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Standard Specification for Masonry Cement[1]

This standard is issued under the fixed designation C91/C91M; 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 specification covers three types of masonry cement for use where mortar for masonry is required.

1.2 *Units*—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 shall be obtained by measurement in SI units or by appropriate conversion, using the Rules for Conversion and Rounding given in Standard IEEE/ASTM SI 10, of measurements made in other units. Values are stated in only SI units when inch-pound units are not used in practice.

1.3 The text of this standard refers to 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.

1.4 The following safety hazards caveat pertains only to Sections 16 and 17 of this specification. *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.* (**Warning—**Fresh hydraulic cementitious mixtures are caustic and may cause chemical burns to skin and tissue upon prolonged exposure.)[2]

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.*

2. Referenced Documents

2.1 *ASTM Standards:*[3]

C109/C109M Test Method for Compressive Strength of Hydraulic Cement Mortars (Using 2-in. or [50-mm] Cube Specimens)

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

C219 Terminology Relating to Hydraulic Cement

C266 Test Method for Time of Setting of Hydraulic-Cement Paste by Gillmore Needles

C270 Specification for Mortar for Unit Masonry

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

C430 Test Method for Fineness of Hydraulic Cement by the 45-μm (No. 325) Sieve

C511 Specification for Mixing Rooms, Moist Cabinets, Moist Rooms, and Water Storage Tanks Used in the Testing of Hydraulic Cements and Concretes

C778 Specification for Standard Sand

C1506 Test Method for Water Retention of Hydraulic Cement-Based Mortars and Plasters

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

3. Terminology

3.1 *Definitions:*

3.1.1 *masonry cement, n*—a hydraulic cement, primarily used in masonry and plastering construction, consisting of a mixture of portland or blended hydraulic cement and plasticizing materials (such as limestone, hydrated or hydraulic lime)

[1] This specification is under the jurisdiction of ASTM Committee C01 on Cement and is the direct responsibility of Subcommittee C01.11 on Masonry Cement.

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[2] *Annual Book of ASTM Standards*, Vol 04.01. See the section on Safety Precautions in the Manual of Cement Testing.

[3] 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.

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together with other materials introduced to enhance one or more properties such as setting time, workability, water retention, and durability.

3.1.2 Other terms used in this specification are defined in Terminology C219.

4. Classification

4.1 *Type N*—For use in preparation of Specification C270 Type N mortar without further addition of cements or hydrated lime, and for use in preparation of Specification C270 Type S or Type M mortar when cement is added in accordance with the requirements of C270.

4.2 *Type S*—For use in preparation of Specification C270 Type S mortar without further addition of cements or hydrated lime.

4.3 *Type M*—For use in preparation of Specification C270 Type M mortar without further addition of cements or hydrated lime.

5. Physical Properties

5.1 Masonry cement shall conform to the applicable requirements prescribed in Table 1 for its classification.

6. Sampling

6.1 The masonry cement shall be sampled in accordance with Practice C183.

7. Temperature and Humidity

7.1 The temperature and relative humidity of the air in the vicinity of the mixing slab and dry materials, molds, base plates, and mixing bowl shall conform to the requirements of Test Method C109/C109M.

7.2 The moist cabinet or moist room shall conform to the requirements of Specification C511.

8. Fineness

8.1 Determine the residue on the 45-µm (No. 325) sieve in accordance with Test Method C430.

9. Normal Consistency

9.1 Determine normal consistency by the Vicat apparatus in accordance with Test Method C187.

10. Autoclave Expansion

10.1 Determine autoclave expansion in accordance with Test Method C151. After molding, store the bars in the moist cabinet or room for 48 h ± 30 min before removal from the molds for measurement and testing in the autoclave. Calculate the difference in length of the test specimen before and after autoclaving to the nearest 0.01 % of the effective gauge length and report as the autoclave expansion of the masonry cement.

11. Time of Setting

11.1 Determine the time of setting by the Gillmore needle method in accordance with Test Method C266.

12. Density

12.1 Determine the density of the masonry cement in accordance with Test Method C188, using kerosine as the liquid. Use the density so determined in the calculation of the air content of the mortars.

13. Blended Sand

13.1 The sand shall be a blend of equal parts by weight of graded standard sand and standard 20–30 sand conforming to Specification C778.

14. Preparation of Mortar

14.1 *Proportions for Mortar*—Mortar for air entrainment, compressive strength, and water retention tests shall be proportioned to contain 1620 g of sand and a mass of cement, in grams, in accordance with Table 2. The sand shall consist of 810 g of graded standard sand and 810 g of 20–30 standard sand. The quantity of water, measured in millilitres shall be such as to produce a flow of 110 ± 5 as determined by Test Method C109/C109M.

14.2 *Mixing of Mortars*—Mix the mortar in accordance with Practice C305.

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TABLE 1 Physical Requirements

Masonry Cement Type	N	S	M
Fineness, residue on a 45-µm (No. 325) sieve, max, %	24	24	24
Autoclave expansion, max, %	1.0	1.0	1.0
Time of setting, Gillmore method:			
Initial set, minutes, not less than	120	90	90
Initial set, minutes, not more than	1000	1000	1000
Compressive strength (average of 3 cubes):			
The compressive strength of mortar cubes, composed of 1 part cement and 3 parts blended sand (half graded standard sand, and half standard 20–30 sand) by volume, prepared and tested in accordance with this specification shall be equal to or higher than the values specified for the ages indicated below:			
7 days, MPa (psi)	3.4 [500]	9.0 [1300]	12.4 [1800]
28 days, MPa (psi)	6.2 [900]	14.5 [2100]	20.0 [2900]
Air content of mortar, prepared and tested in accordance with requirements of this specification:			
Min, volume %	8	8	8
Max, volume %	21	19	19
Water retention value, min, % of original flow	70	70	70