
Standard Method of Test for Density of Soil In-Place by the Sand-Cone Method

AASHTO Designation: T 191-14 (2022)

Technically Revised: 2014

Reviewed but Not Updated: 2022

**Technical Subcommittee: 1b, Geotechnical Exploration,
Instrumentation, Stabilization and Field Testing**



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1. SCOPE

- 1.1. This method is intended for determining the in-place density of soils. The apparatus described herein is restricted to tests in soils containing particles not larger than 50 mm (2 in.) in diameter.
- 1.2. The following applies to all specified limits in this standard: For the purposes of determining conformance with these specifications, an observed 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 the rounding-off method of [ASTM E29](#).
- 1.3. *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
 - [R 18](#), Establishing and Implementing a Quality Management System for Construction Materials Testing Laboratories
 - [T 19M/T 19](#), Bulk Density (“Unit Weight”) and Voids in Aggregate
 - [T 99](#), Moisture–Density Relations of Soils Using a 2.5-kg (5.5-lb) Rammer and a 305-mm (12-in.) Drop
 - [T 217](#), Determination of Moisture in Soils by Means of a Calcium Carbide Gas Pressure Moisture Tester
 - [T 265](#), Laboratory Determination of Moisture Content of Soils
- 2.2. *ASTM Standards:*
- [D4643](#), Standard Test Method for Determination of Water Content of Soil by Microwave Oven Heating
 - [D4959](#), Standard Test Method for Determination of Water Content of Soil by Direct Heating

- [E29](#), Standard Practice for Using Significant Digits in Test Data to Determine Conformance with Specifications

3. APPARATUS

- 3.1. *Density Apparatus with Base Plate*—The density apparatus shall consist of a 4-L (1-gal) jar and a detachable appliance consisting of a cylindrical valve with an orifice 12.7 mm ($\frac{1}{2}$ in.) in diameter and having a small funnel connecting to a standard G mason jar top on one end and a large funnel on the other end. The valve shall have stops to prevent rotating the valve past the completely open or completely closed positions. The base plate shall be made of metal and sufficiently rigid. The plate shall have a flanged center hole to receive the large funnel. The apparatus shall conform to the requirements shown in Figure 1. The apparatus described here represents a design that has proven satisfactory. Other apparatus of similar proportions will perform equally well so long as the basic principles of the sand-volume determination are observed. The base plate is required for calibrations and testing.