



Designation: C183/C183M – 23

Standard Practice for Sampling and the Amount of Testing of Hydraulic Cement¹

This standard is issued under the fixed designation C183/C183M; the number immediately following the designation indicates the year of original adoption or, in the case of revision, the year of last revision. A number in parentheses indicates the year of last reapproval. A superscript epsilon (ϵ) indicates an editorial change since the last revision or reapproval.

This standard has been approved for use by agencies of the U.S. Department of Defense.

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 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 Standard IEEE/ASTM SI 10. 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.*

1.5 *This international standard was developed in accordance with internationally recognized principles on standardization established in the Decision on Principles for the Development of International Standards, Guides and Recommendations issued by the World Trade Organization Technical Barriers to Trade (TBT) Committee.*

¹ This practice is under the jurisdiction of ASTM Committee C01 on Cement and is the direct responsibility of Subcommittee C01.95 on Coordination of Standards. Current edition approved June 1, 2023. Published June 2023. Originally approved in 1944. Last previous edition approved in 2022 as C183/C183M – 22. DOI: 10.1520/C0183_C0183M-23.

2. Referenced Documents

2.1 *ASTM Standards:*²

- C10/C10M Specification for Natural Cement
- C91/C91M Specification for Masonry Cement
- C109/C109M Test Method for Compressive Strength of Hydraulic Cement Mortars (Using 2-in. or [50 mm] Cube Specimens)
- C114 Test Methods for Chemical Analysis of Hydraulic Cement
- C150/C150M Specification for Portland Cement
- C151/C151M Test Method for Autoclave Expansion of Hydraulic Cement
- C157/C157M Test Method for Length Change of Hardened Hydraulic-Cement Mortar and Concrete
- C185 Test Method for Air Content of Hydraulic Cement Mortar
- C191 Test Methods for Time of Setting of Hydraulic Cement by Vicat Needle
- C204 Test Methods for Fineness of Hydraulic Cement by Air-Permeability Apparatus
- C266 Test Method for Time of Setting of Hydraulic-Cement Paste by Gillmore Needles
- C430 Test Method for Fineness of Hydraulic Cement by the 45- μ m (No. 325) Sieve
- C451 Test Method for Early Stiffening of Hydraulic Cement (Paste Method)
- C452/C452M Test Method for Potential Expansion of Portland-Cement Mortars Exposed to Sulfate
- C595/C595M Specification for Blended Hydraulic Cements
- C806 Test Method for Restrained Expansion of Expansive Cement Mortar
- C807 Test Method for Time of Setting of Hydraulic Cement Mortar by Modified Vicat Needle

² For referenced ASTM standards, visit the ASTM website, www.astm.org, or contact ASTM Customer Service at service@astm.org. For *Annual Book of ASTM Standards* volume information, refer to the standard's Document Summary page on the ASTM website.

*A Summary of Changes section appears at the end of this standard

[C845/C845M Specification for Expansive Hydraulic Cement](#)
[C1012/C1012M Test Method for Length Change of Hydraulic-Cement Mortars Exposed to a Sulfate Solution](#)
[C1038/C1038M Test Method for Expansion of Hydraulic Cement Mortar Bars Stored in Water](#)
[C1157/C1157M Performance Specification for Hydraulic Cement](#)
[C1328/C1328M Specification for Plastic \(Stucco\) Cement](#)
[C1329/C1329M Specification for Mortar Cement](#)
[C1357 Test Methods for Evaluating Masonry Bond Strength \(Withdrawn 2016\)](#)³
[C1506 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](#)
[E11 Specification for Woven Wire Test Sieve Cloth and Test Sieves](#)
[IEEE/ASTM SI 10 Standard for Use of the International System of Units \(SI\): The Modern Metric System](#)
2.2 *ACI Standard*:
[225.1R Guide to the Selection and Use of Hydraulic Cements](#)⁴

[C595M](#)), expansive hydraulic cement (Specification [C845/C845M](#)), hydraulic cement based on a performance specification (Specification [C1157/C1157M](#)), plastic stucco cement (Specification [C1328/C1328M](#)), and mortar cement (Specification [C1329/C1329M](#)), and

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 [C10/C10M](#), [C91/C91M](#), [C150/C150M](#), [C595/C595M](#), [C1157/C1157M](#), [C1328/C1328M](#), [C1329/C1329M](#), or [C845/C845M](#). If the code or specification requires sampling of the manufactured cement, the provisions given in 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.

3. Terminology

3.1 *Definitions of Terms Specific to This Standard*:

3.1.1 *lot (of cement), n*—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, n*—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 % confidence that less than 5 % of the samples would be outside the specification limits.

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 non-conformance of cements with requirements of purchase specifications.

4.2 This practice is referenced as the procedure for sampling natural cement (Specification [C10/C10M](#)), masonry cement (Specification [C91/C91M](#)), portland cement (Specification [C150/C150M](#)), blended hydraulic cement (Specification [C595/](#)

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 termed 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. 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.

6. Testing-Time Requirements for Completion of Tests

6.1 When tests of hydraulic cement are made at a laboratory other than that of the cement manufacturer, the cement sampling schedule, sample transportation time, and sample testing schedule must be coordinated among the purchaser, the

³The last approved version of this historical standard is referenced on www.astm.org.

⁴Detailed requirements for this sieve are given in Specification [E11](#).

manufacturer, and the testing laboratory so that the tests results will be available when required.

6.2 The manufacturer of the cement shall make the cement available to be sampled for testing early enough before the time the test results are needed so that at least the applicable time intervals listed in 6.3 exist.

6.3 When this has been done, the testing laboratory shall provide test results not later than the indicated number of days after sampling:

Test Methods	Time Interval, days
C109/C109M (1 day results), C114, C151/C151M, C185, C191, C204, C451, C266	8
C109/C109M and C1702 (3 day results)	10
C109/C109M and C1702 (7 day results)	14
C452/C452M and C1012/C1012M (14 day results)	21
C109/C109M (28 day results)	35
C157/C157M (34 day results)	41

7. Sampling

7.1 The cement may be sampled by any of the applicable methods described in this section.

7.1.1 *Delivering to Bulk Storage and Transfer Sampling*—Sample cement while the cement is being transferred. Take one grab sample from the transfer stream for each 360 Mg [400 tons] of cement, or fraction thereof, but take no less than two grab samples and combine them to produce a composite sample.

7.1.2 *Other Sampling Methods*—When the above sampling method is not applicable, samples may, when authorized by the purchaser, be taken by one of the following methods:

7.1.2.1 *From Bulk Storage at Points of Discharge*—Withdraw cement from the discharge openings in a steady stream until sampling is completed. If a high circular silo is being sampled, take all samples from one opening. If the quantity of the cement in the bin exceeds 1100 Mg [1200 tons] when low rectangular bins are being sampled, discharge openings employed in the sampling shall be such that for no opening shall the number of samples represent more than one half the contents of the bin or more than 1800 Mg [2000 tons]. When sampling bulk storage at points of discharge, while the cement is flowing through the openings, take samples at such intervals so that at least two grab samples shall be secured for each 360 Mg [400 tons] in the bin or silo.

7.1.2.2 *From Bulk Storage and Bulk Shipment by Means of Slotted Tube Sampler*—Obtain sample using a tube sampler designed for cohesive and semi-cohesive powders and designed for the depth of the cement to be sampled. An example of just one type is shown in Fig. 1. Take samples from well-distributed points and various depths of the cement so that the samples taken will represent the cement involved.

7.1.2.3 *From Packaged Cement by Means of Tube Sampler*—Sample package cement using a tube sampler designed for cohesive and semi-cohesive powders and able to

sample packaged cement from the valve of the cement bag. An example of just one type is shown in Fig. 1. Take one sample from a bag in each 4.5 Mg [5 tons] or fraction thereof.

7.1.2.4 From Bulk Shipment of Car or Truck:

(a) *Single Shipment*—If only one car or truck is being loaded and the loading is continuous and all from the same source, take a 5 kg [10-lb] sample. If not continuous or unknown, combine five or more portions from different points in the load to form the test sample.

(b) *Multiple Shipments*—When the shipment consists of several cars or trucks loaded from the same source and on the same day, sample the shipment at the rate of one sample for each 90 Mg [100 tons] of cement or fraction thereof, but take not less than two samples. Consider cement represented by such samples as a lot, and test the samples in accordance with the procedure outlined in the section on Amount of Testing.

7.2 *Protection of Samples*—As samples are taken, place them directly in moisture-proof airtight containers to avoid moisture absorption and aeration of the sample. If the samples are placed in cans, fill the can completely and immediately seal. Use moisture-proof multiple-wall paper bags or plastic bags if they are strong enough to avoid breakage, and if they can be sealed immediately after filling in such a manner as to eliminate excess air in the sample and avoid moisture absorption and aeration of the sample. Samples shall be treated as described in the section on Preparation of Sample.

8. Preparation of Sample

8.1 Before testing, pass each sample through an 850 μm (No. 20) sieve,⁴ or any other sieve having approximately the same size openings, in order to mix the sample, break up lumps, and remove foreign material. Do not include the foreign materials and hardened lumps that do not break up on sieving or brushing in the sample to be tested. Store the cement in airtight moisture-proof containers to prevent aeration or absorption of moisture prior to test.

9. Amount of Testing

9.1 *General*—When required, the purchaser shall specify the amount of testing for the following specification specific requirements:

9.1.1 Heat of hydration (Test Method C1702) for optional limits specified in Specification C150/C150M, and special properties in Specifications C595/C595M and C1157/C1157M;

9.1.2 Sulfate resistance (Test Method C1012/C1012M) for optional limits specified in Specifications C595/C595M and C1157/C1157M;

9.1.3 Potential Expansion of Portland-Cement Mortars Exposed to Sulfate (Test Method C452/C452M) for optional limits specified in Specification C150/C150M;

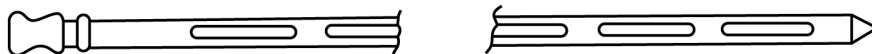


FIG. 1 Example of Tube Sampler for Cement