Designation: D1776 – 08ε1

StandardPractice for Conditioning and Testing Textiles[1]

This standard is issued under the fixed designation D1776; 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 U.S. Department of Defense.

ε[1] NOTE—Table 1 was corrected editorially in July 2009.

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 the text are in SI units. Inch-pound units are shown in parentheses. The values stated in each system are not exact equivalents; therefore, each system shall be used independently of the other. Combining values from the two systems may result in nonconformance to a specification.

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
D1776 Practice for Conditioning and Testing Textiles
D4920 Terminology Relating to Conditioning, Chemical, and Thermal Properties
D7269 Test Methods for Tensile Testing of Aramid Yarns
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 *Definitions:*

3.1.1 *accelerated conditioning, n*— a process that uses humidity generation and precise temperature controls to rapidly bring a textile to equilibrium in a standard atmosphere.

3.1.1.1 *Discussion*—Accelerated conditioning may be achieved in closed cabinets, rooms or process lines designed such that equilibrium can be achieved in a much shorter time, such as 2 to 10 minutes, compared to typical conditioning times.

3.1.2 *moisture content, n*—that part of the total mass of a material that is absorbed or adsorbed water, expressed as a percentage of the total mass.

3.1.2.1 *Discussion*—The total mass is the original mass comprising the dry substance plus any water present. The word *water* as used in these definitions refers to the compound chemically defined as H_2O. The terms *water* and *moisture* frequently are used interchangeably in the literature and the trade, but the term *moisture* is sometimes considered to include other volatile matter.

3.1.3 *moisture equilibrium, n*— the state of condition a textile reaches when it no longer takes up moisture from, or gives up moisture to, the surrounding atmosphere.

3.1.3.1 *Discussion*—Superficial equilibrium is reached very rapidly when air comes into contact with the outer surfaces of a textile. Moisture equilibrium can be reached in a reasonable time only if the air to which the sample is exposed is in motion. Moisture equilibrium, with air temperature (in motion) and relative humidity controlled to prescribed levels, is achieved when successive weighings do not show a progressive change in mass greater than the tolerance established for the textile.

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

Current edition approved Aug. 1, 2008. Published October 2008. Originally approved in 1998. Last previous edition approved in 2004 as D1776–04. DOI: 10.1520/D1776-08E01.

[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 tot he 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.

3.1.4 *moisture equilibrium, for preconditioning, n*—the moisture state of a textile sample(s) or specimen(s) reached after exposure to moving air in the standard atmosphere for preconditioning.

3.1.5 *moisture equilibrium, for testing, n*— the state of a textile sample(s) or specimen (s) reaches after exposure to moving air and relative humidity in selected standard atmospheres for conditioning and testing, when its mass does not change the after successive weighings.

3.1.5.1 *Discussion*—For test purposes, moisture equilibrium must be reached by adsorption, starting from a relatively moisture content. Moisture equilibrium for testing is considered as having been reached when the rate of increase in mass of a sample or specimen does not exceed that specified for the material being tested.

3.1.6 *precondition, v*—to bring a sample or specimen of a textile to a relatively low moisture content (approximate equilibrium an atmosphere between 5 and 25% relative humidity) prior to conditioning in a controlled atmosphere for testing.

3.1.7 *standard atmosphere for preconditioning textiles, n*—a set of controlled conditions having a temperature not over 50°C (122°F), with respective tolerances of ±1°C (±2°F), and a relative humidity of 5-25% ± 2 % for the selected humidity that drying can be achieved prior to conditioning in the standard atmosphere for testing textiles.

3.1.8 *standard atmosphere for testing textiles, n*—laboratory conditions for testing fibers, yarns, and fabrics in which air temperature and relative humidity are maintained at specific levels with established tolerances. See Table 1.

3.1.8.1 *Discussion*—Textile materials are used in a number of specific end use application that frequently require different testing temperatures and relative humidities. Specific conditioning and testing of textiles for end product requirements can be carried out using Table 1 in Practice D1776.

3.1.9 For additional terms, see Terminologies D123 and D4920.

4. Summary of Practice

4.1 Samples or specimens requiring preconditioning are brought to relatively low moisture content in a specified atmosphere. Samples or specimen not requiring preconditioning are brought to moisture equilibrium (specific to fiber-content) according to the standard atmosphere 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 atmosphere conditions 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 to standardize the humidity and temperature conditions to which the textile material or product is subjected for conditioning and during testing.

6. Apparatus

6.1 *Conditioning Room or Chamber, consisting of:*

6.1.1 Equipment for maintaining the standard atmosphere for testing textiles throughout the room or chamber within the tolerances given in Table 1 and including facilities for circulating air over all surfaces of the exposed sample or specimen and

6.1.2 Equipment for recording the temperature and relative humidity of the air in the conditioning room, chamber, or area.

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 within the tolerance given in 3.1.6.

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.

[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., 1996, *Advancements in USDA Cotton Classing Facilities, Proceedings 1996,* Beltwide Cotton Conferences, pp. 1651–1654," and "Knowiton, J. I., and Alldredge, R. K., 1994, *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.

TABLE 1 Standard Atmospheres for Testing Various Materials

Material	Temperature	Relative Humidity %	ASTM Standard
Textiles, general, other than nonwoven, tire cords and glass fiber	21 ± 1°C (70 ± 2°F)	65 ± 2	D1776
Nonwovens (includes paper)	23 ± 1°C (73.4 ± 1.8°F)	50 ± 2	D1776
Plastics and electrical insulating materials	23 ± 2°C (73.4 ± 3.6°F)	50 ± 5	D618
Glass fiber products:			
Plastic applications	23 ± 2°C (73.4 ± 3.6°F)	50 ± 5	D618
Textile applications	21 ± 1°C (70 ± 2°F)	65 ± 5	D1776
Tire cords:			
Rayon, Polyester, Polyamide	20 ± 2°C (68 ± 2°F)	65 ± 2	D885
Aramid	20 ± 2°C (68 ± 2°F)	65 ± 5	D7269