Designation: C10/C10M – 14

Standard Specification for Natural Cement[1]

This standard is issued under the fixed designation C10/C10M; 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.

1. Scope*

1.1 This specification covers natural cement and quick-setting natural cement.

NOTE 1—Examples of typical past uses of natural cement include unit masonry mortar, cement plaster, grout, whitewash, and concrete.

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 IEEE/ASTM SI 10, of measurements made in other units [or SI units]. 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 as requirements of the standard.

2. Referenced Documents

2.1 *ASTM Standards:*[2]

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 Specification for Portland Cement

C151 Test Method for Autoclave Expansion of Hydraulic Cement

C183 Practice for Sampling and the Amount of Testing of Hydraulic Cement

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

C188 Test Method for Density of Hydraulic Cement

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

C305 Practice for Mechanical Mixing of Hydraulic Cement Pastes and Mortars of Plastic Consistency

C465 Specification for Processing Additions for Use in the Manufacture of Hydraulic Cements

C688 Specification for Functional Additions for Use in Hydraulic Cements

C778 Specification for Sand

C786 Test Method for Fineness of Hydraulic Cement and Raw Materials by the 300-μm (No. 50), 150-μm (No. 100), and 75-μm (No. 200) Sieves by Wet Methods

IEEE/ASTM SI 10 Standard for Use of the International System of Units (SI): The Modern Metric System

3. Terminology

3.1 For definitions of terms related to this specification, see Terminology C219.

4. Ordering Information

4.1 Orders for material under this specification shall include the following:

4.1.1 This specification number and date, and

4.1.2 Optional physical requirements as given in 7.2.

5. Additions

5.1 The cement covered by this specification shall contain no addition except as follows:

5.1.1 Water, or calcium sulfate, or both.

5.1.2 Processing additions used in the manufacture of the cement shall have been shown to meet the requirements of Specification C465 in the amounts used or greater.

5.1.3 Functional additions shall have been shown to meet the requirements of Specification C688 when tested with the cement to be used in the amounts used or greater.

[1] This test method is under the jurisdiction of ASTM Committee C01 on Cement and is the direct responsibility of Subcommittee C01.10 on Hydraulic Cements for General Concrete Construction.

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[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**

6. Chemical Requirements

6.1 Natural cements shall conform to the standard chemical requirements in Table 1.

7. Physical Requirements

7.1 Natural cements and quick-setting natural cements shall conform to the respective standard physical requirements prescribed in Table 1.

NOTE 2—Time of setting requirements for natural cements have changed over time. Requirements of previous editions of this standard are as follows:

1904-1937: Minimum 10 min initial setting, minimum 30 min final setting

1937-1954: Minimum 10 min initial setting (Vicat) or 20 min (Gillmore) and maximum 10 h final setting

1954-1962: Minimum 10 min and maximum 6 h initial setting (Test Method C191)

1962-1970: Minimum 60 min initial setting and maximum 12 h final setting (Gillmore)

1970-1976 and 2006-2008: Minimum 30 min initial setting (Vicat)

2009: Minimum 30 min initial setting—Natural Cement; Minimum 10 min initial setting, maximum 30 min initial setting, and minimum 30 min final setting—Quick Setting Natural Cement

7.2 In order to match historic cements, at the option of the purchaser, the required values for % retention on the 300-µm (N0. 50), 150-µm (No. 100), and 75-µm (No. 200) sieves, or of air permeability fineness shall be agreed at time of placing the order.

NOTE 3—If no data on historic cement fineness are available, the purchaser may wish to consider that previous editions of this specification from 1904 to 1976 required minimum values as follows:

1954-1976: Minimum 550 m^2/kg fineness (air-permeability method)

1937-1954: Maximum 15% retained on a 75-µm (No. 200) sieve

1904-1937: Maximum 10% retained on a 150-µm (No. 100) sieve, maximum 30 % retained on a 75-µm (No. 200) sieve

8. Acceptance and Rejection

8.1 Natural cement meets the strength requirements of this standard if the 7-day strength exceeds the minimum in Table 1. The cement also meets the strength requirements of this standard if the cement fails the 7-day strength minimum, but exceeds the 28-day strength minimum in Table 1.

8.2 If the cement fails an initial test for autoclave expansion, it meets the requirements of this standard if it passes on a second and third series of test specimens.

8.3 The cement shall be rejected if it fails to meet any of the requirements of this specification, subject to the provisions of 8.1 and 8.2.

8.4 Re-test cement remaining in storage for a period longer than six months after initial test. Reject it if it fails to meet any of the requirements of this specification at that time.

8.5 Tentative or provisional acceptance of the cement shall not deprive the purchaser of the right of rejection in the event final tests or retests fail to meet applicable requirements.

8.6 At the option of the purchaser, packages more than 2 % below the mass marked thereon shall be rejected and if the average mass of packages in any shipment, as shown by determining the mass of 50 packages selected at random, is less than that marked on the packages, the entire shipment shall be rejected.

9. Packaging and Package Marking

9.1 When the cement is delivered in packages, the words "Natural Cement," or "Quick-Setting Natural Cement," as appropriate, the name and brand of the manufacturer, and the mass of the cement contained therein, shall be plainly indicated on each package. Similar information shall be provided in the shipping documents accompanying the shipment of packaged or bulk cement. All packages shall be in good condition at the time of inspection.

TABLE 1 Standard Requirements

	Applicable Test Methods	Requirements: Natural Cement	Requirements: Quick-Setting Natural Cement
Chemical Requirements			
Loss on ignition, max, %:	C114	12	12
Insoluble residue, min, %:	C114	2	2
Sulfur trioxide (SO_3), max, %:	C114	3.0	3.0
Physical Requirements			
Autoclave length change, max, %:	C151, as modified in 10.1.4	0.80	0.80
Fineness, m^2/kg or % retained:	C204 or C786	[A]	[A]
Time of setting, Vicat test:	C191		
Initial Setting Time in minutes, not less than		30	10
Initial Setting Time in minutes, not more than		...	30
Air content of mortar[B], volume %:	C185		
max		12	12
Compressive strength, min, MPa [psi]:	C109/C109M, as modified in 10.1.7		
7 days		3.5 [510]	3.5 [510]
28 days		7.0 [1020]	7.0 [1020]

[A] The fineness shall be chosen at the option of the purchaser as per 7.2.

[B] Compliance with the requirements of this specification does not necessarily ensure that the desired air content will be obtained in concrete.

9.2 When the cement contains a functional addition the type of functional addition shall be plainly marked on each package. Similar information shall be provided in the shipping documents accompanying the shipment of packaged or bulk cement.

10. Test Methods

10.1 Sample the cement and determine the properties enumerated in this specification in accordance with the following ASTM methods:

10.1.1 *Sampling*—Practice C183.

10.1.2 *Chemical Analysis*—Test Methods C114.

10.1.3 *Fineness*—One of the following test methods shall be used:

10.1.3.1 Test Method C204. In this fineness determination, the specific gravity of natural cement shall be considered to be 2.90. Tests shall be made at a porosity of 0.530 ± 0.005. In case of dispute, the true specific gravity used shall be as determined in accordance with Test Method C188.

10.1.3.2 Test Method C786.

10.1.4 *Autoclave Expansion*—Test Method C151 with the following modification:

10.1.4.1 The cement used in preparing the test specimens shall be a blend of 75 weight percent of the natural cement to be tested with 25 weight percent of portland cement conforming to the requirements of Type II cement in Specification C150.

10.1.4.2 The natural cement and the portland cement shall be dry mixed to a uniform blend before water is added.

10.1.5 *Time of Setting*—Test Method C191.

10.1.6 *Air Content of Mortar*—Test Method C185. In this air content determination, the specific gravity of natural cement shall be considered to be 2.90. In case of dispute, the true specific gravity used shall be as determined in accordance with Test Method C188.

10.1.7 *Compressive Strength*—The compressive strength shall be determined for mortar cubes prepared as follows:

10.1.7.1 The proportions shall be one part of cement to one part of standard sand by mass. The amount of mixing water is based on the amount of water required to produce a neat cement paste of normal consistency from the same sample of cement according to Test Method C187. Calculate the percentage of water required as follows:

$$y = \frac{P}{3} + 6.5$$

where:

y = water required for the mortar as a percentage of the combined mass of cement and sand, and

P = water needed for normal consistency, percent by mass of cement.

10.1.7.2 The standard sand shall be 20-30 sand conforming to Specification C778.

10.1.7.3 The mortar shall be mixed in accordance with Practice C305. The quantities of materials to be mixed at one time in the batch of mortar for making six and nine test specimens shall be as follows:

	Number of Specimens	
	6	9
Cement, g	900	1335
Sand, g	900	1335
Water, mL	18y	26.7y

10.1.7.4 The 2-in. [50-mm] cube specimens shall be molded and tested in accordance with Test Method C109/C109M.

11. Keywords

11.1 hydraulic cement; natural cement; specification

SUMMARY OF CHANGES

Committee C01 has identified the location of selected changes to this specification since the last issue, C10/C10M–13, that may impact the use of this specification. (Approved January 1, 2014)

(1) Added Specification C688 to Section 2.1.

(2) Added 5.1.3.

(3) Added 9.2.