a procedure for simulating the distortion that may occur with the laying of a fabric roofing ply into hot bitumen during the construction of a hot-applied built-up roofing membrane.

14.2 *Summary of Test Method*—Fabric specimens are laid into hot silicone oil at 500°F (260°C), allowed to cool to room temperature, and then removed and measured for percent shrinkage and rated visually for distortion.

14.3 *Significance and Use*—Not all thermoplastic fabrics are suitable for hot-applied built-up roofing. This test procedure is designed to simulate hot-applied built-up application and to identify those thermoplastic fabrics that are suitable and not susceptible to excessive shrinkage or distortion, or both.

14.4 *Apparatus and Materials:*

14.4.1 *Stainless Steel Container*, appropriately sized, used to heat the silicone oil.

14.4.2 *Heating Mantle*, used in conjunction with the container and capable of heating the silicone oil adequately.

14.4.3 *Thermometer*, graduated in 2°F (1°C) intervals and including the range of 500 to 550°F (260 to 288°C) on its scale, such as ASTM No. 2F-86 (see Specification E 1).

14.4.4 *Stainless Steel Ladle*, with a capacity of three oz (0.09 L).

14.4.5 *Aluminum Baking Pans*, measuring approximately 10.75-in. long by 7-in. wide by 1-in. deep (273 by 178 by 25 mm).

14.4.6 *Silicone Oil*, Dow Corning 710 Fluid⁷ or an equivalent.

14.4.7 *Safety Equipment*, which includes long arm rubber gloves or hot gloves, an apron, and face shield, which are recommended to help prevent possible injury.

14.4.8 *Insulation Board*, a minimum 1-in. (25-mm) thickness, to be used beneath the metal pans as a method of reducing excessive heat loss when pouring the hot silicone oil just prior to introduction of the fabric sample.

14.4.9 The *AATCC Test Set No. 128, Wrinkle Recovery Test*, used to visually evaluate and rate the fabric distortion after testing.

14.5 *Preparation of Specimens:*

14.5.1 Each test specimen shall be 10-in. (254-mm) long and 6-in. (152-mm) wide, with the length dimension taken parallel to the machine direction of the fabric.

14.5.2 Cut five specimens spaced uniformly across the fabric sample. No specimen shall be taken within 2 in. (51 mm) of any selvage edge of the fabric.

14.5.3 Using an indelible marker, mark a 1-in. (25-mm) border from each outside edge, forming a block that will be used for measurement purposes.

14.6 *Conditioning*—Condition the test specimens using the procedures described in Practice D 1776.

14.7 *Procedure:*

14.7.1 Heat the silicone oil to approximately 525°F (274°C). Place the ladle in the oil to allow it to equilibrate and minimize excessive, rapid cooling of the oil prior to adding to the test pans.

14.7.2 Measure and record the original length and width measurements of the bordered box pattern. Measure along each line and at a midpoint in both directions to provide for averaging of the measurements in both directions.

14.7.3 Lay an aluminum baking pan on top of the insulation board.

14.7.4 Remove a ladle full of silicone oil, and immerse the thermometer in the oil. When the temperature has dropped to 500°F (260°C), pour quickly into the test pan.

⁷ Silicone oil, available from Dow Corning Corp., South Saginaw Road, Midland, MI 48686, has been found suitable for this purpose.

14.7.5 Within 3 s after pouring the oil, lay a fabric specimen into the oil, placing one end in the pan and rolling in the remaining length of the fabric.

14.7.6 Take additional pans, and repeat the process described in 14.7.3 through 14.7.5 for the remaining four specimens.

14.7.7 Once cooled to room temperature, remove the fabric specimen from the test pan and place it on an absorbent towel, dabbing with additional absorbent towels to remove as much excess oil as possible.

14.7.8 Rate and record the visual distortion and appearance rating of each specimen using AATCC Test Set No. 128. An average can then be determined for the sample fabric.

14.8 *Calculation:*

14.8.1 Remeasure the dimensions of the outlined block for each specimen as described in 14.7.2. Do not attempt to flatten or straighten the specimen for measurements.

14.8.2 Using the initial and final (as tested) measurements for each specimen, determine the percent of shrinkage of the fabric sample as follows:

$$\% \text{ shrinkage (length)} = 100 \times \frac{\text{initial length} - \text{final length}}{\text{initial length}} \quad (1)$$

$$\% \text{ shrinkage (width)} = 100 \times \frac{\text{initial width} - \text{final width}}{\text{initial width}} \quad (2)$$

14.9 *Report:*

14.9.1 State that the tests were performed in accordance with these specified test methods. Describe the material or product evaluated and sampling method used.

14.9.2 Record the distortion appearance rating for each test specimen as determined with AATCC Test Set No. 128, and determine the average.

14.9.3 The tested fabric will be qualified on a pass/fail basis. If the average visual rating as determined with AATCC Test Set No. 128 is found to be 4 or 5, the sample is considered to be suitable for application as a hot-applied built-up ply reinforcement. The test sample is considered to have failed with a visual rating of 1 to 3.

14.9.4 For fabrics that have passed the requirements given in 14.9.3, record the percent shrinkage in both directions for each specimen. Determine the respective averages, and report them as that sample's percent shrinkage.

14.10 *Precision and Bias:*

14.10.1 *Precision*—The precision of the procedure in this test method is being determined.

14.10.2 *Bias*—Since there is no accepted reference material to determine the bias for the procedure in this test method of determining the heat distortion/stability of thermoplastic fabrics for use in hot-applied built-up roofing, no bias statement is being made.

15. Inspection

15.1 *Inspection*—Inspection shall be in accordance with the requirements of this specification.

15.2 *Inspection Alternatives*—Alternative inspection requirements shall be determined by and as agreed upon between the purchaser and the supplier.

16. Rejection and Resubmittal

16.1 *Failure to Conform*—Failure to conform to any of the requirements as stated in this specification constitutes grounds for rejection.

16.2 *Rejection Redress*—The supplier shall have the right to inspect the rejected materials. The supplier and the purchaser shall agree to the quantity of rolls deemed unacceptable. The supplier shall then have the right to submit the same number of new rolls as replacement.

17. Packaging and Package Marking

17.1 The rolls shall be wrapped or banded securely with a substantial grade of paper, plastic wrap, or taping that encircles the roll in a manner that will prevent slipping or unraveling.

17.2 No roll shall contain more than two pieces, and no more than 3 % of the rolls in any lot (pallet or shipment) shall contain two pieces. Pieces represent roll ends that can be (1) individual and loose, (2) adhered, or (3) stitched to appear as one continuous piece. These rolls must be marked clearly with a red tag or other item to identify the location of the splice.

17.3 Unless otherwise specified, each package shall be marked plainly with the manufacturer's or supplier's name, product or brand name, or both, and the ASTM designation and type.

18. Keywords

18.1 fiber glass scrim; hot-applied roofing and waterproofing; polyester/polyamide reinforcement; polyester reinforcement; thermoplastic fabrics

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