



Designation: D4685 – 07

Standard Test Method for Pile Fabric Abrasion¹

This standard is issued under the fixed designation D4685; 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 test method covers the determination of the abrasion of pile fabrics when the loss of pile tufts occur, sometimes called pile retention or pile pull out. It includes two procedures:

1.1.1 *Procedure A*—The “Heavy Duty” procedure describes the test option for fabrics over 240 g/m² (7 oz/yd²) or fabrics which should meet heavy duty end-use conditions of wear.

1.1.2 *Procedure B*—The “Light Duty” procedure describes the test option for fabrics under 240 g/m² (7 oz/yd²) or fabrics which should meet light duty end-use conditions of wear.

1.2 The test method is intended for both regular, ribless woven corduroy or other woven pile fabric constructions.

1.3 The values stated in SI units are to be regarded as the standard.

1.4 *This standard may involve hazardous materials, operations, and equipment. 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

D1776 Practice for Conditioning and Testing Textiles

D2724 Test Methods for Bonded, Fused, and Laminated Apparel Fabrics

D3884 Test Method for Abrasion Resistance of Textile Fabrics (Rotary Platform, Double-Head Method)

D4850 Terminology Relating to Fabrics and Fabric Test Methods

2.2 *ASTM Adjunct*:³ *Photographic Scale for Pile Retention*

¹ This test method is under the jurisdiction of ASTM Committee D13 on Textiles and is the direct responsibility of Subcommittee D13.59 on Fabric Test Methods, General.

Current edition approved Jan. 1, 2007. Published January 2007. Originally approved in 1987. Last previous edition approved in 1987 as D4685 – 87, which was withdrawn April 1997 and reinstated in January 2007. DOI: 10.1520/D4685-07.

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 A set of six photographic standards for pile retention of corduroy fabrics is available from ASTM International, 100 Barr Harbor Drive, W. Conshohocken, PA 19483-9585. Request adjunct no. 12-446850-18.

2.3 *AATCC Method*:⁴

TM 135 Dimensional Changes in Automatic Home Laundering of Woven or Knit Fabrics

3. Terminology

3.1 For all terminology related to fabric see Terminology D4850.

3.2 *Definitions of Terms Specific to This Standard*:

3.2.1 *abrasion, n*—the wearing away of any part of a material by rubbing against another surface.

3.2.2 *corduroy, n*—a filling cut-pile fabric in which the cut fibers form a surface of wales (rounded cords or ribs) which usually run in the warp direction.

3.2.3 *pile fabric, n*—a fabric in which certain yarns project from the weave structure to form a rib or wale (not to be confused with knitted construction column of looped yarns) on the face of the fabric that can be cut or remain uncut.

3.2.3.1 *Discussion*—Corduroy and velveteen are examples of cut filling pile fabrics.

3.2.4 *pile retention, n*—the degree to which cut-pile yarns are held secure and intact during wear (*Ant.* pile loss, pile pull-out).

3.2.5 *velveteen, n*—a woven fabric in twill or plain weave made with short, closely packed cut filling pile in imitation of velvet.

3.3 For definitions of other textile terms used in this test method, refer to Terminology D123.

4. Summary of Test Method

4.1 Test specimens are exposed to a specified number of abrasion cycles on face and back separately and then evaluated by viewing the specimen over a light box and comparing to photographic standards. The method measures only the amount of pile pulled out of the base fabric structure and not the surface pile appearance attributes, such as crushed or flatten ribs.

5. Significance and Use

5.1 This test method is considered satisfactory for quality control testing and commercial shipment acceptance.

⁴ Available from American Association of Textile Chemists and Colorists (AATCC), P.O. Box 12215, Research Triangle Park, NC 27709, http://www.aatcc.org.

5.1.1 In case of a dispute arising from differences in reported test results when using this test method, the purchaser and the supplier should conduct comparative tests to determine if there is a statistical bias between their laboratories. Competent statistical assistance is recommended for the investigation of bias. As a minimum, the two parties should take test specimens that are from the lot of material of the type in question. The test specimens should then be randomly assigned in equal numbers to each laboratory for testing. The average results from the two laboratories should be compared using student's t-test for unpaired data and an acceptable probability level chosen by the two parties before the testing is begun. If a bias is found, either its cause must be found and corrected or the purchaser and the supplier must agree to interpret future test results in the light of the known bias.

5.2 Finishes and changes in fabric surfaces may exert a large effect on pile retention of corduroy. Therefore, it may be desirable to test before as well as after laundering or drycleaning, or both.

5.3 The separate testing of specimens on the face and back of the fabric is important in this test method since the pile pull-out may be due to abrasive action on either the face or back. With many pile fabrics, specifically corduroy constructions, pile retention properties are worse when abraded on the back.

6. Apparatus

6.1 *Rotary Platform Abraser*, as described in Test Method D3884.⁵

6.1.1 *CS-10 Calibrase Abrading Wheels*.

6.1.2 *Specimen Holder*, rubber pad, clamp plate, and clamp ring.

6.1.3 *Auxillary Weight*, to give a load of 500 g per wheel.

6.1.4 *Vacuum Unit*.

6.2 *Round Template*, or die approximately 135 mm (5¼ in.) in diameter for cutting out specimens.

6.3 *Photographic Rating Standards*.³

6.4 *Lighted Viewing Box*, for evaluation (see Fig. 1).

6.4.1 The box is approximately 215 mm (8⅜ in.) in height, 150 mm (5⅞ in.) wide, 150 mm (5⅞ in.) in depth, with a 90 mm (3¾ in.) diameter opening in the top. The opening is covered with a clear glass plate which has a black 25 mm (1 in.) circular tape glued to the center of the opening to prevent light from passing through the center hole of the specimen while grading.

6.4.2 The box contains a 75 W reflector flood light⁶ the top of which is 38 mm (1½ in.) below the glass surface of the box and the specimen. The lamp size and spacing is critical.

7. Sampling

7.1 *Lot Sample*—As a lot sample for acceptance testing, take at random the number of rolls of fabric directed in an applicable material specification or other agreement between

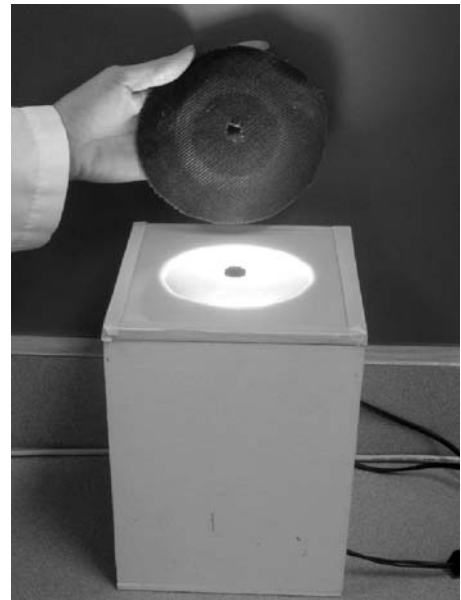


FIG. 1 Pile Retention Viewing Box

the purchaser and the supplier. Consider rolls of fabric to be the primary sampling units.

7.2 *Laboratory Sample*—As a laboratory sample, take from each roll of fabric in the lot sample a full width swatch at least 500 mm (20 in.) long after removing at least 1 m (1 yd) of fabric from the outside of the roll. If the fabric is also to be evaluated after laundering or drycleaning, take a second full width swatch 500 mm (20 in.) long from each roll of fabric in the lot sample.

7.3 *Test Specimens*—Cut four specimens from each swatch in the laboratory sample as directed in 8.1.

8. Specimens and Preparation

8.1 Using the template or die specified in 6.2, cut four specimens 133 mm (5¼ in.) in diameter from each laboratory sample. If a sample is to be evaluated after laundering or drycleaning, four additional specimens will be taken. (See Section 9).

8.2 Cut the specimens from each laboratory sample so that each specimen contains different warp and filling yarns. Two specimens are to be used to test the face of the sample and two specimens to test the back of the fabric.

8.3 Prepare specimen by folding the round specimen twice and cutting off the pointed tip to produce a 6-mm (¼-in.) hole in the center of the specimen to accommodate the clamping screw.

8.4 Determine the fabric mass or identify the anticipated end-use of the sample, or both, for proper selection of the testing option.

8.5 Prior to testing, ensure the expiration date of the abrasion wheels has not passed for the CS-10 wheels. Follow the manufacturer's recommended procedure for breaking in new, or resurfacing and cleaning wheel sets.

NOTE 1—See detailed instructions on preconditioning and other operations in the instrument manual or those in Test Method D3884.

⁵ The Taber Abraser has been found suitable for this purpose. Several models are available from Taber Industries, 455 Bryant St., North Tonawanda, NY 14120.

⁶ A 75-watt reflector flood light manufactured by General Electric Co. (75R 30/FL) has been found suitable for this purpose.