
Standard Method of Test for

Density of Soil In-Place by Block, Chunk, or Core Sampling

AASHTO Designation: T 233-22

Technically Revised: 2022

Technical Subcommittee: 1a, Soil and Unbound Recycled Materials



**American Association of State Highway and Transportation Officials
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1. SCOPE

- 1.1. This method of test is intended to determine the density of cohesive soil in the natural state, compacted cohesive soil, and stabilized soil by measuring the weight and volume of undisturbed samples.
- 1.2. The following applies to all specified limits in this standard: For the purposes of determining conformance with these specifications, an observed value or a calculated value shall be rounded off “to the nearest unit” in the last right-hand place of figures used in expressing the limiting value, in accordance with ASTM E29.
- 1.3. The values stated in SI units are to be regarded as the standard.
- 1.4. Refer to 29 CFR 1910.1200 for regulatory information for chemicals.
- 1.5. *The quality of the results produced by this standard are dependent on the competence of the personnel performing the procedure and the capability, calibration, and maintenance of the equipment used. Agencies that meet the criteria of R 18 are generally considered capable of competent and objective testing/sampling/inspection/etc. Users of this standard are cautioned that compliance with R 18 alone does not completely assure reliable results. Reliable results depend on many factors; following the suggestions of R 18 or some similar acceptable guideline provides a means of evaluating and controlling some of those factors.*

2. REFERENCED DOCUMENTS

- 2.1. *AASHTO Standards:*
- M 231, Weighing Devices Used in the Testing of Materials
 - M 339M/M 339, Thermometers Used in the Testing of Construction Materials
 - R 18, Establishing and Implementing a Quality Management System for Construction Materials Testing Laboratories
 - T 217, Determination of Moisture in Soils by Means of a Calcium Carbide Gas Pressure Moisture Tester
- 2.2. *ASTM Standards:*
- E1, Standard Specification for ASTM Liquid-in-Glass Thermometers
 - E29, Standard Practice for Using Significant Digits in Test Data to Determine Conformance with Specifications

- E230/E230M, Standard Specification for Temperature-Electromotive Force (emf) Tables for Standardized Thermocouples
- E2877, Standard Guide for Digital Contact Thermometers

2.3. *Federal Standard:*

- Fed. Std. No. 29, CFR 1910.1200 OSHA Hazard Communication Standard; see also Permissible Exposure Limits—Annotated Tables, available at <https://www.osha.gov/dsg/annotated-pels/>

2.4. *International Electrotechnical Commission Standard:*

- IEC 60584-1: 2013 Thermocouples - Part 1: EMF Specifications and Tolerances

3. APPARATUS AND MATERIALS

- 3.1. *Sampling Tools*—Trowel, thick-blade spatula, knife, small spade suitable for removing sample, or a coring device suitable for obtaining an undisturbed sample. Diamond and carborundum saws may be used.
- 3.2. *Balances and Scales*—A balance or scale conforming to the requirements of M 231, Class G 20. Also, a balance conforming to the requirements of M 231, Class G 2.
- 3.3. *Water Bath*—For immersing the paraffin-coated sample in water while on the holder under the balance, equipped with an overflow outlet for maintaining a constant water level.
- 3.4. *Volume Measuring Device*—An overflow, volumetric displacement apparatus as shown in Figure 1, or similar.