



Designation: **D1776/D1776M – 15** **D1776/D1776M – 16**

Standard Practice for Conditioning and Testing Textiles¹

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 (ϵ) 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 may not be exact equivalents; therefore, each system shall be used independently of the other. Combining values from the two systems may result in non-conformance with the standard.

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:*²

[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](#)³

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](#).

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~~ specimens not requiring pre-conditioning are brought to moisture equilibrium (specific to fiber-content) according to the standard ~~atmosphere~~ atmospheres for testing textiles as shown in [Table 1](#).

¹ 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.

Current edition approved Feb. 1, 2015; Jan. 1, 2016. Published March 2015; January 2016. Originally approved in 1960. Last previous edition approved in 2008; 2015 as [D1776-08](#); [D1776-15](#). DOI: [10.1520/D1776-D1776M-15-10.1520/D1776_D1776M-16](#).

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.

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



TABLE 1 Standard Atmospheres for Conditioning and Testing General Textiles

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

^A 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.

^B 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.

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

^D Report the standard atmosphere used.

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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:

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 ±1°C [±2°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*,^{4,5} 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.

7.4.2 Make temperature and relative humidity measurements in an atmosphere as close as possible to the specimen being conditioned or tested; however, it should not differ significantly from the room monitoring systems. For large conditioning rooms or testing laboratories, multiple sensors may be needed.

8. Procedure

8.1 *Sample or Specimen Configuration for Preconditioning or Conditioning:*

8.1.1 All samples or specimens shall be exposed to the applicable standard atmospheres in such a manner that the air will have free access to all surfaces of the textile.

8.1.2 Fiber samples or specimens shall be in their loose or open state for conditioning.

⁴ 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.

⁵ 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.



FIG. 1 Multiple Shelf Conditioning Rack