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Standard Test Method for Abrasion Resistance of Geotextiles (Sand Paper/Sliding Block Method)¹

This standard is issued under the fixed designation D4886; 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 resistance of geotextiles to abrasion using an abrasion tester. This test method at this point has only been evaluated for geotextiles—not geomembranes, grids, etc. Therefore, the test method is designated for geotextiles, not geosynthetics, as all products may not lend themselves to this test method for abrasion. If later developments indicate a wider scope for this test method, appropriate changes will be made.

1.2 The values stated in SI units are to be regarded as standard. The values given in inch-pound units are provided as information only.

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](#) ~~D1682~~ [Methods of Test for Breaking Load and Elongation of Textile Fabrics](#)

D1776 [Practice for Conditioning and Testing Textiles](#)

D4354 [Practice for Sampling of Geosynthetics for Testing](#)

D4439 [Terminology for Geosynthetics](#) ~~Terminology for Geosynthetics~~

D5035 [Test Method for Breaking Force and Elongation of Textile Fabrics \(Strip Method\)](#)

3. Terminology

3.1 Definitions:

3.1.1 *atmosphere for testing geotextiles, n*—air maintained at a relative humidity of $65 \pm 5\%$ and a temperature of $21 \pm 2^\circ\text{C}$ ($70 \pm 4^\circ\text{F}$).

3.1 For definitions of other terms used in this test method, refer to Terminologies D123 or D4439

3.1.2

3.2 Definitions:

3.2.1 *abrasion, n*—the wearing away of any part of a material by rubbing against another surface. ~~D123~~

3.1.3 *geotextiles*

D123

3.2.2 *loss in breaking force, n*—any permeable textile used with foundation, soil, rock, earth, or any other geotechnical engineering related material as an integral part of a man-made project, structure, or system. **D4439**

3.1.4 For definitions of other terms used in this test method, refer to Terminologies D123 or D4439. ~~—percent comparison of breaking force before and after abrasion.~~

4. Summary of Test Method

4.1 A test specimen, mounted on a stationary platform is rubbed by an abradant with specified surface characteristics. Under controlled conditions of pressure and abrasive action, the abradant is rubbed on a horizontal axis using a uniaxial motion. Resistance to abrasions is expressed as a percentage of original strength before abrading.

¹ This test method is under the jurisdiction of ASTM Committee D35 on Geosynthetics and is the direct responsibility of Subcommittee D35.02 on Endurance Properties. Current edition approved Nov. 25, 1988. Published January 1989. DOI: 10.1520/D4886-88R02. Current edition approved Oct. 1, 2010. Published October 2010. Originally approved in 1988. Last previous edition approved in 2002 as D4486-88(2002). DOI: 10.1520/D4886-10.

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.

5. Significance and Use

5.1 This test method may be used for acceptance testing of commercial shipments of geotextiles, but caution is advised since information on the precision of the test is lacking. Comparative testing as directed in 5.1.1 may be advisable.

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 a group of test specimens that are as homogeneous as possible and that are from a 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 light of the known bias.

5.2 The resistance of abrasion is also greatly affected by 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.

5.3 The resistance of geotextile materials to abrasion as measured on a testing machine in the laboratory is generally only one of several factors contributing to performance or durability as experienced in the actual use of the material. While “abrasion resistance” and “durability” 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 for prediction of actual in-situation life in specific end uses unless there are data showing the specific relationship between laboratory abrasion tests and actual in-situation life in the intended end-use.

5.4 These general observations apply to all types of fabrics, including woven, nonwoven, and knit fabrics.

5.5 If there is a disagreement arising from differences in values reported by the purchaser and the seller when using this test method for acceptance testing, the statistical bias, if any, between the laboratory of the purchaser and the laboratory of the seller should be determined with each comparison being based on testing specimens randomly drawn from one sampling unit of material of the type being evaluated.

6. Apparatus

6.1 *Abrasion Tester*,³ having the following essential parts:

6.1.1 *Balanced Head and Block Assembly*—The assembly should be two parallel, smooth plates, one of which makes a reciprocating motion. The speed of the reciprocating plate should be adjustable between 10 and 115 double strokes per minute. The stroke length should be 25 mm (1 in.). The second plate is rigidly supported by a double-lever assembly to provide free movement in a direction perpendicular to the reciprocating plate. This plate is stationary during the test and must be well balanced so that a vertical load can be maintained by means of dead weights. Both plates are equipped with clamps at each end to hold the test sample and the abrading medium. The clamps have gripping surfaces adequate to prevent slippage of the specimen or the abrading material during the test.

6.1.2 *Indicator*—Means should be provided for indicating the number of cycles (1 cycle = 1 double stroke).

6.1.3 *Weights*—Weights should be provided for applying a vertical load to the specimen.

7. Sampling

7.1 *Lot Sample*—As a lot sample for acceptance testing, or routine product evaluation, take at random the number of rolls of fabric directed in an applicable material specification or other agreement between the purchaser and the supplier, such as agreement to use Practice D4354. Consider rolls of fabric to be the primary sampling unit.

NOTE 1—Abrasion testing is a nonroutine quality control test for geotextiles and will not normally be performed on every lot by the manufacturer or supplier. When testing for abrasion is performed, however, the sampling should be as described in Section 7.

7.2 *Laboratory Sample*—Take for the laboratory sample, a swatch extending the width of the fabric and approximately 1 m (39 in.) along the selvage from each roll in the lot sample. The swatch may be taken from the end portion of a roll provided there is no evidence that it is distorted or different from other portions of the roll. In cases of dispute, take a swatch that will exclude fabric from the outer wrap of the roll or the inner wrap around the core.

7.3 *Test Specimens*—From each swatch in the laboratory sample, prepare two sets of specimens each containing five specimens. Cut rectangular specimens 75 by 200 ± 1 mm (3 by 8 ± 1/16 in.). Cut the set of specimens to be tested in the machine direction with the longer dimension parallel to the machine direction and the set of specimens to be tested in the cross-machine direction with the longer dimension in the cross-machine direction. Take each set of specimens from a swatch along a diagonal so that they

³Withdrawn. The last approved version of this historical standard is referenced on www.astm.org.

³The sole source of supply of the abrasion tester known to the committee at this time is Custom Scientific Instrument Inc., 13 Wing Drive, Cedar Knolls, NJ 07927. If you are aware of alternative suppliers, please provide this information to ASTM International Headquarters. Your comments will receive careful consideration at a meeting of the responsible technical committee, which you may attend.