



Designation: C91/C91M – 23

Standard Specification for Masonry Cement¹

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 15 and 16 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.*

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.

Current edition approved Jan. 1, 2023. Published January 2023. Originally approved in 1932. Last previous edition approved in 2018 as C91/C91M – 18. DOI: 10.1520/C0091_C0091M-23.

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

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)
- C183/C183M** 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 and Other Inorganic Cements
- 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) together with other materials introduced to enhance one or

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.

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

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/C183M.

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. Time of Setting

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

11. Density

11.1 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.

12. Blended Sand

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

13. Preparation of Mortar

13.1 *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.

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

14. Air Entrainment

14.1 *Procedure*—If the mortar has the correct flow, use a separate portion of the mortar for the determination of entrained air. Determine the mass of 400 mL of mortar in accordance with Test Method C185.

14.2 *Calculation*—Calculate the air content of the mortar and report it to the nearest 1 % as follows:

TABLE 1 Physical Requirements

Masonry Cement Type	N	S	M
Fineness, residue on a 45 μm (No. 325) sieve, max, %	24	24	24
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