
Standard Method of Test for Water Content of Freshly Mixed Concrete Using Microwave Oven Drying

AASHTO Designation: T 318-15 (2023)¹

Technically Revised: 2015

Reviewed but Not Updated: 2023

Editorially Revised: 2021

Technical Subcommittee: 3b, Fresh Concrete



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1. SCOPE

- 1.1. This method covers the measurement of total water content of fresh concrete. It consists of drying a test specimen of fresh concrete using a relatively high-power microwave oven within a short period of time. The difference in mass between the fresh and dry concrete test specimen will be the water content of that test specimen. Water content per unit volume of concrete can be determined by knowing the unit weight of that concrete. Unit weight shall be determined in accordance with T 121M/T 121 or ASTM C138/C138M.
- 1.2. This standard is applicable to both laboratory and field testing.
- 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 establish appropriate safety and health practices and determine the applicability of regulatory limitations prior to use.*
Warning—Fresh hydraulic cementitious mixtures are caustic and may cause chemical burns to skin and tissue upon prolonged exposure.
- 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 231, Weighing Devices Used in the Testing of Materials
 - R 18, Establishing and Implementing a Quality Management System for Construction Materials Testing Laboratories
 - R 60M/R 60, Sampling Freshly Mixed Concrete
 - T 84, Specific Gravity and Absorption of Fine Aggregate
 - T 85, Specific Gravity and Absorption of Coarse Aggregate
 - T 121M/T 121, Density (Unit Weight), Yield, and Air Content (Gravimetric) of Concrete
 - T 255, Total Evaporable Moisture Content of Aggregate by Drying

2.2.

ASTM Standards:

- C138/C138M, Standard Test Method for Density (Unit Weight), Yield, and Air Content (Gravimetric) of Concrete
- C670, Standard Practice for Preparing Precision and Bias Statements for Test Methods for Construction Materials

3.

SUMMARY OF TEST METHOD

3.1.

A test specimen of freshly mixed concrete is wrapped in a fiberglass cloth and dried in a microwave oven using a minimum of three drying intervals. The test specimen is broken up using a metal scraper, separating the coarse aggregate from the mortar throughout each of the drying intervals. A grinding pestle may also aid in separating the coarse aggregate from the mortar but is not required. The water content of the test specimen is calculated based on loss in mass of the test specimen at completion of the test. Total drying time is usually between 15 and 30 min. Drying times are reduced if a higher wattage microwave oven is used.

4.

SIGNIFICANCE AND USE

4.1.

This test is for both laboratory and field measurements of water content in fresh concrete. The test results provide an estimate of the total water content in the fresh concrete and, with the absorption of the aggregates determined, provides an estimate of the mixing water content.

4.2.

This test can be used as a quality control tool to check the water content of as-delivered concrete and to calculate the water/cement ratio if the cement content of the tested concrete is known.

4.3.

Determine the water absorption of coarse and fine aggregates representative of the aggregates used in the concrete in accordance with T 84 or T 85, as applicable.

5.

APPARATUS

5.1.

Microwave Oven—A microwave oven with a minimum power setting of at least 900 watts, a turntable, and sufficient capacity to accept the specified tray and test specimen.

5.2.

Glass Tray—A heat-resistant glass tray with dimensions of approximately 230 by 230 by 50 mm (9 by 9 by 2 in.).

5.3.

Scale—A scale of sufficient capacity meeting the requirements of M 231, having a capacity larger than the sample plus tare, sensitive to 0.1 g or less, and accurate to within 0.1 percent of the test load at any point within the range of use for this test method.

5.4.

Metal Scraper—A small metal scraper having a sharp edge and a blade approximately 25 mm (1 in.) wide.

5.5.

Grinding Pestle—A pestle having a porcelain grinding head with a diameter of approximately 50 mm (2 in.).

5.6.

Scoop—Metal, hand held with a capacity of at least 1.2 L (40 oz).