



Designation: **D1776/D1776M – 16 D1776/D1776M – 20**

## Standard Practice for Conditioning and Testing Textiles<sup>1</sup>

This standard is issued under the fixed designation D1776/D1776M; 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 reappraisal. A superscript epsilon ( $\epsilon$ ) indicates an editorial change since the last revision or reappraisal.

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

### 1. Scope

1.1 This practice covers the conditioning and testing of textiles when conditioning is specified in a test method. Because prior exposure of textiles to high or low humidity may affect moisture pick-up equilibrium, a procedure also is given for preconditioning the material when required.

1.2 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 necessarily exact equivalents; therefore, to ensure conformance with the standard, each system shall be used independently of the other, and values from the two systems shall not be combined.

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, health, and environmental practices and determine the applicability of regulatory limitations prior to use.*

1.4 *This international standard was developed in accordance with internationally recognized principles on standardization established in the Decision on Principles for the Development of International Standards, Guides and Recommendations issued by the World Trade Organization Technical Barriers to Trade (TBT) Committee.*

### 2. Referenced Documents

2.1 *ASTM Standards:*<sup>2</sup>

D123 Terminology Relating to Textiles

D618 Practice for Conditioning Plastics for Testing

D885 Test Methods for Tire Cords, Tire Cord Fabrics, and Industrial Filament Yarns Made from Manufactured Organic-Base Fibers

D4920 Terminology Relating to Conditioning, Chemical, and Thermal Properties

D5867 Test Methods for Measurement of Physical Properties of Raw Cotton by Cotton Classification Instruments

D7269 Test Methods for Tensile Testing of Aramid Yarns

D7744 Test Methods for Tensile Testing of High Performance Polyethylene Tapes

E337 Test Method for Measuring Humidity with a Psychrometer (the Measurement of Wet- and Dry-Bulb Temperatures)

2.2 *ISO Standard:*

ISO 139 Textiles Standard Atmosphere for Conditioning and Testing<sup>3</sup>

### 3. Terminology

3.1 For terminology related to conditioning see Terminology D4920.

3.2 The following terms are relevant to this standard: accelerated conditioning, moisture content, moisture equilibrium, moisture equilibrium for preconditioning, moisture equilibrium for testing, precondition, standard atmosphere for preconditioning textiles, standard atmosphere for testing textiles, uncertainty of (in) measurement.

3.3 For definitions of other textile terms used in this standard see Terminology D123.

<sup>1</sup> This practice is under the jurisdiction of ASTM Committee D13 on Textiles and is the direct responsibility of Subcommittee D13.51 on Conditioning, Chemical and Thermal Properties.

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<sup>2</sup> 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.

<sup>3</sup> Available from American National Standards Institute, 11 W. 42nd Street, 13th Floor, New York, NY 10036.

## 4. Summary of Practice

4.1 Samples or specimens requiring preconditioning are brought to relatively low moisture content in a specified atmosphere. Samples or specimens not requiring pre-conditioning are brought to moisture equilibrium (specific to fiber-content) according to the standard atmospheres for testing textiles as shown in [Table 1](#).

4.2 Understanding of tolerance and uncertainty of measurement has evolved since the creation of the original version of this standard. Due to this new understanding, uncertainty of measurement has been taken into account in determining acceptable tolerances for the standard atmospheres for testing textiles as shown in [Table 1](#).

## 5. Significance and Use

5.1 The conditioning prescribed in this practice is designed to obtain reproducible results on textiles and textile products. Results of tests obtained on these materials under uncontrolled atmospheres may not be comparable with each other. In general, many of the physical properties of textiles and textile products are influenced by relative humidity and temperature in a manner that affects the results of the tests. To make reliable comparisons among different textile materials and products, and among different laboratories, it is necessary that standard atmospheres be utilized during conditioning and testing.

5.2 The documentation of standard atmospheres for preconditioning (if necessary), conditioning, testing settings and tolerances, including the determination of the uncertainty of measurement of temperature and relative humidity recording devices, may be necessary for laboratory accreditation. See [Appendix X1](#).

## 6. Apparatus

6.1 *Conditioning Room or Chamber, consisting of:*

**TABLE 1 Standard Atmospheres for Conditioning and Testing Textiles**

Material	Preconditioning <sup>A</sup> Time (h), minimum	Temperature, °C [°F]	Relative Humidity %	Time (h), minimum	ASTM Standard
<b>Textiles, general<sup>B</sup></b>		$-21 \pm 2$ [ $70 \pm 4$ ]	$65 \pm 5$		<a href="#">D1776</a>
<b>Textiles, general<sup>B</sup></b>		$21 \pm 2$ [ $70 \pm 4$ ]	$65 \pm 5$		<a href="#">D1776/D1776M</a>
<b>Textiles, specific<sup>C</sup></b>					
Cotton fiber classification and testing	4	$21 \pm 1$ [ $70 \pm 2$ ]	$65 \pm 2$		<a href="#">D1776</a> , <a href="#">D5867</a>
Cotton fiber classification and testing	4	$21 \pm 1$ [ $70 \pm 2$ ]	$65 \pm 2$		<a href="#">D1776/D1776M</a> , <a href="#">D5867</a>
Tire cords:					
— Polyamide					
— Polyamide	Not applicable	$-20 \pm 2$ [ $68 \pm 4$ ]	$65 \pm 5$	46	<a href="#">D885</a>
Option 2	Not applicable	$24 \pm 2$ [ $75 \pm 4$ ]	$55 \pm 5$	16	<a href="#">D885</a>
— Polyester	Not applicable	$-20 \pm 2$ [ $68 \pm 4$ ]	$65 \pm 5$	2	<a href="#">D885</a>
Option 1	Not applicable	$20 \pm 2$ [ $68 \pm 4$ ]	$65 \pm 5$	16	<a href="#">D885</a>
— Polyester					
Option 2	Not applicable	$24 \pm 2$ [ $75 \pm 4$ ]	$55 \pm 5$		<a href="#">D885</a>
Option 1	Not applicable	$20 \pm 2$ [ $68 \pm 4$ ]	$65 \pm 5$	16	<a href="#">D885</a>
— Rayon					
— Rayon		$-20 \pm 2$ [ $68 \pm 4$ ]	$65 \pm 5$	8	
— Rayon		$20 \pm 2$ [ $68 \pm 4$ ]	$65 \pm 5$	8	
Aramid <sup>D</sup>					
Option 1	3	$20 \pm 2$ [ $68 \pm 4$ ]	$65 \pm 5$	14	<a href="#">D7269</a>
Option 2	3	$24 \pm 2$ [ $75 \pm 4$ ]	$55 \pm 5$	14	<a href="#">D7269</a>
High Performance Polyethylene	Not applicable	$20 \pm 2$ [ $68 \pm 4$ ]	$65 \pm 5$	4	<a href="#">D7744</a>
Glass fiber products:					
— Plastic applications					<a href="#">D618</a>
— Plastic applications		$23 \pm 2$ [ $73 \pm 4$ ]	$50 \pm 5$		<a href="#">D1776</a>
— Textile applications		$23 \pm 2$ [ $73 \pm 4$ ]	$50 \pm 5$		<a href="#">D1776/D1776M</a>
— Textile applications		$21 \pm 1$ [ $70 \pm 2$ ]	$65 \pm 5$		<a href="#">D1776</a>
— Textile applications		$21 \pm 1$ [ $70 \pm 2$ ]	$65 \pm 5$		<a href="#">D1776/D1776M</a>
Nonwovens		$23 \pm 2$ [ $73 \pm 4$ ]	$50 \pm 5$		<a href="#">D1776</a>
Nonwovens		$23 \pm 2$ [ $73 \pm 4$ ]	$50 \pm 5$		<a href="#">D1776/D1776M</a>
Plastics and electrical insulation		$23 \pm 2$ [ $73 \pm 4$ ]	$50 \pm 5$		<a href="#">D618</a>

<sup>A</sup> Preconditioning is an option and may be employed when samples are being brought to equilibrium moisture content from an extreme high or low moisture content.

<sup>B</sup> Previous publications of this standard cited tolerances for general textiles without consideration of the uncertainty of measurement of the temperature and humidity controllers or the measurement devices used in textile laboratories. Changes in ISO 139 broadened tolerances to account for the uncertainty of measurement of controller and measurement devices have also been incorporated into the tolerances for the general textile category.

<sup>C</sup> Specific textiles' conditioning tolerances and their associated standards do not account for the uncertainty of measurement of controllers or devices.

<sup>D</sup> Report the standard atmosphere used.

6.1.1 Equipment for the generation of heated or cooled air, moisture, and air circulation with control devices to maintain standard atmospheres for testing textiles throughout a laboratory space, room or chamber within the tolerances given in **Table 1**.

NOTE 1—Temperature and relative humidity recording devices used in a testing laboratory are separate ones from those cited in 6.1.1

6.2 *Psychrometer, Ventilated by Aspiration*, or a similar measuring device, which is accurate to  $\pm 1^{\circ}\text{C}$  [ $\pm 2^{\circ}\text{F}$ ], for checking the recorded relative humidity, as directed in Test Method **E337**.

6.3 *Preconditioning Cabinet, Room, or Space*, equipped for maintaining the standard atmosphere for preconditioning.

6.4 *Balance*, having a sensitivity of one part in 1000 of the mass of the specimen.

6.5 *Multiple Shelf Conditioning Rack*,<sup>4,5</sup> for spreading out samples and specimens. See **Fig. 1**.

## 7. Preparation of Test Apparatus and Calibration

7.1 Verify the uncertainty of measurement of the temperature and relative humidity devices being used to produce standard atmospheres and those recording temperature and relative humidity in laboratories as this factor should be included in the tolerances prescribed in **Table 1**. It is recommended that devices with the smallest uncertainty of measurement be used. See **Appendix XI** and Bibliography.

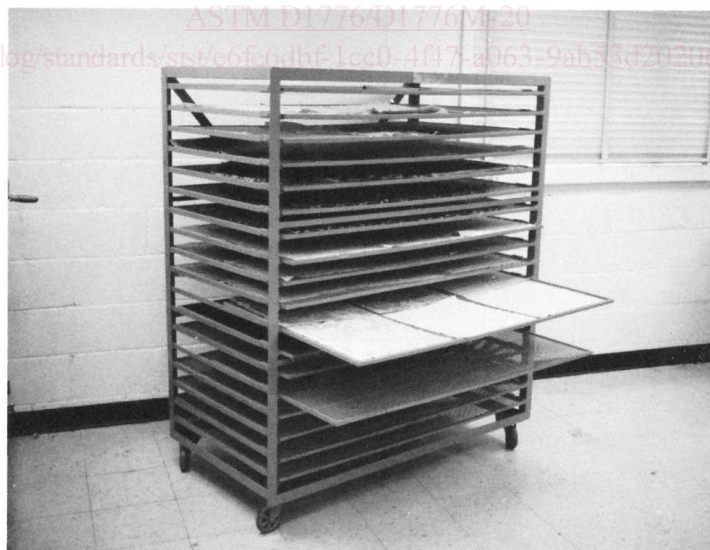
7.2 Set-up procedures for the preconditioning and conditioning room or chamber from different manufacturers may vary. Prepare and verify calibration of the temperature and relative humidity recording devices as directed in the manufacturer’s instructions.

7.3 Verify calibration of the temperature and relative humidity recording devices in the testing room as directed in the equipment manufacturer’s instructions.

7.3.1 The temperature and relative humidity indicated on the control point or on a recorder located away from the specimen may not be representative of a localized condition at the specimen because of local effects or deficiency in circulation of air that may take place in an enclosure or room. Tolerances at a controller usually must be smaller than those required at the specimen.

7.4 Determine the temperature and relative humidity of the air in the preconditioning cabinet if preconditioning is required (see 6.3), the conditioning room (see 6.1) and the testing room as directed in Test Method **E337**. If necessary, adjust the conditions to meet the specified limits for the standard atmospheres for preconditioning, conditioning, and testing, as applicable.

7.4.1 If the standard atmosphere for testing is found to be out of tolerance, use the guidelines in **Note 3** and **Table 2** to establish the equalization time after adjustments have been made and the required tolerances have been attained before any further testing is conducted.



**FIG. 1 Multiple Shelf Conditioning Rack**

<sup>4</sup> Drawings of the passive conditioning rack may be obtained from the American Association of Chemists and Colorists, P. O. Box 12215, Research Triangle Park, NC 27709-2215.

<sup>5</sup> A suitable rapid conditioning system may be constructed in the laboratory. See “Earnest, D. W., *Advancements in USDA Cotton Classing Facilities, Proceedings 1996, Beltwide Cotton Conferences*, pp. 1651–1654,” and “Knowiton, J. I., and Alldredge, R. K., *A New Method for Accelerating Cotton Sample Conditioning in Cotton Classing Offices, Proceedings 1994, Beltwide Cotton Conferences*, pp. 582–584.” Suitable self-contained rapid conditioning units are available from at least two commercial sources.