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Standard Guide for Evaluating Nonwoven Fabrics[1]

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1. Scope

1.1 This guide covers procedures for testing nonwoven fabrics. The test procedures appear in the following sections:

	Section
Abrasion Resistance	18
Absorbency	21
Air Permeability	8
Breaking Force and Elongation	9
Bursting Strength	10
Conditioning	7
Dimensional Change	20
Drycleaning	11
Flexural Rigidity	12
Mass Per Unit Area (Note 2)	17
Resin Binder Distribution	22
Seam Breaking Strength	13
Trapezoid Tear	14
Tongue Tear (Single Rip)	15
Elmendorf Tear	16
Thickness	19

NOTE 1—The terms "machine" and "cross machine" must be substituted for "warp" and "filling," respectively, throughout these test methods wherever pertinent.

1.2 The values stated in SI units are to be regarded as the standard. The values given in parentheses are for information only and may be approximate.

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 123 Terminology Relating to Textile Materials[2]

D 737 Test Method for Air Permeability of Textile Fabrics[2]

D 1683 Test Method for Failure in Sewn Seams of Woven Fabrics[2]

D 1776 Practice for Conditioning Textiles for Testing[2]

D 2724 Test Method for Bonded and Laminated Apparel Fabrics[2]

D 3776 Test Methods for Mass per Unit Area (Weight) of Woven Fabric[3]

D 3786 Test Method for Hydraulic Bursting Strength of Knitted Goods and Nonwoven Fabrics: Diaphragm Bursting Strength Tester Method[3]

D 3884 Test Method for Abrasion Resistance of Textile Fabrics (Rotary Platform, Double-Head Method)[4]

D 3885 Test Method for Abrasion Resistance of Textile Fabrics (Flexing and Abrasion Method)[3]

D 3886 Test Method for Abrasion Resistance of Textile Fabrics (Inflated Diaphragm Method)[3]

D 4158 Test Method for Abrasion Resistance of Textile Fabrics (Uniform Abrasion Method)[3]

D 5034 Test Method for Breaking Force and Elongation of Textile Fabrics (Grab Test)[3]

D 5035 Test Method for Breaking Force and Elongation of Textile Fabrics (Strip Test)[3]

D 5729 Test Method for Thickness of Nonwoven Fabrics[4]

D 5732 Test Method for Stiffness of Nonwoven Fabrics Using the Cantilever Test[3]

D 5733 Test Method for Tearing Strength of Nonwoven Fabrics by the Trapezoid Procedure[3]

D 5734 Test Method for Tearing Strength of Nonwoven Fabrics by the Falling-Pendulum (Elmendorf) Apparatus[3]

D 5735 Test Method for Tearing Strength of Nonwoven Fabrics by the Tongue (Single Rip) Procedure (CRE Testing)[3]

D 5736 Test Method for Thickness of Highloft Nonwoven Fabrics[3]

D 5802 Test Method for Sorption of Biloulous Paper Products (Sorptive Rate and Capacity Using Gravimetric Principles)[4]

D 5908 Test Method for Resin Binder Distribution and Binder Penetration Analysis of Polyester Nonwoven Fabrics[3]

F 778 Test Methods for Gas Flow Resistance Testing of Filtration Media[5]

3. Terminology

3.1 *Definitions:*

3.1.1 *nonwoven fabric, n*—a textile structure produced by bonding or interlocking of fibers, or both, accomplished by

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[2] *Annual Book of ASTM Standards*, Vol 07.01.

[3] *Annual Book of ASTM Standards*, Vol 07.02.

[4] *Annual Book of ASTM Standards*, Vol 15.09.

[5] *Annual Book of ASTM Standards*, Vol 14.02.

mechanical, chemical, thermal, or solvent means, and combinations thereof.

3.1.1.1 *Discussion*—The term does not include paper or fabrics that are woven, knitted, or tufted.

3.2 For definitions of textile terms used in these test methods, refer to Terminology D 123.

4. Significance and Use

4.1 Refer to the particular test method cited for the property of interest for specific significance and use statements.

4.2 In case of a dispute arising from the differences in reported test values when using the test methods listed in these test methods for acceptance testing of commercial shipments, the purchaser and the supplier should conduct comparative tests to determine whether a statistical bias exists between their laboratories. Competent statistical assistance is recommended for the investigation of this bias. As a minimum, the two parties should take a group of test specimens that are as homogeneous as possible and that are from a lot of material of the type in question. The test specimens should then be assigned randomly, in equal numbers, to each laboratory for testing. The average results from the two laboratories should be compared using Student's t-test for unpaired data and an acceptable probability level chosen by the two parties before the testing is begun. If a bias is found, either its cause must be determined and corrected or the purchaser and supplier must agree to interpret future results in the light of the known bias.

5. Sampling

5.1 *Lot Sample*—As a lot sample for acceptance testing, take at random the number of rolls, or pieces, of nonwoven fabric directed in an applicable material specification or other agreement between the purchaser and the supplier. Consider the rolls, or pieces, of nonwoven fabric to be the primary sampling units. Take the number of nonwoven fabric rolls specified in Table 1 in the absence of such an agreement.

NOTE 2—An adequate specification or other agreement between the purchaser and the supplier requires taking into account the variability between rolls, or pieces, of fabric and between specimens from a swatch from a roll of pieces of fabric to provide a sampling plan with a meaningful producer's risk and consumer's risk, acceptable quality level, and limiting quality level.

5.2 *Laboratory Sample*—For the laboratory sample, take a sample extending the width of the fabric and approximately 1 m (1 yd) along the machine direction from each roll, or piece, in the lot sample. For rolls of fabric, take a sample that will exclude fabric from the outer wrap of the roll or the inner wrap around the core.

5.3 *Test Specimens*—From each laboratory sample, take test specimens as directed in the individual test method of interest.

TABLE 1 Number of Rolls, or Pieces, of Nonwoven Fabric in the Lot Sample

Number of Rolls or Pieces in Lot, Inclusive	Number of Rolls or Pieces in Lot Sample
1 to 3	all
4 to 24	4
25 to 50	5
over 50	10 % to a max of 10 rolls or pieces

6. Calibration

6.1 Many of the test methods cited herein require the use of properly calibrated testing equipment. All testing systems should be verified before being used to generate results. Refer to the particular test method for specific information on the preparation, calibration, and verification of apparatus.

7. Conditioning

7.1 No conditioning is required unless otherwise specified.

7.2 When specified, precondition the specimens by bringing them to approximate moisture equilibrium in the standard atmosphere for preconditioning textiles in accordance with Practice D 1776.

7.2.1 After preconditioning, bring the test specimens to moisture equilibrium for testing in the standard atmosphere for testing textiles in accordance with Practice D 1776 or, if applicable, in the specified atmosphere in which the testing is to be performed.

8. Air Permeability

8.1 Determine the air permeability as directed in Test Method D 737. See Test Methods F 778 for additional methods for testing materials other than thin flat fabrics.

NOTE 3—With highloft nonwovens, compression of the sample edges may affect the air permeability.

9. Breaking Force and Elongation

9.1 Determine the breaking force and elongation using either Test Method D 5034 or Test Method D 5035, or both.

10. Bursting Strength

10.1 Determine the bursting strength as directed in Test Method D 3786.

11. Drycleaning

11.1 Determine the effect of drycleaning on nonwovens as directed in Test Method D 2724.

12. Flexural Rigidity

12.1 Determine the flexural rigidity as directed in Test Methods D 5732 using the cantilever test.

13. Seam Breaking Strength

13.1 Determine the seam breaking strength as directed in Test Method D 1683.

14. Trapezoid Tearing Strength

14.1 Determine the trapezoid tearing strength as directed in Test Methods D 5733.

15. Tongue Tear (Single Rip)

15.1 Determine the tearing strength as directed in Test Method D 5733.

16. Elmendorf Tear

16.1 Determine the tearing strength as directed in Test Method D 5734.

17. Mass per Unit Area

17.1 Determine the mass per unit area as directed in Test Methods D 3776.

18. Abrasion Resistance

18.1 Determine the abrasion resistance as directed in Test Method D 3884, Test Method D 3885, Test Method D 3886, or Test Method D 4158.

19. Thickness

19.1 Determine the thickness as directed in Test Method D 5729. For highloft non-wovens, determine thickness as directed in Test Method D 5736.

20. Dimensional Change

20.1 Determine the dimensional change as directed in Test Method D 2724.

21. Absorbency

21.1 Determine absorbency as directed in Test Method D 5802.

22. Resin Binder Distribution

22.1 Determine the resin binder distribution in polyester non-woven fabrics as directed in Test Method D 5908.

23. Keywords

23.1 abrasion resistance; air permeability; breaking strength; dimensional change; drycleaning; elongation; fabric; fabric bursting strength; highloft; mass per unit area; non-woven fabric; seam strength; stiffness; tearing strength; thickness