



Designation: D 5446 – 02

Standard Practice for Determining Physical Properties of Fabrics, Yarns, and Sewing Thread Used in Inflatable Restraints¹

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1. Scope

1.1 This standard is a listing of the test methods commonly employed in determining the physical properties of fabrics and yarns used in the manufacture of inflatable restraints.

1.2 Fabrics used in the manufacture of inflatable restraints may be coated or uncoated, and may be comprised of spun yarns, continuous filament yarns, or a combination thereof.

1.3 Fabrics used in the manufacturer of inflatable restraints may be either flat or one piece woven. For the one-piece woven, follow the sampling section of D 5446 and the individual test method.

1.4 In Section 9, this standard lists in alphabetical order the procedures associated with conducting physical testing of the following fabric or yarn properties of concern to the design and manufacture of inflatable restraints.

	Yarn	Section
Denier (Yarn Number)		9.3.1
Fiber Content		9.3.2
Finish (Extractable Material)		9.3.3
Strength and Elongation		9.3.4
Twist		9.3.5
	Fabric	
Air Permeability		9.3.6
Abrasion Resistance		9.3.7
Blocking		9.3.8
Bow and Skew		9.3.9
Breaking Force & Elongation		9.3.10
Burst Strength		9.3.11
Coating Adhesion		9.3.12
Coating Weight		9.3.13
Count of Woven Fabric		9.3.14
Dynamic Air Permeability		9.3.28
Edgecomb Resistance		9.3.29
Flammability		9.3.15
Fogging (Volatility)		9.3.16
Length		9.3.17
Mass per Unit Area		9.3.18
Non-Fibrous Material		9.3.19
Odor		9.3.20
Packability		9.3.30
pH		9.3.21
Stiffness		9.3.22
Tear Strength		9.3.23

Thickness		9.3.24
Warp Size Content & Residual Sizing		9.3.25
Width		9.3.26
	Thread	
Sewing Thread		9.3.27

1.5 This standard may be used in conjunction with Practice D 5427 which prescribes standard practices for the accelerated aging of inflatable restraint fabrics when comparative results of physical properties before and after accelerated aging are required.

1.6 Procedures and apparatus other than those stated in this standard may be used by agreement of purchaser and supplier with the specific deviations from the standard practice acknowledged in the report.

1.7 The values stated in either SI units or inch-pound units are to be regarded separately as standard. The values stated in each system are not exact equivalents; therefore, each system must be used independent of the other.

1.8 *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. See Note 3.*

2. Referenced Documents

2.1 ASTM Standards:

- D 123 Terminology Relating to Textiles²
- D 204 Test Methods for Sewing Thread²
- D 276 Test Methods for Identification of Fibers in Textiles²
- D 737 Test Method for Air Permeability of Textile Fabrics²
- D 751 Test Methods for Testing Coated Fabric³
- D 1059 Test Method for Yarn Number Based on Short-Length Specimens²
- D 1388 Test Methods for Stiffness of Fabrics²
- D 1422 Test Method for Twist in Yarns by the Untwist Retwist Method²
- D 1423 Test Method for Twist in Yarns by Direct Count Method²
- D 1777 Test Method for Measuring Thickness of Textile Materials²

¹ These test methods are under the jurisdiction of ASTM Committee D13 on Textiles and is the direct responsibility of Subcommittee D13.20 on Inflatable Restraints.

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² Annual Book of ASTM Standards, Vol 07.01

³ Annual Book of ASTM Standards, Vol 09.02.

- D 1907 Test Method for Yarn Number by the Skein Method²
- D 2256 Test Method for Tensile Properties of Yarns by the Single Strand Method²
- D 2257 Test Method for Extractable Matter in Textiles²
- D 2261 Test Method for Tearing Strength of Woven Fabrics by the Tongue (Single Rip) Method (Constant-Rate-of-Extension Tensile Testing Machine)²
- D 3773 Test Method for Length of Woven Fabric⁴
- D 3774 Test Method for Width of Woven Fabric⁴
- D 3775 Test Method for Fabric Count of Woven Fabric⁴
- D 3776 Test Method for Mass Per Unit Area (Weight) of Woven Fabric⁴
- D 3786 Test Method for Hydraulic Bursting Strength of Knitted Goods and Nonwoven Fabrics—Diaphragm Bursting Strength Tester Method⁴
- D 3882 Test Method for Bow and Skewness in Woven and Knitted Fabrics⁴
- D 3990 Terminology Relating to Fabric Defects⁴
- D 4032 Test Method for Stiffness of Fabric by the Circular Bend Procedure⁴
- D 4157 Test Method for Abrasion Resistance of Textile Fabrics (Oscillatory Cylinder Method)⁴
- D 4851 Test Method for Coated and Laminated Fabrics for Architectural Use⁴
- D 5034 Test Method for Breaking Force and Elongation of Textile Fabrics (Grab Test)⁴
- D 5427 Practice for Accelerated Aging of Inflatable Restraint Fabric⁴
- D 5587 Test Method for Trapezoid Tearing Strength of Textiles⁴
- F 778 Methods for Gas Flow Resistance Testing of Filtration Media⁵
- D 6476 Test Method for Determining Dynamic Air Permeability of Inflatable Restraint Fabric⁴
- D 6478 Test Method for Determining Specific Packability of Fabrics Used in Inflatable Restraint⁴
- D 6479 Test Method for Determining Edgcomb Resistance of Woven Fabrics Used in Inflatable Restraints⁴
- D 6613 Practice for Determining the Presence of Sizing in Nylon and Polyester Fabric Used in Inflatable Restraints⁴
- D 6799 Terminology Relating to Inflatable Restraints⁶
- 2.2 *Federal Standards*.⁷
- Motor Vehicle Safety Standard 302—Flammability
- 2.3 *SAE Standards*.⁸
- J912-A Resistance to Blocking
- J1351 Determination of Odor
- 2.4 *Ford Motor Company Standards*.⁹
- FLTM BO116-03 Fogging Standard

FLTM BN13-1 Coating Adhesion

2.5 *AATCC Methods*.¹⁰

Method 81 pH of Water—Extract from Wet Processed Textiles

3. Terminology

3.1 *Definitions*:

3.2 For definitions of other terms used in this standard, refer to Terminology D 123, Terminology D 3990 and Terminology D 6799.

4. Summary of Test Method

4.1 Test specimens are taken from sample rolls of fabric and tested using prescribed laboratory procedures, conditions and equipment by the supplier to determine the physical properties of the fabric in accordance with the requirements of the purchaser.

5. Significance and Use

5.1 Every ASTM test method listed in 2.1 contains a section describing its particular significance and use. Other test methods listed in 2.1 of this standard may contain sections pertaining to their particular significance and use.

5.2 The physical testing procedures in this standard can be used in conjunction with lot sampling procedures as a basis for acceptance testing of commercial shipments of inflatable restraint fabrics. They may be used to establish the criteria by which inflatable restraint fabrics will be tested by the supplier to determine whether a lot of material is acceptable for shipment to the purchaser.

5.3 This standard addresses all the physical properties that describe inflatable restraint fabrics and their commonly used test methods. Unless otherwise specified by agreement of purchaser and supplier, these standard test methods shall constitute the test conditions, procedures, and equipment used to determine the physical properties of fabrics used in inflatable restraints. It is intended to be used as a guideline in establishing a written material specification. The specification or agreement of purchaser and supplier may deviate from the practices described herein when (based on experience) considerations of fabric properties, material handling equipment, or inflatable restraint system design dictate otherwise.

6. Apparatus

6.1 Periodic laboratory certification of test equipment used in accordance with this standard is required to reduce test variability due to precision and bias.

6.2 For inflatable restraints, all test equipment used in accordance with the procedures referenced in this standard shall be certified for calibration annually by an independent agency or equipment manufacturer whose results are traceable to National Institute of Science and Technology (NIST) or other national standards laboratory. The test parameters of the equipment shall be tested within the operating ranges covered in the material specification or equivalent document.

⁴ *Annual Book of ASTM Standards*, Vol 07.02.

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

⁶ *Annual Book of ASTM Standards*, Vol 07.02.

⁷ Available from the Superintendent of Documents, U.S. Government Printing Office, Washington, DC 20525.

⁸ Available from the Society of Automotive Engineers, 400 Commonwealth Drive, Warrendale, PA 15096-0001.

⁹ Available from Ford Motor Company, Engineering Department, Body Engineering Building, Room 1145, 21500 Oakwood Boulevard, Dearborn, MI 48124.

¹⁰ Available from American Association of Textiles Chemists and Colorists, PO Box 12215, Research Triangle Park, NC 27709.