Designation: D751 – 06 (Reapproved 2011)

Standard Test Methods for Coated Fabrics[1]

This standard is issued under the fixed designation D751; 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.

This standard has been approved for use by agencies of the Department of Defense.

1. Scope

1.1 These test methods cover, but are not limited to, rubber-coated fabrics, that is, tarpaulins, rainwear, and similar products.

1.2 The scope of each of these test methods appears in the section in which the test method is described.

1.3 The test methods appear in the following sections:

1.4 The values stated in SI 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:*[2]

D573 Test Method for Rubber—Deterioration in an Air Oven

D1349 Practice for Rubber—Standard Temperatures for Testing

D1424 Test Method for Tearing Strength of Fabrics by Falling-Pendulum (Elmendorf-Type) Apparatus

D2136 Test Method for Coated Fabrics—Low-Temperature Bend Test

D2137 Test Methods for Rubber Property—Brittleness Point of Flexible Polymers and Coated Fabrics

D4483 Practice for Evaluating Precision for Test Method Standards in the Rubber and Carbon Black Manufacturing Industries

3. Significance and Use

3.1 Coated fabrics and rubber products made from coated fabrics are important items of commerce, and adequate test methods must be available to ensure the quality of these products. These test methods provide for this testing capability.

4. Standard Conditions

4.1 *Test Conditions*—Coated fabrics shall be tested in an environment satisfying the conditions as defined in 4.2 or 4.3 unless otherwise specified, or as per agreement between supplier and purchaser. When it is known that the coated fabric is to be used in a tropical environment, the atmosphere described in 4.3 shall be specified.

4.2 *Temperate Atmosphere*—The standard condition for testing coated fabrics shall be that reached by the fabric when in moisture equilibrium with a standard atmosphere having a relative humidity of 50 ± 5 % at 23 ± 2°C (73 ± 4°F).

4.3 *Tropical Atmosphere*—The standard condition for testing coated fabrics shall be that reached by the fabric when in moisture equilibrium with a standard atmosphere having a relative humidity of 65 ± 5 % at 27 ± 2°C (80 ± 2°F).

[1] These test methods are under the jurisdiction of ASTM Committee D11 on Rubber and are the direct responsibility of Subcommittee D11.37 on Coated Fabrics, Rubber Threads and Seals.

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[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.

4.4 *Moisture Equilibrium*—It shall be considered that moisture equilibrium is reached when after free exposure to air in motion, there is no progressive increase in mass. Moisture equilibrium shall be approached from the dry side (not moisture-free). Certain coatings may greatly retard moisture penetration into the fabric; therefore, fabrics coated on both sides may require 24 h or more to reach equilibrium.

5. Time Lapse Between Vulcanization and Testing

5.1 For all test purposes, the minimum time between vulcanization and testing should be 16 h.

5.2 For nonproduct tests, the maximum time between vulcanization and testing should be four weeks, and for evaluations intended to be comparable, the tests, as far as possible, should be carried out after the same time interval.

5.3 For product tests, where possible, the time between vulcanization and testing should not exceed three months. In other cases, tests should be made within two months of the date of receipt by the customer.

NOTE 1—Section 5 is not applicable for coated fabrics not requiring vulcanization.

6. Precision and Bias

6.1 *Precision*—These precision statements have been prepared in accordance with Practice D4483. Please refer to Practice D4483 for terminology and other testing and statistical concepts (see Annex A1 for precision tables).

6.2 The precision results give an estimate of the precision of these test methods with the materials (rubbers) used in the particular interlaboratory program as described in Annex A1. The precision parameters should not be used for acceptance/rejection testing of any group of materials without documentation that they are applicable to those particular materials and the specific testing protocols that include these test methods.

6.3 *Bias*—In test method statistical terminology, bias is the difference between an average test value and the reference or true test property value. Reference values do not exist for these test methods since the value or level of the test property is exclusively defined by the test method. Bias, therefore, cannot be determined.

DIMENSIONS AND MASS

7. Length

7.1 *General Method*—Lay the coated fabric out smooth, without tension, on a horizontal surface and measure the length parallel to the selvage; or, measure successive portions, each at least 5 m (5 yd) in length, under the same conditions.

7.2 *Drum Method*—Run the coated fabric over a measuring drum with just enough uniform tension to keep it running flat and true. Determine the length from the dial or counter on the drum and its calibration.

8. Width

8.1 Measure the width with the coated fabric laid out smooth on a horizontal surface but without tension in either direction. Report the average of at least five different measurements uniformly distributed along the full length of a roll or piece as the average width of the roll or piece.

9. Thickness

9.1 *Thickness Gauge*—The gauge used for the measurement of thickness shall be of the deadweight type equipped with a dial graduated to read directly to 0.025 mm (0.001 in.). The presser foot shall be circular with a diameter of 9.52 ± 0.03 mm (0.375 ± 0.001 in.). The presser foot and moving parts connected therewith shall be weighted so as to apply a total force of 1.7 ± 0.03 N (6 ± 0.1 oz) equivalent to a pressure of 23.5 ± 0.5 kPa (3.4 ± 0.07 psi) to the specimen. The presser foot and anvil surfaces shall be plane to within 0.0025 mm (0.0001 in.) and parallel to each other to within 0.0025 mm (0.0001 in.). The gauge shall be calibrated for the actual load exerted by the presser foot by means of any device so arranged as to measure the total vertical force exerted by the presser foot at the several gauge readings or presser foot levels selected for calibration. The presser foot shall be brought to each calibration level from a higher one.

NOTE 2—It is suggested that the calibration may be accomplished by supporting the presser foot on a horizontal strap suspended from a weighing device so arranged that it may be raised or lowered gradually and leveled at any required position.

9.2 *Procedure*—Place the coated fabric upon the anvil of the gauge smooth, but without tension. Lower the presser foot upon the material gradually (without impact), allow it to rest upon it for 10 s, and then observe the reading of the dial. Make similar measurements at not less than five different places uniformly distributed over the surface of the coated fabric exclusive of the area adjacent to either selvage and within one tenth the width of the fabric or within 2.5 m (100 in.) of either end of a roll or piece. Report the average of the five or more measurements as the average thickness.

10. Mass

10.1 *Method Applicable to a Piece, Cut, or Roll*—Weigh the full piece, cut, or roll, on a calibrated scale accurate to 0.25 %, measure the length and width of the coated fabric, and calculate the mass, reporting it in grams per square metre (ounces per square yard) to the nearest 2.8 g (0.1 oz).

10.2 *Method Applicable to a Sample*—Cut a specimen having an area of at least 129 cm^2 (20 $in.^2$), or a number of specimens not less than 50 mm (2 in.) square and having a total area of at least 129 cm^2 (20 $in.^2$) from the coated fabric, weigh on a calibrated scale accurate to 0.25 %, and calculate the mass, reporting it in grams per square metre (ounces per square yard). Unless a specimen the full width of the fabric is used, take no specimen nearer the selvage than one tenth the width of the fabric.

NOTE 3—This test method is intended for use when a small sample of coated fabric is sent to the laboratory for test. The result is considered to be applicable to the sample, but not to the piece or lot of goods from which the sample was taken unless the number of samples and method of sampling are specified and agreed upon by those concerned. If this is done, each sample should be tested in accordance with 9.2 and the results averaged to obtain the average mass in grams per square metre (or ounces per square yard).

BREAKING STRENGTH

11. Breaking Strength

11.1 Breaking strength shall be determined by the grab test method, unless the strip test method is specified.

Procedure A—Grab Test Method

12. Testing Machine

12.1 The machine shall consist of three main parts:

12.1.1 Straining mechanism,

12.1.2 Clamps for holding specimen, and

12.1.3 Load and elongation recording mechanism(s).

12.2 *Straining Mechanism*—A machine wherein the specimen is held between the two clamps and strained by a uniform movement of the pulling clamp shall be used. Unless otherwise specified in the material specification, the machine shall be adjusted so that the pulling clamp shall have a uniform speed of 5 ± 0.2 mm/s (12 ± 0.5 in./min).

12.3 *Load and Elongation Recording Mechanism(s)*—Calibrated dial, scale, or chart to indicate applied load and elongation. Unless otherwise specified for load determination, the machine shall be adjusted or set so that the maximum load required to break the specimen will remain indicated on the calibrated dial, scale, chart, autographic recording, or computer interfaced with the testing machine after the test specimen has ruptured.

12.4 *Capacity*—The machine shall be of such capacity that the maximum load required to break the specimen shall be not greater than 85 % or less than 15 % of the rated capacity.

12.5 *Machine Efficiency*—The error of the machine shall not exceed 2 % up to and including a 222-N (50-lbf) force and 1 % over 222 N and 1 % at any reading within its loading range.

13. Clamps for Fabrics

13.1 The clamps for holding a specimen of coated fabric shall have gripping surfaces sufficiently flat and parallel as to prevent the test specimen from slipping or moving between the gripping surfaces when held under the pressure normal to operation. The dimension of all gripping surfaces parallel to the direction of application of the load shall be 25 mm (1 in.); the dimension perpendicular to this direction shall be 1 in. for the face jaw and 50 mm (2 in.) or more for the other. All edges that might cause a cutting action shall be rounded to a radius of not over 0.4 mm (0.0156 in.). The pressure between the gripping surfaces, sufficient to clamp the specimen firmly before the testing load is applied and to prevent slippage during the progress of the test, shall be secured by any suitably constructed mechanical device operating on the member of the clamp. The distance between the clamps at the start of the test shall be 75 mm (3 in.).

NOTE 4—As a practical method of determining the degree of flatness and parallelism of the assembled clamp mechanism, it is recommended that a sheet of thin white paper, between two thin sheets of carbon paper, be placed between the gripping surfaces, and the jaws then brought together with a light pressure.

14. Test Specimens

14.1 Specimens 102 mm (4 in.) in width and not less than 152 mm (6 in.) in length shall be cut from the coated fabric for test. Two sets of five specimens each will be required, one set for longitudinal breaking strength having the longer dimension parallel to the lengthwise direction of the goods, and the other set for transverse breaking strength, having the longer dimension parallel to the crosswise direction of the goods. No two specimens shall contain the same threads of the fabric in the direction to be tested. Unless otherwise specified, specimens shall be taken no nearer the selvage than one tenth the width of the coated fabric.

15. Procedure

15.1 Place the specimen symmetrically in the clamps of the machine (see Fig. 1) with the longer dimension parallel to and the shorter dimension at right angles to the direction of application of the force. Report the average of the results of the five individual tests in each direction as the longitudinal breaking strength and the transverse breaking strength of the fabric, respectively. If a specimen slips in the clamps, breaks in the clamps, breaks at the edges of the clamps, or if for any reason attributable to faulty operation, the result falls markedly below the average for the set of specimens, discard the result, take another specimen, and include the result of this break in the average.

Procedure B—Cut Strip Test Method

16. Procedure

16.1 Make the breaking strength test by the cut strip method in accordance with the directions for the grab method (Sections 12-15), with the exception that the specimens shall be cut 25 mm (1 in.) in width (or other width when specified). The 25 mm (1 in.) wide specimen shall be cut to obtain 25 mm (1 in.) of yarn.

ELONGATION

17. Procedure

17.1 Unless otherwise specified, obtain the elongation of a coated fabric at any stated force when the breaking strength (Sections 11-15) is determined and for the same specimens by the mechanism provided for such purpose. The elongation shall be the average of the results obtained for five specimens, and it shall be expressed as the percentage increase in length. Since the initial length and, therefore, the measured elongation depend upon the load applied in placing the specimen in the

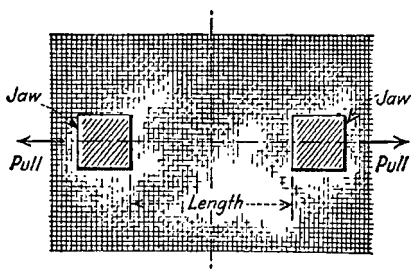

FIG. 1 Illustration of Grab Test