Designation: F 1936 – 98

An American National Standard

Standard Specification for Shock-Absorbing Properties of North American Football Field Playing Systems as Measured in the Field[1]

This standard is issued under the fixed designation F 1936; 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 specification covers a test method and maximum impact attenuation for all types of installed turf playing systems for North American football.

1.2 It is recognized that laboratory testing results often reflect optimum conditions which may not correspond to the actual site conditions. Therefore, a method of testing along with a maximum for impact attenuation of installed synthetic turf playing systems is addressed herein.

1.3 This specification does not imply that an injury cannot be incurred if the surface system complies with this specification.

1.4 The following precautionary statement pertains only to the test procedure portion, Section 9, of this specification: *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]

F355 Test Method for Shock-Absorbing Properties of Playing Surface Systems and Materials

F1292 Specification for Impact Attenuation of Surfacing Materials Within the Use Zone of Playground Equipment

F1551 Test Methods for Comprehensive Characterization of Synthetic Turf Playing Surfaces and Materials

2.2 *ISO Standard:*

ISO 6587 [3]

NOTE 1—Additional references are listed at the end of this specification.

3. Terminology

3.1 *Definitions of Terms Specific to This Standard:*

3.1.1 *abnormal drop*—any drop of the missile which, due to operator or equipment problem(s) or uncertainty, results in a reading which is questionable.

3.1.2 *average G_{max}*—sum of the G_{max} of the second and third drops divided by two and rounded to the nearest whole number.

3.1.3 *combination field system*—a field system which combines a natural turf surface which is enhanced by use of synthetic elements such as synthetic turf substructures, excluding water/drainage systems and single layer mesh fabrics, which are used for the sole source purpose of soil stabilization.

3.1.4 *drop height*—height from which the missile is released as measured from the bottom of the missile face to the top of the surface system.

3.1.5 *drop test*—a set of three successive and recorded drops of the impact missile onto the synthetic turf system within the guidelines prescribed.

3.1.6 *G*—the ratio of magnitude of missile acceleration during impact to the acceleration of gravity, expressed in the same units (*g*, that has units, can be measured, but *G*, being a ratio, is unitless).

3.1.7 *G_{max}*—the maximum value of G encountered during an impact rounded to the nearest whole number.

3.1.8 *impact velocity*—the velocity of the missile as it impacts the surface system.

3.1.9 *missile*—the striking part of the testing apparatus.

3.1.10 *natural grass field system*—a field system which is comprised of live and growing grass or other plant like materials which are rooted in soil.

3.1.11 *pile*—a surface texture composed of many individual thin strands or groups of strands bound to a backing fabric in a repetitive array.

3.1.12 *pile layover*—horizontal motion of the pile under the influence of impact.

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

Current edition approved Nov. 10, 1998. Published March 1999.

[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] Available from American National Standards Institute (ANSI), 25 W. 43rd St., 4th Floor, New York, NY 10036, http://www.ansi.org.

3.1.13 *restraining ring*—a rigid circular device with a smooth or polished surface, creating little or no friction, used to restrict the horizontal movement of the missile upon impact.

3.1.14 *synthetic turf field system*—a composite of synthetic contact surface material, any fill material used in the contact surface, energy absorbing material, fabric layers, adhesives, if any, and other constructed layers (as applicable to the individual system construction).

3.1.15 *test point*—a location on the field system at which a series of measurements is taken.

4. Summary of Test Method

4.1 Turf field systems are tested according to this standard and Test Method F 355F355, Procedure A. A free-fall drop height of 2 ft (61 cm), as measured from the bottom of the missile face to the top of the turf field system shall be used. Any debris or material not part of the surface system shall be removed from the test point location prior to testing. Three successive drops, allowing a 3 min pause between drops, are recorded. The average G_{max} for the tested point will be calculated as the sum of the second and third G_{max} values divided by two and rounded to the nearest whole number.

5. Significance and Use

5.1 Data obtained from this specification are indicative of the relative impact attenuation characteristics of the turf playing field system and can be used only for comparison, establishing minimum requirements for use.

6. Performance Requirements

6.1 When tested in accordance with this sspecification and Test Method F 355F355, Procedure A, the average G_{max} at any single test point shall not exceed 200 average G_{max} when tested at a free-fall drop height of 2 ft (61 cm).

6.2 If a turf surface system is tested in accordance with Test Method F 355F355, Procedure A, as specified in this specification, and the average G_{max} of one or more of the tested points reported is in excess of 200 average G_{max}, the surface system should be replaced in full or in part.

7. Test Apparatus

7.1 The impacting missile shall be cylindrical with a circular, flat, metal, impacting surface weighing 20 lb (9.1 kg), having a 20 in.^{2} (129 cm^2) surface face with the impacting edges slightly beveled to eliminate sharp edges, a provision for mounting the accelerometer within ±1° of the vertical axis of the missile and for reaching a velocity of 11.35 ± 0.56 ft/s (3.46 ± 0.17 m/s) (referenced in Section 27 of Test Methods F 1551F1551 as the velocity corresponding to a theoretical drop height of 24 in. (61 cm) (at sea level) upon impact from the drop height.

7.2 To restrict the influence of pile layover, the test equipment shall be designed to include a rigid restraining ring with a smooth or polished surface, creating little or no friction, having an interior dimension not to exceed the diameter of the missile by more than 0.032 in. (1 mm). The ring shall be securely mounted horizontal to the surface such that a minimum of ¼ of the missile shall freely pass through it prior to striking the surface, ensuring a vertical impact and precluding the missiles rebound onto the top of the ring.

7.3 The test equipment shall have sufficient stability to eliminate undesirable vibrations in the apparatus which might be recorded on the acceleration-time curve and to permit a vertical free-fall of the missile from the release height of 24 in. (61 cm) to the surface.

7.4 The signal from the acceleration transducer shall be conditioned with a low pass filter: complying to Channel Class 1000 as specified in Specification F 1292F1292 (ISO 6587).

7.5 The acceleration recording system must be capable of accurately resolving the deceleration to a minimum of ±5 *g* from 0 to 500 *g*.

7.6 The acceleration transducer must be capable of withstanding impacts of at least 1000 *g* without damage.

7.7 A minimum system sampling rate required is 16 000 Hz.

7.8 The test equipment shall be capable of visual display and recording of the acceleration-time curve of each drop.

8. Test Positions

8.1 The following six test point locations are required:

NOTE 2—The test points are arranged to test the overall conditions and known "wear points" of a field (see Fig. 1).

8.1.1 *Point 1*—Goal Line, End A, Center Field,

8.1.2 *Point 2*—10 Yard Line, End A, and ¼ the distance measured from side line C toward the center of the field,

8.1.3 *Point 3*—25 Yard Line, End A, and ½ the distance measured from side line A toward the center of the field,

8.1.4 *Point 4*—Center field,

8.1.5 *Point 5*—25 Yard Line, End B, and ¼ the distance measured from side line D toward the center of the field, and

8.1.6 *Point 6*—12 Yard Line, End B, and Center of Field.

8.2 Actual drop site(s) shall be located within 36 in. (91 cm) in any direction of a required test point location.

8.3 For North American football fields with Canadian or other configurations differing from Fig. 1, adjust the test point location to like locations on the field and record the test points in accordance with 11.1.9.

8.4 *Optional*—One additional test point shall be added for each condition of the surface system construction or sub construction differing from the field in general. The additional test point shall be located in the area where the deviation occurs. Some examples are: side zone installed over rock (no asphalt) and area installed over a drainage element.

8.5 In the case of locating the test points on an unlined field: locate the above test points as accurately as possible noting the unlined condition in the test report as a site abnormality as described in Section 11.

8.6 Deviations in a test point location in excess of the stated tolerance must be recorded in the test report as a site abnormality as described in Section 11.

9. Test Procedure

9.1 Record the general overall weather conditions for each day of testing (sunny, light rain, gusting wind, etc.). Include a general description of the field conditions as influenced by the weather (damp, dry, areas of standing water, ice, etc.).