Standard Method of Test for

Specific Gravity of Soils

AASHTO Designation: T 100-15 (2019)

Technical Subcommittee: 1a, Soil and Unbound Recycled Materials

Release: Group 3 (July)

ASTM Designation: D854-00

AASHTO

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1. SCOPE

1.1. This method covers determination of the specific gravity of soils composed of particles smaller than the 4.75-mm (No. 4) sieve by means of a pycnometer. When the soil is composed of particles larger than the 4.75-mm (No. 4) sieve, the method outlined in T 85 shall be followed. When the soil is composed of particles both larger and smaller than the 4.75-mm (No. 4) sieve, the sample shall be separated on the 4.75-mm (No. 4) sieve, the appropriate test method should be used on each portion, and a weighted average should be calculated.

1.2. The values stated in SI units are to be regarded as the standard.

1.3. *This standard may involve hazardous materials, operations, and equipment. This standard does not purport to address all of the safety concerns associated with its use. It is the responsibility of the user of this standard to consult and establish appropriate safety and health practices and determine the applicability of regulatory limitations prior to use*.

2. REFERENCED DOCUMENTS

2.1. *AASHTO Standards*:

- M 231, Weighing Devices Used in the Testing of Materials
- R 18, Establishing and Implementing a Quality Management System for Construction Materials Testing Laboratories
- R 61, Establishing Requirements for Equipment Calibrations, Standardizations, and Checks
- T 85, Specific Gravity and Absorption of Coarse Aggregate
- T 88, Particle Size Analysis of Soils

2.2. *ASTM Standards*:

- C670, Standard Practice for Preparing Precision and Bias Statements for Test Methods for Construction Materials
- E1, Standard Specification for ASTM Liquid-in-Glass Thermometers
- E29, Standard Practice for Using Significant Digits in Test Data to Determine Conformance with Specifications
- E77, Standard Test Method for Inspection and Verification of Thermometers
- E563, Standard Practice for Preparation and Use of an Ice-Point Bath as a Reference Temperature

- E644, Standard Test Methods for Testing Industrial Resistance Thermometers
- E1137/E1137M, Standard Specification for Industrial Platinum Resistance Thermometers
- E2251, Standard Specification for Liquid-in-Glass ASTM Thermometers with Low-Hazard Precision Liquids

3. TERMINOLOGY

3.1. *Definition*:

3.1.1. *specific gravity*—The ratio of the mass of a unit volume of a material at a stated temperature to the mass of the same volume of gas-free distilled or deionized water at a stated temperature.

4. SIGNIFICANCE AND USE

4.1. The specific gravity of a soil is used in almost every equation expressing the phase relationship of air, water, and solids in a given volume of material.

4.2. The term "solid particles," as used in geotechnical engineering, is typically assumed to mean naturally occurring mineral particles that are not soluble in water. Therefore, the specific gravity of materials containing extraneous matter (such as cement, lime, etc.), water-soluble matter (such as sodium chloride), and soils containing matter with a specific gravity of less than one, typically require special treatment or a qualified definition of specific gravity.

5. APPARATUS

5.1. *Pycnometer*—Either a volumetric flask having a capacity of at least 100 mL or a stoppered bottle having a capacity of at least 50 mL (Note 1). A 500-mL flask is required for samples of clayey soils containing their natural moisture content (see Section 9.2). If a bottle is used, the stopper shall be of the same material as the bottle, and of such size and shape that it can be easily inserted to a fixed depth in the neck of the bottle. The stopper shall have a small hole through its center to permit the emission of air and surplus water.

Note 1—The use of either the volumetric flask or the stoppered bottle is a matter of individual preference. However, the flask should be used when the sample is too large to fit into the stoppered bottle, based on the maximum grain size of the sample.

5.2. *Balance*—Either of the following, depending on the type of pycnometer used.

5.2.1. A Class G1 balance meeting the accuracy requirements of M 231 for use with the volumetric flask.

5.2.2. A Class B balance meeting the accuracy requirements of M 231 for use with the stoppered bottle.

5.3. *Oven*—A thermostatically controlled drying oven capable of maintaining a temperature of 110° ± 5°C (230 ± 9°F).

5.4. *Apparatus for Removing Entrapped Air*—One of the following devices shall be used:

5.4.1. *Vacuum*—Capable of subjecting the contents of the pycnometer to a partial vacuum of 13.33 kPa (100 mmHg) or less absolute pressure. Subjection of the contents to reduced air pressure may be done either by connecting the pycnometer directly to an aspirator or vacuum pump, or by use of a bell jar; or