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AMERICAN SOCIETY FOR TESTING AND MATERIALS
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Standard Test Method for Specific Gravity of Soil Solids by Gas Pycnometer¹

This standard is issued under the fixed designation D 5550; 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 covers the determination of the specific gravity of soil solids by means of a gas pycnometer. Particle size is limited by the dimensions of the specimen container of the particular pycnometer being used.

1.2 Test Method D 854 may be used instead of or in conjunction with this test method for performing specific gravity tests on soils. Note that Test Method D 854 does not require the specialized test apparatus needed by this test method. However, Test Method D 854 may not be used if the specimen contains matter that can readily dissolve in water, whereas this test method does not have that limitation.

1.3 The values stated in acceptable SI units are to be regarded as the standard. The inch-pound units given in parentheses are for information only.

1.4 *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:

C 670 Practice for Precision and Bias Statements for Test Methods for Construction Materials²

D 653 Terminology Relating to Soil, Rock, and Contained Fluids²

D 854 Test Method for Specific Gravity of Soils²

D 4753 Specification for Evaluating, Selecting, and Specifying Balances and Scales for Use in Soil, Rock, and Related Construction Materials²

3. Terminology

3.1 Definitions:

3.1.1 The definitions of terms used in this test method shall be in accordance with Terminology D 653.

3.2 Definitions of Terms Specific to This Standard:

3.2.1 *specific gravity*—the ratio of the mass in air of a given

volume of solids to the mass in air of an equal volume of distilled water at a temperature of 4°C (in accordance with Terminology D 653).

NOTE 1—Distilled water at a temperature of 4°C has a density of 1.000 g/cm³. It is recommended that this test method be performed at or near room temperature. The temperature at which the soil volume is measured can be reported but is not required by this test method because of the negligible effect of temperature on the volume of soil solids. However, temperature may have a significant effect on performance of the gas pycnometer. Therefore, testing should be conducted within the specified operating temperature range of the apparatus.

4. Summary of Test Method

4.1 This test method is used to determine the specific gravity of soil grains using a gas pycnometer. This test method also contains equations for correcting the initial specific gravity value for dissolved matter within the pore fluid.

5. Significance and Use

5.1 The specific gravity value is used in many phase relation equations to determine relative volumes of particle, water, and gas mixtures.

5.2 The term soil particle typically refers to a naturally occurring mineral grain that is not readily soluble in water. Therefore, the specific gravity of soils that contain extraneous matter (such as cement, lime, and the like) or water-soluble material (such as salt) must be corrected for the precipitate that forms on the specimen after drying. If the precipitate has a specific gravity less than the parent soil grains, the uncorrected test result will be too low. If the precipitate has a higher specific gravity, then the uncorrected test value will be too high.

6. Apparatus

6.1 *Pycnometer*—The gas pycnometer shall be one of the commercially available models that determines the volume of a solid by one of two methods. One measures the pressure drop that occurs after a gas at a known pressure is allowed to flow into another chamber (typically the first chamber contains the solid material being tested). The amount of pressure drop is related to the volume of soil present. The other type of instrument puts a known volume of gas into a chamber containing the specimen. The increase in pressure is related to the volume of the material. Either type of instrument is

¹ This test method is under the jurisdiction of ASTM Committee D-18 on Soil and Rock and is the direct responsibility of Subcommittee D18.13 on Marine and Coastal Geotechnical.

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² *Annual Book of ASTM Standards*, Vol 04.08.