
Standard Practice for Sampling and Amount of Testing of Hydraulic Cement

AASHTO Designation: R 71-24¹

Technically Revised: 2024

Editorially Revised: 2024

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

ASTM Designation: C183/C183M-22



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1. SCOPE
- 1.1.

This practice covers procedures for sampling and for the amount of testing of hydraulic cement after it has been manufactured and is ready to be offered for sale.
- 1.2.

The values stated in either SI units or inch-pound units are to be regarded separately as standard. The values stated in each system may not be the exact equivalents; therefore, each system shall be used independently of the other. Combining values from the two systems may result in non-conformance with the standard. Values in SI units [or inch-pound units] shall be obtained by measurement in SI units [or inch-pound units] or by appropriate conversion, using the Rules for Conversion and Rounding given in ASTM Standard IEEE/ASTM SI10. Values are stated in only SI units when inch-pound units are not used in practice.
- 1.3.

The text of this standard references notes and footnotes which provide explanatory material. These notes and footnotes (excluding those in tables and figures) shall not be considered requirements of the standard.
- 1.4.

This standard does not purport to address all of the safety concerns, if any, associated with its use. It is the responsibility of the user of this standard to establish appropriate safety, health, and environmental practices and determine the applicability of regulatory limitations prior to use.

2. REFERENCED DOCUMENTS

- 2.1. AASHTO Standards:
- M 85, Portland Cement
- M 240M/M 240, Blended Hydraulic Cement
- T 105, Chemical Analysis of Hydraulic Cement
- T 106M/T 106, Compressive Strength of Hydraulic Cement Mortar (Using 50-mm or 2-in. Cube Specimens)
- T 131, Time of Setting of Hydraulic Cement by Vicat Needle
- T 137, Air Content of Hydraulic Cement Mortar
- T 153, Fineness of Hydraulic Cement by Air Permeability Apparatus
- T 154, Time of Setting of Hydraulic Cement Paste by Gillmore Needles

- T 186, Early Stiffening of Hydraulic Cement (Paste Method)
- T 192, Fineness of Hydraulic Cement by the 45- μ m (No. 325) Sieve

2.2.

ASTM Standards:

- C10/C10M, Standard Specification for Natural Cement
- C91/C91M, Standard Specification for Masonry Cement
- C157/C157M, Standard Test Method for Length Change of Hardened Hydraulic-Cement Mortar and Concrete
- C452, Standard Test Method for Potential Expansion of Portland-Cement Mortars Exposed to Sulfate
- C806, Standard Test Method for Restrained Expansion of Expansive Cement Mortar
- C807, Standard Test Method for Time of Setting of Hydraulic Cement Mortar by Modified Vicat Needle
- C845/C845M, Standard Specification for Expansive Hydraulic Cement
- C1012/C1012M, Standard Test Method for Length Change of Hydraulic-Cement Mortars Exposed to a Sulfate Solution
- C1038/C1038M, Standard Test Method for Expansion of Hydraulic Cement Mortar Bars Stored in Water
- C1157/C1157M, Standard Performance Specification for Hydraulic Cement
- C1328/C1328M, Standard Specification for Plastic (Stucco) Cement
- C1329/C1329M, Standard Specification for Mortar Cement
- C1357, Standard Test Methods for Evaluating Masonry Bond Strength (withdrawn 2016; replaced by C1072)
- C1506, Standard Test Method for Water Retention of Hydraulic Cement-Based Mortars and Plasters
- C1702, Test Method for Measurement of Heat of Hydration of Hydraulic Cementitious Materials Using Isothermal Conduction Calorimetry

2.3.

ACI Standard:

- ACI 225.1R, Guide to the Selection and Use of Hydraulic Cements

2.4.

IEEE/ASTM Standard:

- SI10, American National Standard for Metric Practice

3.

TERMINOLOGY

3.1.

Definitions of Terms Specific to This Standard:

3.1.1.

lot (of cement)—specific quantity of cement offered for inspection at any one time. A lot may be one or more storage bins filled consecutively. A lot may also be the contents of one or more transport units representing cement drawn from the same storage bin.

3.1.2.

reduced testing rate—test program that provides for the testing of only two samples from any given lot of samples obtained and prepared for testing at the normal rate as described herein. The program utilizes probability factors and is so designed that when results from the two samples fulfill the requirements of the program, it may be said with 95 percent confidence that less than 5 percent of the samples would be outside the specification limits.

3.1.3.

ton, n—907 kg [2000 lb] (as used in this practice).

4. SIGNIFICANCE AND USE

- 4.1. The sampling procedures described are intended for use in the procurement of samples of hydraulic cement after it has been manufactured and is ready to be offered for sale. They are not intended as sampling procedures for quality control purposes during manufacturing. The testing procedures outlined cover the amount of testing to be done and provide guidance for reporting on conformance or nonconformance of cements with requirements of purchase specifications.
- 4.2. This practice is referenced as the procedure for sampling natural cement (ASTM C10/C10M), masonry cement (ASTM C91/C91M), portland cement (M 85), blended hydraulic cement (M 240M/M 240), expansive hydraulic cement (ASTM C845/C845M), plastic (stucco) cement (ASTM C1328), mortar cement (ASTM C1329), and hydraulic cement (ASTM C1157/C1157M) based on a performance specification.
- 4.3. Most building codes and construction specifications require that hydraulic cement to be used in the work meet the applicable requirements of the relevant purchase specifications, such as Specifications M 85, M 240M/M 240, ASTM C91/C91M, ASTM C845/C845M, ASTM C1157/C1157M, ASTM C1328, and ASTM C1329. If the code or specification requires sampling of the manufactured cement, the provisions given in Section 4.4 are applicable. Not much cement is sold on the basis of such sampling and testing. A useful discussion of sampling and testing cement is contained in ACI 225.1R.
- 4.4. The procedures covered in this practice should be done by or for purchasers of hydraulic cement who are using a code or specification that requires sampling and testing to determine if the samples conform to the relevant acceptance specifications. The testing is done using specified methods to determine whether the samples yield test results that conform to the specification, and the tests serve as a basis for acceptance or rejection of the lot of material sampled.
- 4.5. It is neither intended nor required that all cements be tested using all the test methods referenced in Section 2.

5. KINDS AND SIZE OF SAMPLES AND BY WHOM TAKEN

- 5.1. A cement sample secured during transfer to bulk storage, from bulk storage, or from a bulk shipment in one operation, shall be termed a “grab sample.” A sample obtained during a 10-min interval using an automatic sampling device that continuously samples a cement stream may also be considered a grab sample. Grab samples taken at prescribed intervals over a period of time may be combined to form a “composite sample” representative of the cement produced during that period of time.
- 5.2. All samples, whether grab or composite, shall have a mass of at least 5 kg [10 lb].
- 5.3. The purchaser may designate a representative to supervise the sampling, packing, and shipping of samples when it is so specified in the purchase contract.
- 5.4. Package the samples in moisture-proof, airtight containers numbered consecutively in the order in which the samples are taken (see Note 1). The purchase contract shall state who will pay for the costs of sampling, packaging, shipping, and testing the samples.
- Note 1**—Polyvinyl chloride sample containers, upon occasion, have been found to affect the air-entraining potential of a cement sample. The same problem might be experienced with containers made from other plastics.