



Standard Guide for Construction and Maintenance of Warning Track Areas on Sports Athletic Fields¹

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1. Scope

1.1 This guide covers techniques that are appropriate for the construction and maintenance of warning track areas on sports fields. This guide provides guidance for the selection of materials, such as soil and sand for use in constructing or reconditioning warning track areas and for selection of management practices that will maintain a safe and functioning warning track. Although this guide has applications to all sports where a warning track surface may be required or desired, it has specific applications to baseball/softball.

1.2 This guide does not address synthetic warning tracks such as rubberized surfaces, artificial turf, or paved surfaces.

1.3 Decisions in selecting construction and maintenance techniques are influenced by local soil types, climatic factors, level of play, budget, and training/ability of management personnel.

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

1.5 *This standard may involve hazardous materials, operations, and equipment. 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 requirements prior to use.*

2. Referenced Documents

2.1 *ASTM Standards:*² ~~D422~~ Test Method for Particle-Size Analysis of Soils

~~D653~~ Terminology Relating to Soil, Rock, and Contained Fluids

~~D4318~~ Test Methods for Liquid Limit, Plastic Limit, and Plasticity Index of Soils

~~E11~~ Specification for Woven Wire Test Sieve Cloth and Test Sieves

~~F405~~ Specification for Corrugated Polyethylene (PE) Pipe and Fittings

~~F1815~~ Test Methods for Saturated Hydraulic Conductivity, Water Retention, Porosity, and Bulk Density of Athletic Field Rootzones

~~F2107~~ Guide for Construction and Maintenance of Skinned Areas on Baseball and Softball Fields ~~2651~~ Terminology Relating to Soil and Turfgrass Characteristics of Natural Playing Surfaces

3. Terminology

3.1 *Definitions*—Except as noted, soil- and turfgrass-related definitions are in accordance with Terminology ~~D653~~ F2651.

3.2 *Definitions of Terms Specific to This Standard:*

3.2.1 *aggregate material*—a soil-like or earthy material without appreciable soil structural properties such that an aggregate material is essentially granular or single-grained in nature.

3.2.2 *clay*—(1) A soil separate consisting of particles <0.002 mm in equivalent diameter. See also *soil separates*. (2) A textural class. See also *soil texture*. (3) In reference to clay mineralogy, a naturally occurring material composed primarily of fine-grained minerals, which is generally plastic at appropriate water contents and will harden when dried or fired. Although clay usually contains phyllosilicates, it may contain other materials that impart plasticity and harden when dried or fired. Associated phases in clay may include materials that do not impart plasticity and organic matter. **(1,3,4,5,6)**

3.2.2.1 *Discussion*—Ideally, clay should be appropriately defined when used to describe soils or top mixes for warning track areas. A 60% sand/40% clay mixture could imply either 60% sand/40% clayey soil or other textures that contain enough clay (<0.002 mm) to exhibit plasticity or 60% sand (2.0 to 0.05 mm)/40% clay (<0.002 mm).

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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.

3.2.3 *clay mineral*—a phyllosilicate mineral or a mineral that imparts plasticity to clay and which hardens upon drying or firing. **(1,2,6)**

3.2.4 *clayey*—(1) Texture group consisting of sandy clay, silty clay, and clay soil textures. See also *soil texture*. (2) Family particle-size class for soils with 35% or more clay and <35% rock fragments in upper subsoil horizons. **(1,3,4,5)**

3.2.5 *fine texture*—(1) A broad group of textures consisting of or containing large quantities of the fine fractions, particularly of silt and clay. (Includes all sandy clay, silty clay, and clay textural classes). (2) When used in reference to family particle-size classes in U.S. soil taxonomy, is specifically defined as having 35 to 60% clay. See also *soil texture*. **(1,3,4,5)**

3.2.6 *gravel*—commonly used to denote spherical, cubelike, or equiaxial aggregate materials with an equivalent diameter >2.0 mm and <7.6 mm. More correctly used, this classification refers to “rock fragments” classed as pebbles in the *Glossary of Soil Science Terms*. **(1)**

3.2.7 *heavy soil*—(colloquial) a soil with a high content of the fine separates, particularly clay, or one with a high drawbar pull and hence difficult to cultivate, especially when wet. See also *fine texture*.

3.2.8 *loamy*—(1) Texture group consisting of coarse sandy loam, sandy loam, fine sandy loam, very fine sandy loam, loam, silt loam, silt, clay loam, sandy clay loam, and silty clay loam soil textures. See also *soil texture*. (2) Family particle-size class for soils with textures finer than very fine sandy loam but <35% clay and <35% rock fragments in upper subsoil horizons. **(1,3,4,5)**

3.2.9 *moderately fine textured*—texture group consisting of clay loam, sandy clay loam, and silty clay loam textures. See also *soil texture*.

3.2.10 *plasticity*—the characteristics of a soil material to deform without rupture or cracking and without appreciable volume change. Plasticity is normally imparted to soils by the proportion of phyllosilicate clay minerals.

3.2.11 *skinned area*—area on sports fields that, by design, is devoid of turfgrasses or other vegetation; may be entire field or a portion of the field (for example, skinned infield in baseball or softball; skinned base paths in otherwise turfed infield). **F2107**

3.2.12 *silt*—(1) A soil separate. See also *soil separates*. (2) A soil textural class. See also *soil texture*. **(1,3,4,5)**

3.2.13 *soil*—sediments or other unconsolidated accumulations of solid particles produced by the physical and chemical disintegration of rocks, and which may or may not contain organic matter.

3.2.14 *soil profile*—vertical section of a soil, showing the nature and sequence of the various layers, as developed by deposition or weathering or both or as developed by construction procedures. **(1,4,5)**

3.2.15 *soil separates*—mineral particles, <2.0 mm in equivalent diameter, ranging between specified size limits. The names and size limits of separates recognized in the U.S. are: *very coarse sand* (prior to 1947 this separate was called “fine gravel;” now fine gravel includes particles between 2.0 mm and about 12.5 mm in diameter), 2.0 to 1.0 mm; *coarse sand*, 1.0 to 0.5 mm; *medium sand*, 0.5 to 0.25 mm; *fine sand*, 0.25 to 0.10 mm; *very fine sand*, 0.10 to 0.05 mm; *silt*, 0.05 to 0.002 mm; and *clay* (Prior to 1937, “clay” included particles <0.005 mm in diameter, and “silt,” those particles from 0.05 to 0.005 mm) <0.002 mm. **(1,4,5)**

3.2.15.1 *Discussion*—Particle size ranges for sand, silt, and clay as listed above vary somewhat from ranges given in Test Method D422 and Terminology D653.

3.2.16 *soil texture*—the relative proportions of the various soil separates in a soil as described by the classes of soil texture. The sand, loamy sand, and sandy loam are further subdivided on the basis of the proportions of the various sand separates present. The limits of the various classes and subclasses are as follows:

3.2.16.1 *clay*—soil material that contains 40% or more clay, <45% sand, and <40% silt.

3.2.16.2 *clay loam*—soil material that contains 27 to 40% clay and 20 to 45% sand.

3.2.16.3 *loam*—soil material that contains 7 to 27% clay, 28 to 50% silt, and <52% sand.

3.2.16.4 *loamy sand*—soil material that contains between 70 and 91% sand and the percentage of silt plus 1.5 times the percentage of clay is 15 or more; and the percentage of silt plus twice the percentage of clay is less than 30.

3.2.16.5 *sand*—soil material that contains 85% or more of sand; percentage of silt plus 1.5 times the percentage of clay shall not exceed 15.

3.2.16.6 *sandy clay*—soil material that contains 35% or more clay and 45% or more sand.

3.2.16.7 *sandy clay loam*—soil material that contains 20 to 35% clay, <28% silt, and >45% sand.

3.2.16.8 *sandy loam*—soil material that contains 7 to 20% clay, more than 52% sand, and the percentage of silt plus twice the percentage of clay is 30 or more; or less than 7% clay, less than 50% silt, and more than 43% sand.

3.2.16.9 *silt*—soil material that contains 80% or more silt and <12% clay.

3.2.16.10 *silty clay*—soil material that contains 40% or more clay and 40% or more silt.

3.2.16.11 *silty clay loam*—soil material that contains 27 to 40% clay and <20% sand.

3.2.16.12 *silt loam*—soil material that contains 50% or more silt and 12 to 27% clay (or) 50 to 80% silt and <12% clay. **(1,4,5)**

3.2.17 *warning track*—a section of a sports field area typically devoid of vegetation, that provides a change in surface texture such that an athlete can sense without looking the proximity to a hazard such as a fence, post, or wall.

4. Significance and Use

4.1 Warning tracks are playing surfaces located on the margins of the playing area for the purpose of providing a warning to the player that he or she is approaching a hazard (commonly a fence) or out-of-bounds area. In order to provide for an effective warning track surface, the warning track must be constructed and maintained in such a manner so that the player can sense the change in texture from the regular playing surface and the warning track without having to look. This feature is very important