
Standard Method of Test for Tensile Strength of Hydraulic Cement Mortars

AASHTO Designation: T 132-22

Technically Revised: 2022

Technical Subcommittee: 3a, Cement, Lime, and Concrete Materials



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

- 1.1. This method covers determination of the tensile strength of hydraulic cement mortars employing the briquet specimen. It is primarily for use by those interested in research on methods for determining tensile strength of hydraulic cement.
- 1.2. *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 consult and establish appropriate safety and health practices and determine the applicability of regulatory limitations prior to use.*
- 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.*
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2. REFERENCED DOCUMENTS

- 2.1. *AASHTO Standards:*
- M 85, Portland Cement
 - M 201, Mixing Rooms, Moist Cabinets, Moist Rooms, and Water Storage Tanks Used in the Testing of Hydraulic Cements and Concretes
 - 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 129, Amount of Water Required for Normal Consistency of Hydraulic Cement Paste
- 2.2. *ASTM Standards:*
- C670, Standard Practice for Preparing Precision and Bias Statements for Test Methods for Construction Materials
 - C778, Standard Specification for Standard Sand
 - C1005, Standard Specification for Reference Masses and Devices for Determining Mass and Volume for Use in the Physical Testing of Hydraulic Cements
 - E1, Standard Specification for ASTM Liquid-in-Glass Thermometers
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- E11, Standard Specification for Wire-Cloth Sieves for Testing Purposes
- E230, Standard Specification for Temperature-Electromotive Force (emf) Tables for Standardized Thermocouples
- E2877, Standard Guide for Digital Contact Thermometers
- *Manual of Cement Testing*, Annual Book of ASTM Standards, Volume 04.01.

2.3. *International Electrotechnical Commission Standard:*

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

3. SIGNIFICANCE AND USE

- 3.1. Researchers in the field of hydraulic cement have recognized the need for improved tensile strength. This method allows for the determination of tensile strength of a hydraulic cement mortar by casting and testing briquet specimens. It is recommended that the tester be familiar with this method in order to obtain the best possible accuracy and precision.
- 3.2. Table 1 contains minimum tensile strength values, which are stated limits in M 85 for portland cement. The user of this method may be interested in comparing research results with these values when briquets composed of one part cement to three parts standard sand have been made. These values may not be appropriate for comparison when different proportions or proportions involving other than standard sand have been used.

Table 1—Tensile Strength^a

	Cement Type				
	I	II	III	IV	V
1 day in moist air, psi (kPa)	—	—	275 (1,896)	—	—
1 day in moist air, 2 days in water, psi (kPa)	150 (1,034)	125 (862)	375 (2,586)	—	—
1 day in moist air, 6 days in water, psi (kPa)	275 (1,896)	250 (1,724)	—	175 (1,207)	250 (1,724)
1 day in moist air, 27 days in water, psi (kPa)	350 (2,413)	325 (2,241)	—	300 (2,068)	325 (2,241)

^a Taken from M 85-70 without change.

4. APPARATUS

- 4.1. *Weights and Weighing Devices*—The weights and weighing devices shall conform to the requirements of ASTM C1005. The weighing devices shall be evaluated for precision and accuracy at a total load of 1000 g or 2000 g, as applicable.
- 4.2. *Sieves*—Square-hole, woven wire cloth, No. 20 (850- μ m) and No. 30 (600- μ m) sieves conforming to ASTM E11.
- 4.3. *Glass Graduates*—Glass graduates of suitable capacities (preferably large enough to measure the mixing water in a single operation) shall be made to deliver the indicated volume at 68°F (20°C). The permissible variation shall be ± 1.0 mL. These graduates shall be subdivided to at least 1 mL, except that the graduation lines may be omitted for the lowest 5 mL for 100- and 150-mL graduates and for the lowest 10 mL for a 200-mL graduate. The main graduation lines shall be circles and shall be numbered. The least graduations shall extend at least one seventh of the way around the cylinder, and intermediate graduations shall extend at least one fifth of the way around.
- 4.4. *Briquet Molds*—The molds for making test specimens shall be made of metal not attacked by the cement mortar and shall have sufficient material in the sides to prevent spreading during molding. Gang molds, when used, shall be of the type shown in Figure 1. The dimensions of the briquet