Designation: D3884 – 22

Standard Guide for Abrasion Resistance of Textile Fabrics (Rotary Platform Abrader Method)[1]

This standard is issued under the fixed designation D3884; 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.

1. Scope

1.1 This guide covers the determination of the abrasion resistance of textile fabrics using the rotary platform abrader.

NOTE 1—Other procedures for measuring the abrasion resistance of textile fabrics are given in Test Methods D3389, D3885, D3886, D4157, D4158, D4685, D4966, and AATCC 93. To determine the abrasion resistance of leather, refer to Test Method D7255.

1.2 The values stated in SI units are to be regarded as standard. No other units of measurement are included in this standard.

1.2.1 *Exception*—English units are used when referencing rotational speed.

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:*[2]

D123 Terminology Relating to Textiles
D1776 Practice for Conditioning and Testing Textiles
D3389 Test Method for Coated Fabrics Abrasion Resistance (Rotary Platform Abrader)
D3885 Test Method for Abrasion Resistance of Textile Fabrics (Flexing and Abrasion Method)
D3886 Test Method for Abrasion Resistance of Textile Fabrics (Inflated Diaphragm Apparatus)
D4157 Test Method for Abrasion Resistance of Textile Fabrics (Oscillatory Cylinder Method)
D4158 Guide for Abrasion Resistance of Textile Fabrics (Uniform Abrasion)
D4685 Test Method for Pile Fabric Abrasion
D4850 Terminology Relating to Fabrics and Fabric Test Methods
D4848 Terminology Related to Force, Deformation and Related Properties of Textiles
D4966 Test Method for Abrasion Resistance of Textile Fabrics (Martindale Abrasion Tester Method)
D5034 Test Method for Breaking Strength and Elongation of Textile Fabrics (Grab Test)
D5035 Test Method for Breaking Force and Elongation of Textile Fabrics (Strip Method)
D7255 Test Method for Abrasion Resistance of Leather (Rotary Platform, Abraser Method)
G195 Guide for Conducting Wear Tests Using a Rotary Platform Abraser

2.2 *Other Documents:*

AATCC 93 Abrasion Resistance of Fabrics: Accelerotor Method[3]

3. Terminology

3.1 For all terminology relating to D13.60, Fabric Test Methods, Specific, refer to Terminology D4850. For the definition of breaking force, refer to Terminology D4848.

3.2 *Definitions:*

3.2.1 The following terms are relevant to this standard: abrasion, abrasion cycle, breaking force.

3.2.2 *resurface, v*—procedure of cleaning and refreshing the running surface of an abrasive wheel prior to use or during testing.

3.3 For all other terminology related to textiles, refer to Terminology D123.

[1] This guide is under the jurisdiction of ASTM Committee D13 on Textiles and is the direct responsibility of Subcommittee D13.60 on Fabric Physical Test Methods B.

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[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 Association of Textile Chemists and Colorists (AATCC), P.O. Box 12215, Research Triangle Park, NC 27709, http://www.aatcc.org.

3.4 *Acronyms:*

3.4.1 *CAMI*—Coated Abrasives Manufacturers Institute

4. Summary of Test Method

4.1 A specimen is abraded using rotary rubbing action under controlled conditions of pressure and abrasive action. The test specimen, mounted on a turntable platform, turns on a vertical axis, against the sliding rotation of two abrading wheels. The wheels shall be mounted in such a way that when they are in contact with the rotating test specimen, they rotate in opposing directions. One abrading wheel rubs the specimen outward toward the periphery and the other, inward toward the center while a vacuum system removes wear debris generated during the test. The resulting abrasion marks form a pattern of crossed arcs over an area of approximately 30 cm^2. Resistance to abrasion is evaluated by various means which are described in Section 13.

5. Significance and Use

5.1 The measurement of the resistance to abrasion of textile and other materials is very complex and may be affected by a number of factors, including:

5.1.1 The inherent mechanical properties of the fibers; the dimensions of the fibers; the structure of the yarns; the construction of the fabrics; and the type, kind, and amount of finishing material added to the fibers, yarns, or fabric.

5.1.2 The conditions of the tests, such as the nature of abradant, variable action of the abradant over the area of specimen abraded, the tension of the specimen, the pressure between the specimen and abradant, and the dimensional changes in the specimens.

5.1.3 Changes in the abradant during specific tests.

NOTE 2—The abradant must accordingly be discarded at frequent intervals or checked periodically against a standard. With disposable abradants, the abradant is used only once or discarded after limited use. With permanent abradants that use hardened metal or equivalent surfaces, it is assumed that the abradant will not change appreciably in a specific series of tests. Similar abradants used in different laboratories will not change at the same rate, due to differences in usage. Permanent abradants may also change due to pick up of finishing or other material from test fabrics and must accordingly be cleaned at frequent intervals.

5.1.4 The method of evaluation, which may be influenced by the judgment of the operator.

5.2 The resistance of textile materials to abrasion as measured on a testing machine in the laboratory is generally only one of several factors contributing to wear performance or durability as experienced in the actual use of the material. While "abrasion resistance" (often stated in terms of the number of cycles on a specified machine, using a specified technique to produce a specified degree or amount of abrasion) and "durability" (defined as the ability to withstand deterioration or wearing out in use, including the effects of abrasion) are frequently related, the relationship varies with different end uses, and different factors may be necessary in any calculation of predicted durability from specific abrasion data. Laboratory tests may be reliable as an indication of relative end-use performance in cases where the difference in abrasion resistance of various materials is large, but they should not be relied upon where differences in laboratory test findings are small. In general, they should not be relied upon for prediction of actual wear-life in specific end uses unless there are data showing the specific relationship between laboratory abrasion tests and actual wear in the intended end-use.

5.3 Before definite predictions of fabric usefulness can be drawn from an abrasion test as made on the rotary platform abrader (Fig. 1), actual end-use trials should be conducted and related to the abrasion test. Different types of wear (for example, wear on men's clothing at cuffs, crotch, etc.) may correspond to different ratings of the rotary platform abrader test.

5.3.1 In making a comparison of different fabrics (that is, of different fibers, weights, etc.) the rotary platform abrader test will not always reveal a difference known to exist when the fabrics are actually used. Therefore, end-use trials should be conducted in conjunction with the abrasion test, at least as a guide for future testing of these fabrics.

5.3.2 Uncontrolled manufacturing or finishing variations occurring within a fabric or within lots of the same style of fabric can, however, be detected satisfactorily with the rotary platform abrader tester.

5.4 These general observations apply to all types of fabrics, including woven, nonwoven, and knit apparel fabrics, household fabrics, industrial fabrics, and floor coverings.

6. Apparatus

6.1 *Rotary Platform Abrader*[4] (Fig. 1), as described in G195 and consisting of the following elements:

6.1.1 Removable, turntable specimen platform that includes a rubber pad, clamp plate and centrally located threaded post with knurled nut, and clamp ring to secure the specimen. The turntable platform shall be motor driven, and mounted so as to produce circular surface travel of a flat specimen in the plane of its surface.

6.1.2 Motor capable of rotating the turntable platform and specimen at a speed of either 72 r/min ± 2 r/min or 60 r/min ± 2 r/min.

6.1.3 Pair of pivoted arms to which the abrasive wheels and accessory weights are attached.

6.1.4 Vacuum suction system and vacuum pick-up nozzle for removal of lint and debris generated during testing. The height of the vacuum nozzle shall be adjustable and the nozzle will have two 8 mm openings – one opening positioned between the two wheels and over the wear path and the other placed diametrically opposite. The distance between the axes of the two openings shall be 76.0 mm ± 1.0 mm.

6.1.5 Counter for indicating the number of abrasion cycles (revolutions of the turntable platform).

6.2 *Abrasive wheels*[4], which are attached to the free end of the pivoted arms and rotate freely about horizontal spindles.

6.2.1 The wheels shall be cylindrical shaped; have an external diameter between 51.9 mm and 44.4 mm; a width of

[4] The sole source of supply of the apparatus known to the committee at this time is Taber Industries, 455 Bryant St. North Tonawanda, NY 14120. If you are aware of alternate suppliers, please provide this information to ASTM headquarters. Your comments will receive careful consideration at a meeting of the responsible technical committee, which you may attend.