
Standard Method of Test for

Determining the Degree of Saturation of Hydraulic-Cement Concrete

AASHTO Designation: TP 136-22 (2024)¹

Technically Revised: 2022

Reviewed but Not Updated: 2024

Technical Subcommittee: 3c, Hardened Concrete



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

- 1.1. This test method is used to determine the degree of saturation of hydraulic cement concrete by measuring the mass of the conditioned specimen, the oven-dry mass and the saturated, surface-dry mass of the specimen.
- 1.2. The values stated in SI units are to be regarded as the standard.
- 1.3. *This standard does not purport to address all of the safety problems, 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.*
- 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 STANDARDS

- 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
 - R 39M/R 39, Making and Curing Concrete Test Specimens in the Laboratory
 - R 100M/R 100, Making and Curing Concrete Test Specimens in the Field
 - T 24M/T 24, Obtaining and Testing Drilled Cores and Sawed Beams of Concrete
 - T 277, Electrical Indication of Concrete's Ability to Resist Chloride Ion Penetration
 - TP 135, Determining the Total Pore Volume in Hardened Concrete Using Vacuum Saturation
- 2.2. *ASTM Standards:*
 - C125, Standard Terminology Relating to Concrete and Concrete Aggregates
 - E1, Standard Specification for ASTM Liquid-in-Glass Thermometers



Documents
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- E230/E230M, Standard Specification for Temperature-Electromotive Force (emf) Tables for Standardized Thermocouples
- E879, Standard Specification for Thermistor Sensors for General Purpose and Laboratory Temperature Measurements
- E2877, Standard Guide for Digital Contact Thermometer

2.3. *International Electrotechnical Commission Standard:*

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

2.4. *Other Documents:*

- Li, W., M. Pour-Ghaz, J. Castro, and J. Weiss. Water Absorption and Critical Degree of Saturation Relating to Freeze-Thaw Damage in Concrete Pavement Joints. *Journal of Materials in Civil Engineering*, Vol. 24, No. 3, 2012, pp. 299–307.
- Weiss, J., K. Snyder, J. Bullard, and D. Bentz. Using a Saturation Function to Interpret the Electrical Properties of Partially Saturated Concrete. *Journal of Materials in Civil Engineering*, Vol. 25, No. 8, 2013, pp. 1097–1106.

3. SUMMARY OF TEST METHOD

- 3.1. This test method covers the procedure for quantitative determination of the degree of saturation of conditioned hydraulic-cement concrete.
- 3.2. The test for degree of saturation is carried out on concrete specimens that have been conditioned in a specific environment. The degree of saturation will be determined by the mass of the conditioned specimen, the oven-dry mass and the percentage of mass increase due to saturation of the specimen. The percentage of mass increase due to saturation of the specimen is determined following TP 135.

4. SIGNIFICANCE AND USE

- 4.1. The performance of concrete subjected to many aggressive environments is a function, to a large extent, of the degree of saturation. For example, the performance of concrete against freeze–thaw damage is directly related to its degree of saturation (Li et al., 2012). Furthermore, some property measurements are also influenced by the degree of saturation, such as electrical resistivity measurements (Weiss, et al., 2013).

5. TERMINOLOGY

- 5.1. For definitions of terms used in this standard, refer to ASTM C125.

6. APPARATUS

- 6.1. *Balance*—Complying with M 231, with a minimum capacity of 3 kg, sensitive and readable to 0.01 g or less, and accurate within 0.025 percent of the testing mass, at any point within the range of use for this test method. The balance shall be equipped with suitable apparatus for suspending the sample container in water from the center of the platform or pan of the balance.
- 6.2. *Oven*—Of sufficient size, shall be capable of operation at the temperatures required, between 100 to 120°C, within $\pm 5^\circ\text{C}$, as corrected, if necessary, by calibration. More than one oven may be used, provided each is used within its proper operating temperature range. The thermometer for