



Standard Guide for Construction and Maintenance of Skinned Areas on Sports Fields¹

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1. Scope

1.1 This guide covers techniques that are appropriate for the construction and maintenance of skinned areas on sports fields. This guide provides guidance for the selection of materials, such as soil, sand, gravel, crushed stone, crushed brick, calcined clay, calcined diatomaceous earth, vitrified clay, etc., for use in constructing or reconditioning skinned areas and for the selection of management practices that will maintain a safe and playable skinned surface. Although parts of this guide are specific to baseball/softball, it has application to other skinned playing surfaces where ball bounce, ball roll, and/or player footing are of importance.

1.2 Decisions in selecting construction and maintenance techniques are influenced by existing soil types, climatic factors, level of play, intensity of use, equipment available, budget, and training and ability of management personnel.

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

1.4 *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:

- C 33 Specification for Concrete Aggregates
- C 144 Specification for Aggregate for Masonry Mortar
- C 242 Terminology of Ceramic Whitewares and Related Products
- D 422 Test Method for Particle-Size Analysis of Soils
- D 653 Terminology Relating to Soil, Rock, and Contained Fluids
- D 4318 Test Method for Liquid Limit, Plastic Limit and Plasticity Index of Soils
- D 5853 Guide for Use of Rotary Kiln Produced Expanded Shale, Clay, or Slate (ESCS) as a Mineral Amendment in Topsoil Used for Landscaping and Related Purposes

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E 11 Specification for Wire-Cloth Sieves for Testing Purposes

F 405 Specification for Corrugated Polyethylene Tubing and Fittings

F 1632 Test Method for Particle Size Analysis and Sand Shape Grading of Golf Course Putting Green and Sports Field Root zone Mixes

3. Terminology

3.1 *Definitions*—Except as noted, soil related definitions are in accordance with Terminology D 653.

3.1.1 *calcined clay*—granular, lightweight material produced by calcining clay minerals, such as montmorillonite and attapulgite, at temperatures of about 700°C or higher. Those used as soil amendments should be hard, resistant to physical breakdown, and screened to appropriate sizes. Calcined clay is a manufactured product that lacks the particle size and plasticity properties that would allow it to be included in the definition of clay. (1)

3.1.2 *calcined diatomite*—stable, lightweight granules produced by calcining diatomite (diatomaceous earth), a hydrated silica mineral derived from the remains of diatoms. (1)

3.1.3 *clay*—clay can be defined in terms of a particular size fraction of a soil, a soil textural class, a soil particle size class, a soil textural group, soil mineralogy, or, in engineering terms, as materials that exhibit plastic soil properties when at appropriate water contents.

3.1.3.1 *Discussion*—Ideally, the term “clay” should be appropriately defined when used to describe soils or top mixes for skinned areas. For example, a 60 % sand/40 % clay mixture could imply either 60 % sand/40 % clayey soil (or other soils with textures containing enough clay (<0.002 mm) to exhibit plasticity) or 60 % sand (2 to 0.05 mm)/40 % clay (<0.002 mm).

3.1.3.2 *clay*—(1) as a particular size fraction of a soil, a soil separate consisting of particles <0.002 mm (fine earth fraction) in equivalent diameter. (2) as a textural class, soil material that contains 40 % or more clay, <45 % sand and <40 % silt. (3) as a soil particle size class, soil material that contains 35 % or more clay, (clayey soils). (4) as a soil textural group, soil material that falls within the textural classes of “sandy clay,” “silty clay” and “clay” (clayey soils). (5) in terms of mineralogy, soil particulates that are commonly occurring but not



restricted to the <0.002 mm fraction (clay minerals). Commonly occurring in soil mineralogy classes as smectitic, kaolinitic, illitic (micaceous), gibbsitic, ferritic, or mixed. Soil mineralogy classes are defined predominantly by the type of soil mineral dominating (40 % or more) the fine earth fraction. (6) in engineering terms, soils containing enough soil material in the less than 0.4 mm fractions such that when moist they exhibit consistence characteristics of “moderately plastic” or “very plastic” forming a roll 4 cm or longer and 4 mm or thinner that supports its own weight. (2-7)

3.1.4 *vitrified clay*—clay that has been manufactured through the progressive reduction and elimination of porosity of a ceramic composition, with the formation of a glass phase, as a result of a heat treatment, vitrification. **C 242**

3.1.5 *expanded shale, clay, or slate (ESCS)*—a rotary kiln produced vesicular amorphous silicate particulate material. It is a highly porous, low density material with an apparent specific gravity of approximately 0.8 to 2.4, and a dry/loose unit weight of approximately 35 to 70 lb/ft³ (561 to 1,121 kg/m³). **D 5883**

3.1.6 *sand*—sand can be defined in terms of a particular size fraction of soil, a soil textural class, a soil particle size class, and a soil textural group.

3.1.6.1 *sand*—(1) as a particular size fraction of soil, a soil separate consisting of particles >0.05 mm and <2.0 mm in equivalent diameter. (2) as a textural class, soil material that contains 85 % or more sand, and not more than 10 % clay. (3) as a soil particle size class, soil material that contains 70 % or more sand, and not more than 15 % clay (sandy soils). (4) as a soil textural group, soil material that falls within the textural classes of “sand” and “loamy sand” (sandy soils). (3,4)

3.1.6.2 *Discussion*—Although no mineralogy term is associated with the definition of sand, common usage often utilizes the terms “quartz” or “silica” as synonyms for sand. While quartz is the most common silicate mineral in soils and in the sand fractions in particular, quartz being a mineral highly resistant to weathering, the synonymy with the term sand is incorrect. A proper mineralogy class for quartz is “siliceous,” defined as 90 % or more of the 0.2 to 2.0 mm fraction composed of silica minerals (quartz, chalcedony, or opal) and other extremely durable minerals that are resistant to weathering. (4)

3.1.7 *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” classified as pebbles in the Glossary of Soil Science Terms (1997). (3,6)

3.1.8 *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).

3.1.9 *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.

3.1.10 *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.

3.1.11 *soil texture* (gradation) (grain-size distribution)—the proportions by mass of a soil or fragmented rock distributed in specified particle size ranges.

3.1.11.1 *soil textural class*—texture designation based on relative proportions of the various soil separates: sand (2.0 to 0.05 mm in diameter), silt (0.05 to 0.002 mm), and clay (< 0.002 mm). (2-7)

NOTE 1—Particle size ranges for sand, silt, and clay as listed above vary somewhat from ranges given in Test Method D 422 and Terminology D 653.

4. Significance and Use

4.1 The skinned areas of sports fields should provide a uniform playing surface of high quality. Ball bounce should be true and predictable. Footing and sliding properties should favor optimum performance of players. Undulations, rough surface, hard or soft surfaces, weeds, stones, and wet spots detract from good play. Playing surface quality is largely affected by construction and maintenance procedures, and this standard guide addresses those procedures.

4.1.1 During construction, consideration should be given to factors such as the physical and chemical properties of materials used in the area, freedom from stones and other debris, and surface and internal drainage.

4.1.2 Maintenance practices that influence the playability of the surface include edging, dragging, rolling, watering, vegetation control, brushing or hosing to prevent buildup of a lip of mineral matter in turfgrass at the skinned/turfed edges, and removal of stones and debris that may adversely affect play and safety.

4.2 Those responsible for the design, construction, and/or maintenance of baseball and softball fields and other sports fields or play areas maintained in a condition devoid of vegetation will benefit from this guide.

4.3 This guide provides flexibility in choices of procedures and can be used to cover a variety of use and budget levels.

5. Construction

5.1 *Soil or Top Mix*—Materials used to provide the skinned surface should be relatively inert mineral matter, which will resist chemical and physical degradation. This soil or mixture is sometimes referred to as “dirt,” for example, infield dirt.

5.1.1 *Particle Size Distribution*—Particle size analyses (Test Method D 422 or F 1632) are based on oven-dried mass of a weighed sample; shaker is the preferred method of dispersion if infield mix contains internally porous amendments. Such analyses are satisfactory when the top mix consists of sand and soil materials; however, analysis based on mass can give misleading results if the top mix contains internally porous amendments.

5.1.2 Depending on the soil texture, some existing or native soils containing greater than 70 % sand (2.0 to 0.05 mm) may be satisfactory in skinned areas; however, most soils will need to be modified to improve drainage and ease of soil grooming. Additions of coarse amendments (sand, calcined mineral (clay or diatomite), expanded shale, clay or slate, vitrified clay or combinations in appropriate amounts (dependent on textural