



# Standard Test Method for Relative Abrasiveness of Synthetic Turf Playing Surfaces<sup>1</sup>

This standard is issued under the fixed designation F1015; 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 ( $\epsilon$ ) indicates an editorial change since the last revision or reapproval.

## 1. Scope

1.1 This test method is applicable to both laboratory and field measurement of synthetic turf surfaces used for sports.

1.2 The values stated in SI units are to be regarded as the standard. The values given in parentheses are for 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, 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:*<sup>2</sup>

**C421** Test Method for Tumbling Friability of Preformed Block-Type and Preformed Pipe-Covering-Type Thermal Insulation

**E105** Guide for Probability Sampling of Materials

**E122** Practice for Calculating Sample Size to Estimate, With Specified Precision, the Average for a Characteristic of a Lot or Process

**F355** Test Method for Impact Attenuation of Playing Surface Systems, Other Protective Sport Systems, and Materials Used for Athletics, Recreation and Play

## 3. Terminology

3.1 *Definitions of Terms Specific to This Standard:*

<sup>1</sup> 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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<sup>2</sup> 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.

3.1.1 *synthetic turf playing surface*—a man-made playing surface incorporating artificial grass-like fibers.

3.1.2 *abrasiveness*—that property of a synthetic turf which causes material in moving contact with the turf surface to wear away.

3.1.3 *abrasiveness index*—a number equal to the weight lost in grams per foot of travel of a standard weighted friable foam set multiplied by 100, when the foam is pulled through a complete 1.8-m (6-ft) test cycle.

3.1.4 *foam friability index*—a number equal to the percent mass loss of foam when tested in accordance with the Procedure section of Test Method C421.

## 4. Summary of Test Method

4.1 Friable foam blocks are attached to a weighted platform which is pulled over the playing surface in a prescribed manner. The weight of foam abraded away determines the relative abrasiveness of the surface.

## 5. Significance and Use

5.1 Data obtained from the procedure of this test method are indicative of the relative abrasiveness of fabric or carpet type synthetic playing surfaces.

## 6. Apparatus

6.1 *Abrasiveness Test Platform*—A test platform is used to support the load on the friable foam material. The platform shall consist of a 20.3 by 20.3 cm (8.00 by 8.00 in.) square of 0.635-cm thick (0.25 in.) aluminum. Holes 0.635 cm in diameter shall be centered 0.635 cm from the midpoint of each edge to permit attachment of a suitable hook for pulling. Foam retaining strips, ¼ in. high by ½ in. wide, defining 2 by 2-in. squares, are attached at each corner (Fig. 1). The completed platform should weigh  $931 \pm 28$  g.

6.2 *Test Weight*—A flat-head (9.072-kg (20.00-lb)) missile as used in Test Method F355, Procedure A, can be used as a test weight. A suitable alternative weight is a steel cylinder about 15.2 cm (6.00 in.) in diameter and about 6.35 cm (2.50 in.) in height. The test weight is to be within 56 g (2 oz) of its specified weight.

6.3 *Pull Cable and Direction Changing Pulley*—A direction changing pulley attached to an operator foot restraint may be

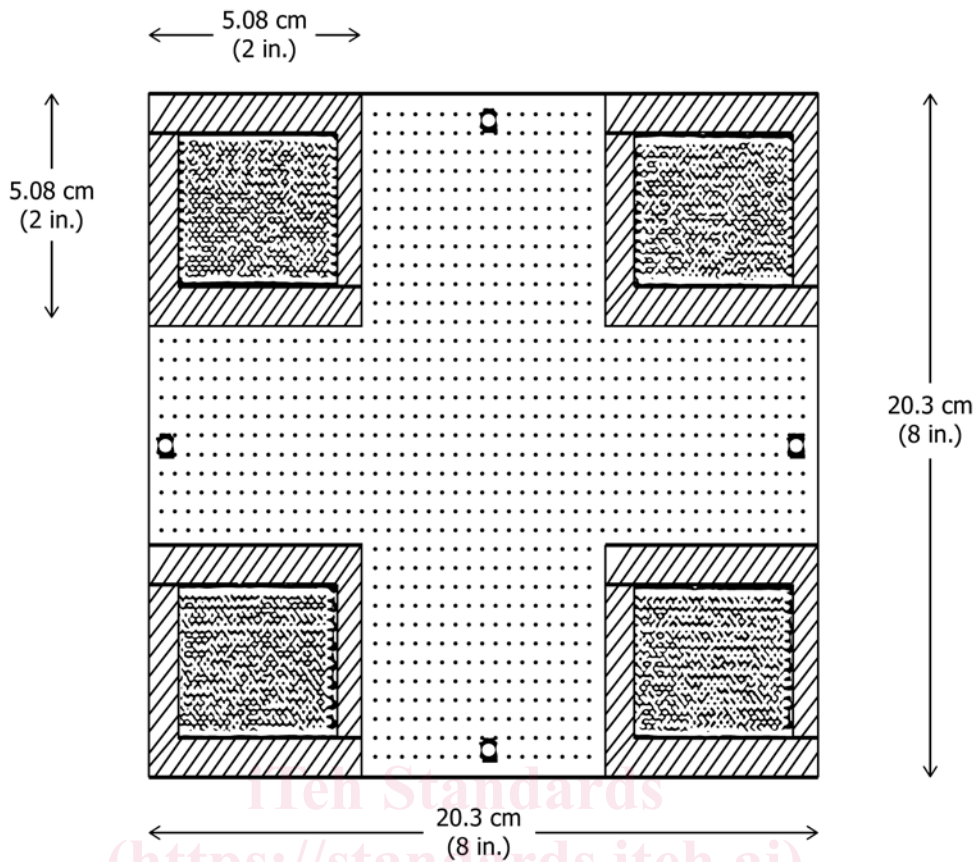


FIG. 1 Test Fixture

used to facilitate moving the loaded platform across the surface while keeping the pull cable parallel to the surface. The pull cable must not stretch under tension and must be equipped with a method of determining the distance pulled. For example, mechanical stops on either side of the direction changing pulley can be set to give the 45.7-cm (18-in.) pull length.

### 7. Test Foam<sup>3</sup>

7.1 The friable foam blocks used as the test material shall be rigid closed-cell isocyanurate foam having a bulk density of  $0.321 \pm 0.0008 \text{ g/cm}^3$  ( $2.00 \pm 0.05 \text{ lb/ft}^3$ ). In addition, the test foam must have a mass loss of  $50 \pm 5 \%$  as measured by Test Method C421. Test blocks must be cut to 5.08 by 5.08 by 2.54 cm, +0.13 cm (2.00 by 2.00 by 1.00 in., +0.05 in.).

### 8. Test Specimen

8.1 Test specimens shall be representative of the playing surface being evaluated. Fabrics used over a shock-absorbing pad should be tested after bonding to that underpad.

<sup>3</sup> The sole source of supply of the test foam (Trymer 2000 XP) known to the committee at this time is Johns Manville, P.O. Box 5108, Denver, CO 80217-5108, <https://www.jm.com/en/>. 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,<sup>1</sup> which you may attend.

8.2 In the case of field evaluation abrasiveness, measurements should be made in representative areas of the field or specific area of interest.

### 9. Number of Specimens

9.1 At least five specimens shall be tested and may be required. In the case of field evaluation, five tests shall be performed, and may be required, in the area of interest or over the entire playing surface depending on the intended data use.

9.2 The sampling procedures of Recommended Practices E105 and E122 should be followed and may be required.

### 10. Sample Conditioning

10.1 Field samples shall be under the intended use condition, although loose debris shall be removed prior to testing.

10.2 *Laboratory Samples*—New samples should be washed with detergent and water to remove any processing finish. These specimens shall be dried at laboratory conditions until moisture equilibrium is established. Other laboratory samples shall be preconditioned at  $65 \pm 2 \%$  relative humidity and  $21 \pm 1^\circ\text{C}$  ( $70 \pm 2^\circ\text{F}$ ) for a minimum of 4 h. Samples evaluated at conditions other than that of the laboratory must be tested immediately after a minimum of 4 h conditioning.

10.3 Condition test blocks in the laboratory for at least 4 h before use at  $65 \%$  relative humidity and  $21 \pm 1^\circ\text{C}$  ( $70 \pm 2^\circ\text{F}$ ).

**11. Procedure**

11.1 Preweigh conditioned sets of four test blocks cut to 5.08 by 5.08 by 2.54 cm ± 0.13 cm (2.00 by 2.00 by 1.00 in. ± 0.05 in.), within ±0.05 g.

11.2 Place a set of four blocks in the test frame. The blocks can be secured using double-stick carpet tape. Position the test frame such that it can be pulled with, against, or across the fabric machine direction. Center the 9.072-kg (20-lb) test weight on the test frame and attach the pull cable hook.

11.3 Pull the loaded frame 45.7 cm (18.0 in.) in each primary surface direction (with, across, against, across, for example), in succession without lifting the test frame so as to outline a “square” on the surface. The test rate is not critical, but the time to travel each 45.7 cm (18-in.) side must be between 8 and 12 s.

11.4 Note any deviations in rate, how smoothly the test frame could be pulled, and any deviation from a square pattern.

11.5 Carefully remove and store the test blocks for weighing.

11.6 Repeat the test procedure as required in 9.1 and 9.2.

11.7 Record the general condition of the surface; whether matted, clean, worn, etc. Temperature, humidity (or wet/dry) should also be noted.

**12. Calculation**

12.1 *Abrasiveness Index*—Determine the weight loss for each set of four blocks in grams. Divide the weight loss expressed in grams by 6.0 (to normalize the 6-ft travel path to 1 ft) and multiply by 100 to determine the abrasiveness index. Average the specimen values and express the result as an integer.

12.2 *Example*—In four block sets:

Starting Weight, g	Final Weight, g	Abrasiveness Index
7.60	5.30	38.3
7.69	5.39	38.3
7.70	5.55	35.8
Average		37.5

For the first set of four blocks:

$$\text{Abrassiveness Index} = \frac{(7.60 - 5.30)}{6.0} \times 100 = 38.3$$

$$\text{Abrassiveness Index} = 37.5$$

**13. Report**

13.1 Report the following information:

13.1.1 Complete identification of the specimens tested and the test foam. The reference fabric used should also be identified.

13.1.2 Conditions of test, including surface temperature, humidity, and any other pertinent data.

13.1.3 Date of test.

13.1.4 Procedure used.

13.1.5 Description of surface, such as new, washed, matted, swept clean, or wet.

13.1.6 Average value for each procedure, standard deviation, and number of samples.

**14. Discussion**

14.1 With regard to precision, the reproducibility is estimated to be ±10 %.

14.2 Potential sources of error or deviations are as follows;

14.2.1 Variations in density, material, compressive strength, or cell properties of the friable test foam.

14.2.2 Variations in path of friable test foam.

14.2.3 *Path deviation*—Since the weighted foam is not constrained to move in a straight path as it is pulled in a principal direction, it will tend to drift somewhat in the direction of pile angle. The deviation of the abrasion pattern left on the surface from a square reflects the directionality of the surface.

**15. Precision and Bias**

15.1 Precision and bias evaluations have not been conducted for this test method. When such data is available, a precision and bias section will be added.

**16. Keywords**

16.1 abrasiveness ; abrasiveness index; playing surfaces; relative abrasiveness; synthetic turf

**APPENDIX**

(Nonmandatory Information)

**X1. APPLICABLE DOCUMENTS**

X1.1 *ASTM Standards*:  
C303 Test Method for Density of Preformed Block-Type

Thermal Insulation<sup>2</sup>  
D1776 Practice for Conditioning Textiles for Testing<sup>2</sup>