
Standard Method of Test for Wetting-and-Drying Test of Compacted Soil–Cement Mixtures

AASHTO Designation: T 135-22

Technically Revised: 2022

Editorially Revised: 2022

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



**American Association of State Highway and Transportation Officials
555 12th Street NW, Suite 1000
Washington, D.C. 20004**

Wetting-and-Drying Test of Compacted Soil-Cement Mixtures

AASHTO Designation: T 135-22



Technically Revised: 2022

Editorially Revised: 2022

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

1. SCOPE

- 1.1. These methods of test cover procedures for determining the soil-cement losses, moisture changes, and volume changes (swell and shrinkage) produced by the repeated wetting and drying of hardened soil-cement specimens. The specimens are compacted in a mold, before cement hydration, to maximum density at optimum moisture content using the compaction procedure described in T 134.
- 1.2. Two methods, depending on soil gradation, are covered for preparation of material for molding specimens and for molding specimens as follows:
 - 1.2.1. *Method A*—Using soil material passing the 4.75-mm (No. 4) sieve. This method shall be used when 100 percent of the soil sample passes the 4.75-mm (No. 4) sieve. See Sections 4 to 6.
 - 1.2.2. *Method B*—Using soil material passing the 19.0-mm ($3/4$ -in.) sieve. This method shall be used when part of the soil sample is retained on the 4.75-mm (No. 4) sieve. See Sections 7 to 9.
- 1.3. The values stated in SI units are to be regarded as the standard.
- 1.4. *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 85, Portland Cement
 - M 145, Classification of Soils and Soil-Aggregate Mixtures for Highway Construction Purposes
 - M 231, Weighing Devices Used in the Testing of Materials
 - M 240M/M 240, Blended Hydraulic Cement
 - 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 99, Moisture–Density Relations of Soils Using a 2.5-kg (5.5-lb) Rammer and a 305-mm (12-in.) Drop
- T 134, Moisture–Density Relations of Soil–Cement Mixtures
- T 265, Laboratory Determination of Moisture Content of Soils

2.2. *ASTM Standards:*

- E1, Standard Specification for ASTM Liquid-in-Glass Thermometers
- E11, Standard Specification for Woven Wire Test Sieve Cloth and Test Sieves
- E230/E230M, Standard Specification for Temperature-Electromotive Force (emf) Tables for Standardized Thermocouples
- E2877, Standard Guide for Digital Contact Thermometers

2.3. *International Electrotechnical Commission Standard:*

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

3. APPARATUS

3.1. *Molds, 101.6 mm (4 in.); Rammer; Sample Extruder; and Straightedge*—As specified in T 99.

3.2. *Balances and Scales*—A balance or scale having a capacity of at least 11.5 kg (25.4 lb) and conforming to the requirements of M 231 for a G 20 class scale, and a balance of at least 1-kg (2-lb) capacity and conforming to the requirements of M 231 for a G 2 class scale.

3.3. *Drying Oven*—A thermostatically controlled drying oven capable of maintaining temperatures of $110 \pm 5^\circ\text{C}$ ($230 \pm 9^\circ\text{F}$). Oven(s) for heating and drying shall be capable of operation at the temperatures required, between 100 to 120°C (212 to 248°F), within $\pm 5^\circ\text{C}$ ($\pm 9^\circ\text{F}$), as corrected, if necessary, by standardization. More than one oven may be used, provided each is used within its proper operating temperature range. The thermometer for measuring the temperature of materials shall meet the requirements of M 339M/M 339 with a temperature range of at least 90 to 130°C (194 to 266°F), and an accuracy of $\pm 1.25^\circ\text{C}$ ($\pm 2.25^\circ\text{F}$) (see Note 1).

Note 1—Thermometer types suitable for use include ASTM E1 mercury thermometers; ASTM E2877 digital metal stem thermometer; ASTM E230/E230M thermocouple thermometer, Type J or K, Special Class, Type T any Class; IEC 60584 thermocouple thermometer, Type J or K, Class 1, Type T any Class; or dial gauge metal stem (bimetal) thermometer.

3.4. *Moist Room*—A moist room or suitable covered container capable of maintaining a temperature of $21 \pm 2^\circ\text{C}$ ($70 \pm 3.6^\circ\text{F}$) and a relative humidity of 100 percent for seven-day storage of compacted specimens. The thermometer for measuring the temperature of the moist room shall meet the requirements of M 339M/M 339 with a temperature range of at least 16 to 27°C [60 to 80°F], with an accuracy of $\pm 0.5^\circ\text{C}$ ($\pm 0.9^\circ\text{F}$) (see Note 2).

Note 2—Thermometer types suitable for use include ASTM E1 mercury thermometers; ASTM E2877 digital metal stem thermometer; ASTM E230/E230M thermocouple thermometer, Type T Special; or IEC 60584 thermocouple thermometer, Type T, Class 1.

3.5. *Water Bath*—Suitable tank for submerging compacted specimens in water at room temperature.

3.6. *Wire Scratch Brush*—A wire scratch brush made of 50-by-1.6-mm (2-by- $\frac{1}{16}$ -in.) flat No. 26 gauge wire bristles assembled in 50 groups of 10 bristles each and mounted to form five longitudinal rows and 10 transverse rows of bristles on a 191-by-64-mm ($7\frac{1}{2}$ -by- $2\frac{1}{2}$ -in.) hardwood block.