



Standard Test Method for Density of Topsoil and Blended Soils In-place by the Core Displacement Method¹

This standard is issued under the fixed designation F3013; 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 test method may be used to determine the undisturbed (in-situ) in-place bulk-density, moisture content and unit weight of topsoil and blended soil growing mediums using the Core Displacement Method.

1.2 This test method is applicable for soils without appreciable amounts of rock or coarse material exceeding 1 inch in size. Further it is only suitable for soils in-which the natural void or pore openings in the soil are small enough to prevent the sand used in the test from entering the voids and impacting the test results. Unlike Test Method [D1556](#), this test method is suitable for organic and plastic soils due to the use of a core apparatus, and not hand excavation methods. The material shall have adequate cohesive material or particle attraction to provide a stable core (core hole) for the duration of the test without deforming or sloughing. Therefore this method is not suitable for unbound granular soils that cannot maintain stable sides. This test method is applicable for assessing compaction of surface layers of topsoil (or blended soils) using a soil small core unlike Test Methods [D4914](#), which uses a large volume soil pit excavation.

1.3 This test method is intended for soil typical of growing mediums suitable for sports fields, golf courses and lawn areas that may include organic material, silts, clays and sand.

1.4 This test method is not applicable for soil conditions in-which the root mass is excessive or in-which the root mass includes woody roots.

1.5 *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.*

¹ 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 [F08.64](#) on Natural Playing Surfaces.

Current edition approved May 1, 2013. Published November 2013. DOI: 10.1520/F3013-13.

2. Referenced Documents

2.1 *ASTM Standards*:²

[D1556](#) Test Method for Density and Unit Weight of Soil in Place by Sand-Cone Method

[D4914](#) Test Methods for Density and Unit Weight of Soil and Rock in Place by the Sand Replacement Method in a Test Pit

[F1815](#) Test Methods for Saturated Hydraulic Conductivity, Water Retention, Porosity, and Bulk Density of Athletic Field Rootzones

3. Terminology

3.1 *Definitions*:

3.1.1 *bulk density of soil, D_b* —mass of dry soil per unit bulk volume, (Mg m^{-3}).

3.1.2 *density, D* —mass per unit volume, (Mg m^{-3}).

3.1.3 *density of water, D_w* —mass per volume of water, (Mg m^{-3}).

3.1.4 *particle density of soil, D_p* —density of the soil particles, the dry mass of the particles being divided by the solid (not bulk) volume of the particles, in contrast with bulk density, (Mg m^{-3}).

4. Summary of Test Method

4.1 A test hole is cored using a hole-cutter into the soil to be tested and the hole-cutter is retracted to remove all soil and saved in a container. The depth of the hole is measured at four points around the diameter of the core. Points shall be at approximately 90° apart. The hole is then filled with a free flowing sand of known volume to determine the volume of the soil removed. The volume of the soil removed is adjusted to account for the volume of the hole-cutter. The removed soil is weighed in the laboratory and the in-place wet density of the sample is calculated by dividing the initial moist sample mass

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.