



Designation: C1222 – 09

## Standard Practice for Evaluation of Laboratories Testing Hydraulic Cement<sup>1</sup>

This standard is issued under the fixed designation C1222; 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 reappraisal. A superscript epsilon ( $\epsilon$ ) indicates an editorial change since the last revision or reappraisal.

### 1. Scope\*

1.1 This practice covers the technical training and experience of laboratory testing personnel and identifies the minimum technical requirements for laboratory equipment used in testing of hydraulic cement as prescribed by ASTM.

1.2 This practice provides minimum criteria for evaluating the capability of a laboratory to perform chemical or physical tests listed in the various specifications on hydraulic cement (see [Note 1](#)).

NOTE 1—Relevant hydraulic cement specifications are Specifications [C91](#), [C150](#), [C595](#), [C845](#), and Performance Specification [C1157](#).

1.3 The values stated in SI units are to be regarded as standard. No other units of measurement are included in this 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 and health practices and determine the applicability of regulatory limitations prior to use.*

### 2. Referenced Documents

#### 2.1 ASTM Standards:<sup>2</sup>

- [C91 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](#)
- [C115 Test Method for Fineness of Portland Cement by the Turbidimeter](#)
- [C125 Terminology Relating to Concrete and Concrete Aggregates](#)
- [C150 Specification for Portland Cement](#)

<sup>1</sup> 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, 2009. Published July 2009. Originally approved in 1991. Last previous edition approved in 2006 as C1222–06. DOI: 10.1520/C1222-09.

<sup>2</sup> For referenced ASTM standards, visit the ASTM website, [www.astm.org](http://www.astm.org), or contact ASTM Customer Service at [service@astm.org](mailto:service@astm.org). For *Annual Book of ASTM Standards* volume information, refer to the standard's Document Summary page on the ASTM website.

- [C185 Test Method for Air Content of Hydraulic Cement Mortar](#)
  - [C187 Test Method for Amount of Water Required for Normal Consistency of Hydraulic Cement Paste](#)
  - [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](#)
  - [C219 Terminology Relating to Hydraulic Cement](#)
  - [C230/C230M Specification for Flow Table for Use in Tests of Hydraulic Cement](#)
  - [C266 Test Method for Time of Setting of Hydraulic-Cement Paste by Gillmore Needles](#)
  - [C305 Practice for Mechanical Mixing of Hydraulic Cement Pastes and Mortars of Plastic Consistency](#)
  - [C451 Test Method for Early Stiffening of Hydraulic Cement \(Paste Method\)](#)
  - [C595 Specification for Blended Hydraulic Cements](#)
  - [C845 Specification for Expansive Hydraulic Cement](#)
  - [C1157 Performance Specification for Hydraulic Cement](#)
  - [C1506 Test Method for Water Retention of Hydraulic Cement-Based Mortars and Plasters](#)
  - [E4 Practices for Force Verification of Testing Machines](#)
- 2.2 *Other Documents:*
- [ACI 116R Cement and Concrete Terminology](#)<sup>3</sup>

### 3. Terminology

#### 3.1 Definitions:

3.1.1 *inspection, n*—a process of measuring, examining, testing, gaging, or using other procedures to ascertain the quality or state, detect errors or defects, or otherwise appraise materials, products, services, systems, or environments when compared to preestablished criteria.

3.1.2 Additional definitions may be found in Terminologies [C125](#) and [C219](#), Practices [E4](#), and [ACI 116R](#).

#### 3.2 Definitions of Terms Specific to This Standard:

3.2.1 *evaluation authority, n*—an independent entity, apart from the organization being evaluated, that can provide an unbiased evaluation of the organization and shall have the capability to assess the technical activities of testing laboratories (see Discussion).

<sup>3</sup> Available from American Concrete Institute (ACI), P.O. Box 9094, Farmington Hills, MI 48333-9094, <http://www.aci-int.org>.

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

3.2.1.1 *Discussion*—One such evaluation authority is the Cement and Concrete Reference Laboratory (CCRL).<sup>4</sup> Laboratory inspection is broadened into accreditation programs by such independent authorities as the National Voluntary Laboratory Accreditation Program (NVLAP),<sup>5</sup> American Association for Laboratory Accreditation (A2LA),<sup>6</sup> AASHTO Accreditation Program (AAP),<sup>7</sup> and others established.

3.2.2 *laboratory technician, n*—an employee of the laboratory who is assigned to perform the actual testing operations primarily conducted in the laboratory.

3.2.3 *quality systems, n*—those internal procedures and practices that a laboratory utilizes to ensure continued compliance with applicable testing standards.

3.2.4 *subcontracting, n*—employing another organization to provide testing services that the laboratory contracted to provide.

3.2.5 *testing laboratory, n*—an organization that measures, examines, performs tests, or otherwise determines the characteristics or performance of materials or products. This may include organizations that offer commercial testing services, an in-house quality control function, an academic institution, or any other organization providing the specified testing services.

## 4. Significance and Use

4.1 The testing of hydraulic cement is an important element in obtaining quality construction. A testing laboratory must be selected with care.

4.2 A testing laboratory shall be deemed qualified to perform and report the results of its tests if the laboratory meets the requirements of this practice.

4.3 This practice provides guidance for evaluating the organization, personnel, facilities, and quality systems of the laboratory. This practice may be supplemented by criteria and requirements for particular projects.

## 5. Documentation of Organization

5.1 The following information shall be readily available for review:

5.1.1 A description of the organization, including the complete legal name and address of the main office and each laboratory location, names and positions of the principal officers and the individual in charge of the laboratory,

5.1.2 A description of the organization management structure, and

5.1.3 A listing of the range of services offered.

## 6. Human Resources

6.1 The manager of the laboratory shall be a chemist, materials analyst, or an engineer and a full-time employee of

the organization having at least three years supervisory experience in the testing of hydraulic cement; however, a person with equivalent science-oriented education or experience having satisfactorily directed testing of hydraulic cement is acceptable.

## 7. Testing and Additional Requirements

7.1 *Testing Requirements*—The organization shall have the capability of performing tests associated with its range of services (see **Note 2**). The laboratory shall have the facilities and equipment required for preparing, storing, conditioning, and testing specimens.

**NOTE 2**—The range of services of a testing laboratory may involve either chemical testing or physical testing, or both. The laboratory need not perform all tests listed in the applicable ASTM specification, but rather have the required equipment and demonstrate the ability to perform the procedures within its reported range of services.

7.1.1 The laboratory shall use the latest version of each referenced ASTM standard within one year of its publication in the *Annual Book of ASTM Standards* except where an earlier version is specifically required.

7.1.2 Laboratory personnel shall have convenient access to applicable standards.

7.2 *Additional Requirements*—The following requirements apply to only those tests performed by the laboratory. They are intended to supplement certain provisions of the standard test methods.

7.2.1 Analytical balances and reference masses shall be checked at least annually and shall conform to the requirements of Test Methods **C114**.

7.2.2 Flow tables shall be checked at least every 2½ years using the calibration material described in Specification **C230/C230M**.

7.2.3 Compression machines shall be verified, in accordance with Practices **E4** at least annually to determine if indicated loads, with and without the maximum load indicator (when so equipped), are accurate to ±1.0 %.

7.2.4 Compression machine bearing blocks shall be checked for planeness in accordance with the requirements of Test Method **C109/C109M** at least annually using a straightedge and feeler stock and shall be refinished if found to be out of tolerance.

7.2.5 Air content measures (400 mL) shall be calibrated at least every 2½ years following the procedures described in Test Method **C185**.

7.2.6 Wagner turbidimeter apparatus shall be calibrated at least every six months using the procedures described in Test Method **C115**.

7.2.7 Cube molds and tampers shall be checked for conformance to the design and dimensional requirements of Test Method **C109/C109M** at least every 2½ years.

7.2.8 Vicat apparatus and vicat ring shall be inspected and checked for conformance to Test Methods **C187**, **C191**, and **C451** at least every 2½ years.

7.2.9 Gillmore test apparatus shall be inspected and checked for conformance to the requirements of Test Method **C266** at least every 2½ years.

<sup>4</sup> CCRL, National Institute of Standards and Technology (NIST), 100 Bureau Dr., Stop 8618, Gaithersburg, MD 20899-8618; www.ccril.us.

<sup>5</sup> NVLAP, Standards Services Division, National Institute of Standards and Technology (NIST), 100 Bureau Dr., Stop 2140, Gaithersburg, MD 20899-2140.

<sup>6</sup> American Association for Laboratory Accreditation (A2LA), 5301 Buckeyestown Pike, Suite 350 Frederick, MD 21704; www.a2la2.net.

<sup>7</sup> Available from American Association of State Highway and Transportation Officials (AASHTO), 444 N. Capitol St., NW, Suite 249, Washington, DC 20001; www.transportation.org.