Designation: F3383 – 19a

Standard Test Method for Filament Bind of Single Fibers in Synthetic Turf[1]

This standard is issued under the fixed designation F3383; 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 applies to tufted synthetic turf produced with at least one bundle of monofilament fibers.

1.2 This test method is applicable to laboratory testing (Method A), and for testing of installed turf (Method B).

1.3 The results from this test method provide an indication of the resistance to single fiber loss during installation or end use applications of the synthetic turf.

1.4 All values stated in inch-pound units are to be regarded as standard; the values in SI units are provided as information only and are not exact equivalents. In case of reference decisions, the inch-pound units shall prevail.

1.5 *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.*

1.6 *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]

D76 Specification for Tensile Testing Machines for Textiles
D1776 Practice for Conditioning and Testing Textiles
D5684 Terminology Relating to Pile Floor Coverings
F1551 Test Methods for Comprehensive Characterization of Synthetic Turf Playing Surfaces and Materials
F1936 Specification for Impact Attenuation of Turf Playing Systems as Measured in the Field

3. Terminology

3.1 For terminology relating to Pile Floor Covering, refer to Terminology D5684.

3.1.1 The following terms are relevant to this standard: *carpet*, *constant-rate-of-extension*, *cut pile floor covering*, *tuft*, *tuft bind*, *tuft leg*, *tufted fabric*, *filament*, *slit tape*, *slit film*, and *monofilament*.

3.2 For terminology relating to Synthetic Turf Materials, refer to Test Methods F1551.

3.3 *Definitions:*

3.3.1 *bundle of monofilament fibers, n*—group of two or more (typically 4 to 12) monofilaments held together by wrap yarn(s) (one or two) or by being twisted together to give a cohesive bundle.

3.3.2 *filament bind, n*—the force required to pull one filament from one bundle of one tuft from the synthetic turf fabric sample.

3.3.3 *lab sample, n*—a full width cut of the synthetic turf roll to be tested, insuring sufficient material for the test samples (Procedure A).

3.3.4 *test sample, n*—a sample cut to a minimum of 6 by 6 in. (150 by 150 mm), from the lab sample (Procedure A).

3.3.4.1 *Discussion*—For lab testing with Procedure B (6.4), assure test sample size is a minimum of 3 in. greater, in length and width, than the size of the portable device base.

3.3.5 *test area, n*—the synthetic turf exposed through the 3 in. (7.6 cm) opening in the clamp (Procedure A), or base of the portable device (Procedure B).

3.3.6 *test location, n*—the specific area tested on a synthetic turf field (7.2.1), consisting of a 20 by 20 in. (51 by 51 cm) square divided into four quadrants (Procedure B).

3.3.7 *test specimens, n*—a single filament from a single tuft leg (Procedure A and B).

4. Summary of Test Method

4.1 A test sample is mounted in a clamping device (see Procedures A and B) associated with the constant rate of extension (CRE) force testing device. The force required to pull one filament from one bundle of one tuft from the synthetic turf fabric sample is measured as the filament bind.

[1] This test method is under the jurisdiction of ASTM Committee F08 on Sports Equipment, Playing Surfaces, and Facilities and is the direct responsibility of Subcommittee F08.65 on Artificial Turf Surfaces and Systems.

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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.

5. Significance and Use

5.1 Monofilament fibers in synthetic turf athletic fields need to be sufficiently bound to the synthetic turf fabric. The binding force must be sufficient to resist filament loss by expected forces applied to the turf during installation and anticipated activities on the installed synthetic turf field.

5.2 Loss of turf fiber filaments from the turf fabric affects the aesthetic appearance of the synthetic turf. There are also potential negative impacts on performance properties from excessive filament loss.

5.3 Filament bind provides a relative indication of the resistance to fiber loss.

6. Apparatus—Tensile Testing Machine

6.1 *Procedure A – Laboratory Testing: Apparatus – Tensile Testing Machine*—Constant-rate-of-extension (CRE) type, conforming to Specification D76, with the capacity selected so that forces as low as 1.0 lb (4.45 N) can accurately be measured. The rate of extension shall be 12 ± 0.5 in./min (300 ± 10 mm/min).

6.2 *Flat Sample Holder*—The test sample is held in place on a flat platen (Fig. 1) using a restraining clamp (Fig. 2) as shown in (Figs. 3 and 4). The clamp shall provide sufficient force to prevent excessive movement of the test area during the test. A circular constrained area of turf having a diameter of 3 in. (7.6 cm) provides the test area for selection of the singular test filament.

6.3 *Filament Clamp,* consisting of a set of hemostats or tweezer like clamps (Fig. 5) that can grip a single filament tightly to assure removal of the filament without slippage of the filament in the tuft clamp, or damage to the fiber. The pull direction shall be 90° from the plane of the turf fabric at the binding site (Fig. 6).

6.4 *Procedure B – Laboratory or Field Testing: Apparatus – Portable Force Testing Machine*—Constant-rate-of-extension (CRE) type, conforming to Specification D76, with the capacity selected so that forces as low as 1.0 lb (4.45 N) can accurately be measured. The rate of extension shall be 12 ± 0.5 in./min (300 ± 10 mm/min).

6.5 The portable device consists of:

6.5.1 Portable stand that supports the upper clamp assembly, and also keeps the test area stationary.

6.5.2 Linear actuator (CRE); a moveable linear shaft assembly capable of providing a constant rate of extension.

6.5.3 A force measuring instrument capable of measuring maximum load while pulling the filament from the turf.

6.5.4 A clamp (example shown in Fig. 8) capable of holding one filament without damaging the filament as to cause breakage/damage at the filament clamping location. The clamp shall hold the filament to assure no slippage occurs during the test.

6.5.5 The base of the portable device has a 3 in. (7.6 cm) opening to provide access to the test area.

7. Sampling, Test Specimens, and Test Units

7.1 *Laboratory Sample*—For rolls of synthetic turf, cut a laboratory sample the full width of the synthetic turf roll insuring sufficient material for the test samples requested in 7.1.1. Avoid areas with visible damage, and areas with excessive, or non representative coating amounts.

7.1.1 *Test Sample*—From each laboratory sample, cut three test samples across the width of the laboratory sample. One of the test samples is taken from the approximate center of the roll. The other two samples are taken between the center and the two sides of the roll. The test sample shall be taken no nearer than 5 % of the synthetic turf roll width. Cut each test sample to a minimum of 6 by 6 in. (150 by 150 mm). For lab

FIG. 1 Example of Flat Platen

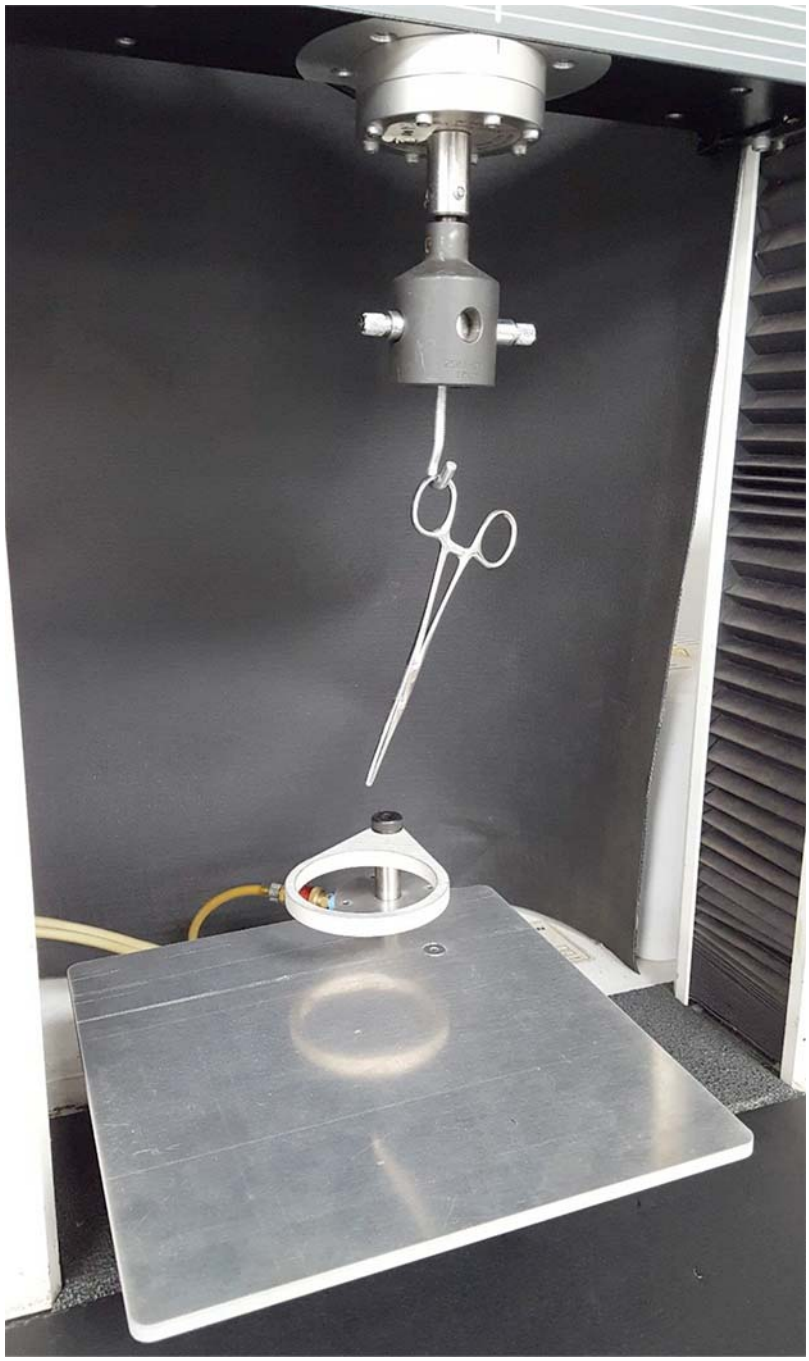

FIG. 2 Example of Sample Clamp (Pneumatic)

testing with Procedure B (6.4), assure sample size is a minimum of 3 in. greater, in length and width, than the size of the portable device base.

7.1.2 Exercise care in handling the sample to avoid damaging the back coating of the test sample.

7.1.3 *Test Specimens*—Test four specimens from each test sample. A specimen is a single filament from a single tuft leg. Each of the four test specimens shall be taken from a different quadrant of the test sample as shown in Fig. 9. Select the filament from the approximate center of each quadrant, and at least 1.5 in. (3.8 cm) away from any cut edge.

7.1.4 *Test Result*—The result for a laboratory sample is the average of the twelve specimen results from the three test samples.

7.2 *In situ Sample:*

7.2.1 *Field Sample Locations:*