Designation: F1551 – 23

An American National Standard

Standard Test Methods for Comprehensive Characterization of Synthetic Turf Playing Surfaces and Materials[1]

This standard is issued under the fixed designation F1551; 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 These test methods establish a recommended list from which suitable test methods shall be selected for the identification of physical property characteristics and comparison of the performance properties of synthetic turf systems or components for athletic and recreational uses, or both.

1.2 Some of the test procedures are suitable only for the laboratory characterization of either components or the complete system; others are suitable for tests on installed sports fields; and some tests may be applied in both the laboratory and the field.

1.3 The test procedures included in these test methods apply as a group to the description of synthetic turf playing surfaces.

1.4 Test methods outlined herein cover system components as well as fully assembled synthetic turf systems. Most of the methods measure material and performance properties of turf components. Component properties are not intended to represent the performance of a fully assembled turf system. Component results provide data for quality control, specification compliance, and component performance used in product design.

1.5 Reference to the methods for testing the synthetic turf playing surface and its components contained herein should state specifically the particular test or tests desired and not refer to this list of test methods as a whole.

1.6 Several new standards have been added since the last revision of this standard. Other standards, for which more appropriate standards exist, have been removed from this standard. A list of the standards that have been removed and their replacements are listed in Table X1.1 in Appendix X1.

1.7 This is a physical property characterization standard, and it shall not be construed as a safety standard.

1.8 The values stated in SI units are to be regarded as the standard. The values given in parentheses are for information only.

1.9 *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.*

1.10 *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]

C136 Test Method for Sieve Analysis of Fine and Coarse Aggregates

D412 Test Methods for Vulcanized Rubber and Thermoplastic Elastomers—Tension

D696 Test Method for Coefficient of Linear Thermal Expansion of Plastics Between −30°C and 30°C with a Vitreous Silica Dilatometer

D1335 Test Method for Tuft Bind of Pile Yarn Floor Coverings

D1577 Test Methods for Linear Density of Textile Fibers

D1895 Test Methods for Apparent Density, Bulk Factor, and Pourability of Plastic Materials

D1907 Test Method for Linear Density of Yarn (Yarn Number) by the Skein Method

D2256 Test Method for Tensile Properties of Yarns by the Single-Strand Method

D2616 Test Method for Evaluation of Visual Color Difference With a Gray Scale

D2859 Test Method for Ignition Characteristics of Finished Textile Floor Covering Materials

D3218 Specification for Polyolefin Monofilaments

D3575 Test Methods for Flexible Cellular Materials Made from Olefin Polymers

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

Current edition approved Sept. 1, 2023. Published March 2024. Originally approved in 1994. Last previous edition approved in 2017 as F1551 – 09 (2017). DOI: 10.1520/F1551-23.

[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.

D4716 Test Method for Determining the (In-plane) Flow Rate per Unit Width and Hydraulic Transmissivity of a Geosynthetic Using a Constant Head
D5034 Test Method for Breaking Strength and Elongation of Textile Fabrics (Grab Test)
D5644 Test Method for Rubber Compounding Materials—Determination of Particle Size Distribution of Recycled Vulcanizate Particulate Rubber
D5793 Test Method for Binding Sites per Unit Length or Width of Pile Yarn Floor Coverings
D5823 Test Method for Tuft Height of Pile Floor Coverings
D5848 Test Method for Mass Per Unit Area of Pile Yarn Floor Coverings
D7138 Test Method to Determine Melting Temperature of Synthetic Fibers
E2402 Test Method for Mass Loss, Residue, and Temperature Measurement Validation of Thermogravimetric Analyzers
F355 Test Method for Impact Attenuation of Playing Surface Systems, Other Protective Sport Systems, and Materials Used for Athletics, Recreation and Play
F963 Consumer Safety Specification for Toy Safety
F1015 Test Method for Relative Abrasiveness of Synthetic Turf Playing Surfaces
F1632 Test Method for Particle Size Analysis and Sand Shape Grading of Golf Course Putting Green and Sports Field Rootzone Mixes
F1936 Specification for Impact Attenuation of Turf Playing Systems as Measured in the Field
F2117 Test Method for Vertical Rebound Characteristics of Sports Surface/Ball Systems; Acoustical Measurement
F2765 Specification for Total Lead Content in Synthetic Turf Fibers
F2898 Test Method for Permeability of Synthetic Turf Sports Field Base Stone and Surface System by Non-confined Area Flood Test Method
F3146 Test Method for Impact Attenuation of Turf Playing Systems Designated for Rugby
F3188 Specification for Extractable Hazardous Metals in Synthetic Turf Infill Materials
F3189 Test Method for Measuring Force Reduction, Vertical Deformation, and Energy Restitution of Synthetic Turf Systems Using the Advanced Artificial Athlete
F3383 Test Method for Filament Bind of Single Fibers in Synthetic Turf
F3496 Specification for Polyaromatic Hydrocarbon (PAH) Content in Synthetic Turf Infill

2.2 *EN Standards:*[3]
EN 1969 Surfaces for Sports Areas – Determination of Thickness of Synthetic Sports Surfaces
EN 12228 Surfaces for Sports Areas – Determination of Joint Strength of Synthetic Surfaces
EN 12234 Surfaces for Sports Areas – Determination of Ball Roll Behaviour
EN 12616 Surfaces for Sports Areas – Determination of Water Infiltration Rate
EN 13036-7 Road and Airfield Surface Characteristics – Test Methods – Part 7: Irregularity Measurement of Pavement Courses: The Straightedge Test
EN 13744 Surfaces for Sports Areas – Procedure for Accelerated Ageing by Immersion in Hot Water
EN 13746 Surface for sports areas – Determination of Dimensional Changes Due to the Effect of Varied Water, Frost, and Heat Conditions
EN 14836 Synthetic Surfaces for Outdoor Sports Areas - Exposure to Artificial Weathering
EN 15301 Surfaces for Sports Areas – Part 1: Determination of Rotational Resistance
EN 17326 Surfaces for Sports Areas – Determination of dimensional stability of shock pads used within sports system
EN 17409 Surfaces for Sports Areas – Code of Practice for the Sampling of Performance Infills Used Within Synthetic Turf Surfaces

2.3 *EPA Standards:*[4]
EPA 1312 Synthetic Precipitation Leaching Procedure
EPA 3050B Acid Digestion of Sediments, Sludges, and Soils
EPA 6010B Inductively Coupled Plasma – Atomic Emission Spectrometry

3. Terminology

3.1 *Definitions*—Terms are as defined in the referenced ASTM procedures comprising these test methods.

3.2 *Definitions of Terms Specific to This Standard:*

3.2.1 *fabric construction*—the method of assembly of pile fiber and backing yarns that produces the fabric, usually tufting, knitting, or weaving.

3.2.2 *infilled turf system*—field system having a long pile height and one or more substances in the face of the fabric to provide the desired playing properties. Infill substances generally consist of synthetic or natural materials. Historically, sand and crumb rubber have been the primary choice of infill materials. The use of various synthetic particles and natural alternative materials have become more prevalent in the synthetic turf industry.

3.2.3 *lengthwise direction, n—in textiles*, the direction in a machine-made fabric parallel to the direction of movement the fabric followed in the manufacturing machine.

3.2.4 *pile, n—for pile fiber turf surfacing*, surface fibers composed of many individual strands or groups of strands bound to a backing fabric in a repetitive array.

3.2.5 *primary backing*—a woven or non-woven fabric used as the tufting substrate through which the turf yarns are tufted to form the synthetic turf greige fabric.

3.2.6 *secondary backing*—a material adhered to the backing side of a pile turf fabric.

3.2.7 *synthetic turf field system*—composite of synthetic contact surface material, any fill material used in the contact

[3] Available from European Committee for Standardization (CEN), Avenue Marnix 17, B-1000, Brussels, Belgium, http://www.cen.eu.

[4] Available from United States Environmental Protection Agency (EPA), William Jefferson Clinton Bldg., 1200 Pennsylvania Ave., NW, Washington, DC 20460, http://www.epa.gov.