



## Standard Specification for Plastic (Stucco) Cement<sup>1</sup>

This standard is issued under the fixed designation C 1328; 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 ( $\epsilon$ ) indicates an editorial change since the last revision or reapproval.

### 1. Scope

1.1 This specification covers two types of plastic cement for use in portland cement-based plasters for exterior (stucco) and interior application.

1.2 The values stated in SI units are to be regarded as 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 IEEE/ASTM SI 10, of measurements made in other units.

1.3 The text of this standard refers to notes and footnotes that 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 14 and 15. *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.* (**Warning**—Fresh hydraulic cementitious mixtures are caustic and may cause chemical burns to skin and tissue upon prolonged exposure.)<sup>2</sup>

### 2. Referenced Documents

#### 2.1 ASTM Standards:

- C 91 Specification for Masonry Cement<sup>3</sup>
- C 109/C 109M Test Method for Compressive Strength of Hydraulic Cement Mortars (Using 2-in. or [50-mm] Cube Specimens)<sup>3</sup>
- C 151 Test Method for Autoclave Expansion of Portland Cement<sup>3</sup>
- C 183 Practice for Sampling and the Amount of Testing of Hydraulic Cement<sup>3</sup>
- C 185 Test Method for Air Content of Hydraulic Cement Mortar<sup>3</sup>

- C 187 Test Method for Normal Consistency of Hydraulic Cement<sup>3</sup>
- C 188 Test Method for Density of Hydraulic Cement<sup>3</sup>
- C 219 Terminology Relating to Hydraulic Cement<sup>3</sup>
- C 230/C 230M Specification for Flow Table for Use in Tests of Hydraulic Cement<sup>3</sup>
- C 266 Test Method for Time of Setting of Hydraulic-Cement Paste by Gillmore Needles<sup>3</sup>
- C 305 Practice for Mechanical Mixing of Hydraulic Cement Pastes and Mortars of Plastic Consistency<sup>3</sup>
- C 430 Test Method for Fineness of Hydraulic Cement by the 45- $\mu$ m (No. 325) Sieve<sup>3</sup>
- C 511 Specification for Moist Cabinets, Moist Rooms, and Water Storage Tanks Used in the Testing of Hydraulic Cements and Concretes<sup>3</sup>
- C 778 Specification for Standard Sand<sup>3</sup>
- C 926 Specification for Application of Portland Cement-Based Plaster<sup>3</sup>
- C 1506 Test Method for Water Retention of Hydraulic Cement-Based Mortars and Plasters<sup>3</sup>
- IEEE/ASTM SI 10 Standard for Use of the International System of Units (SI) (the Modernized Metric System)<sup>4</sup>

### 3. Terminology

3.1 *Definitions*—Terms used in this specification are defined in Terminology C 219 and Specification C 926.

#### 3.2 Definition of Term Specific to This Standard:

3.2.1 *plastic cement*—a hydraulic cement, primarily used in portland cement-based plastering construction, consisting of a mixture of portland or blended hydraulic cement and plasticizing materials (such as limestone or hydrated or hydraulic lime), together with other materials introduced to enhance one or more properties such as setting time, workability, water retention, and durability.

3.2.1.1 *Discussion*—The term “plastic” does not refer to the inclusion of one or more organic components in the cement. The cement is predominantly inorganic in chemical composition. The term “plastic” refers to the ability of the cement to impart to the plaster a high degree of workability, and for the plaster to remain workable or plastic for a period of time so

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

<sup>3</sup> *Annual Book of ASTM Standards*, Vol 04.01.

<sup>4</sup> *Annual Book of ASTM Standards*, Vol 14.04.

that, after initial application and floating on the wall, it can be reworked to obtain both densification and desired texture.

#### 4. Physical Properties

4.1 Plastic cement shall conform to the applicable requirements prescribed in Table 1.

#### 5. Sampling

5.1 At the option of the purchaser, the cement shall be sampled and tested to verify compliance with this specification, sampling and testing shall be performed in accordance with Practice C 183.

5.2 Practice C 183 is not designed for manufacturing quality control and is not required for manufacturer's certification.

#### 6. Temperature and Humidity

6.1 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 C 109/C 109M.

6.2 The moist cabinet or moist room shall conform to the requirements of Specification C 511.

#### 7. Fineness

7.1 Determine the residue on the 45- $\mu\text{m}$  (No. 325) sieve in accordance with Test Method C 430.

#### 8. Normal Consistency

8.1 Determine normal consistency by the Vicat apparatus in accordance with Test Method C 187.

#### 9. Autoclave Expansion

9.1 Determine the autoclave expansion in accordance with Test Method C 151. After molding, store the bars in the moist cabinet or room for 48 h  $\pm$  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 gage length, and report as the autoclave expansion of the plastic cement.

#### 10. Time of Setting

10.1 Determine the time of setting by the Gillmore needle method in accordance with Test Method C 266.

#### 11. Density

11.1 Determine the density of the plastic cement in accordance with Test Method C 188, using kerosine as the liquid. Use the density so determined in the calculation of the air content of the plaster.

#### 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 C 778.

#### 13. Preparation of Plaster

13.1 *Proportions for Plaster*—Plaster 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, as indicated in Table 2. The sand shall consist of 810 g of graded standard sand and 810 g of 20–30 standard sand (Note 1). The quantity of water, measured in millilitres, shall be such as to produce a flow of  $110 \pm 5$ , as determined by Test Method C 109/C 109M.

NOTE 1—Historically, field-mixed plaster has been proportioned by volume measured in increments or fractions of 1 ft<sup>3</sup>. The comparable whole SI-unit volume to 1 ft<sup>3</sup> is 28 L. The specified plaster proportions approximate the 1:3 nominal proportions by volume, commonly specified for construction, on the basis of the following assumed mass and volume relationships:

The mass of dry sand in 28 L of loose damp sand is 36 k.

28 L of Type S Plastic (Stucco) cement has a mass of 35 kg.

28 L of Type M Plastic (Stucco) cement has a mass of 42 kg.

For example, the amount of cement needed to provide a 1:3 volume proportion of cement to sand using a Type S Plastic (Stucco) cement is:

$$A = 1620 \times (C/B) = 1620 \times (35/108) = 525 \quad (1)$$

where:

*A* = number of grams of cement to be used in the mortar with 1620 g of sand,

*B* =  $3 \times 36 = 108$  kg, the mass of dry sand in 84 (or  $3 \times 28$ ) L of loose damp sand, and

*C* = mass of Type S Plastic (Stucco) cement per 28 L.

13.2 *Mixing of Plasters*—Mix the plaster in accordance with Practice C 305.

13.3 *Determination of Flow*—Determine the flow in accordance with Test Method C 109/C 109M.

**TABLE 1 Physical Requirements**

Plastic Cement Type	S	M
Fineness, residue on a 45- $\mu\text{m}$ (No. 325) sieve, max, %	24	24
Autoclave expansion, max, %	1.0	1.0
Time of setting, Gillmore method:		
Initial set, min, not less than	90	90
Final set, min, not more than	1440	1440
Compressive strength (average of three 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)	9.0 (1300)	12.4 (1800)
28 days, MPa (psi)	14.5 (2100)	20.0 (2900)
Air content of mortar:		
Min, volume %	8	8
Max, volume %	20	20
Water retention value, min, %, of original flow	70	70

**TABLE 2 Cement in Laboratory Batch of Plastic**

Plastic (Stucco)	Cement Type	Mass of Cement, g
S		525
M		630

#### 14. Air Entrainment

14.1 *Procedure*—If the plaster has the correct flow, use a separate portion of the plaster for the determination of entrained air. Determine the mass of 400 mL of plaster in accordance with Test Method C 185.

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

$$D = (W_1 + W_2 + V_w) / [(W_1/S_1) + (W_2/S_2) + V_w] \quad (2)$$

$$A = 100 - (W_m/4D)$$

where:

- $D$  = density of air-free plaster, g/cm<sup>3</sup>,
- $W_1$  = mass of cement, g,
- $W_2$  = mass of sand, g,
- $V_w$  = mL-g of water used,
- $S_1$  = density of cement, g/cm<sup>3</sup>,
- $S_2$  = density of standard sand, 2.65 g/cm<sup>3</sup>,
- $A$  = volume percent of entrained air, and
- $W_m$  = mass of 400 mL of plaster, g.

#### 15. Compressive Strength

##### 15.1 Test Specimens:

15.1.1 *Molding*—Immediately after determining the flow and mass of 400 mL of plaster, return all of the plaster to the mixing bowl and remix for 15 s at the medium speed. Then mold the test specimens in accordance with Test Method C 109/C 109M, except that the elapsed time for mixing plaster, determining flow, determining air entrainment, and starting the molding of cubes shall be within 8 min.

15.1.2 *Storage*—Immediately after molding, store all test specimens in the molds on plane plates in a moist cabinet or moist room for 48 to 52 h in such a manner that the upper surfaces shall be exposed to the moist air. Then remove the cubes from the molds, and place them in the moist cabinet or moist room for 5 days in such a manner as to allow free circulation of air around at least five faces of the specimens. At the age of 7 days, immerse the cubes for the 28-day tests in saturated lime water in storage tanks of noncorrodible materials.

##### 15.2 Procedure:

15.2.1 Test the cube specimens immediately after their removal from the moist cabinet or moist room for 7-day specimens, and immediately after their removal from storage water for all other specimens. If more than one specimen at a time is removed from the moist cabinet or moist room for 7-day tests, cover these cubes with a damp cloth until the time of testing.

15.2.2 The remainder of the testing procedure shall conform to Test Method C 109/C 109M.

#### 16. Water Retention

16.1 Water retention shall be determined in accordance with the procedures in Test Method C 1506, except wherever the term “mortar” is used, read “plaster.”

#### 17. Storage

17.1 The cement shall be stored in such a manner as to permit easy access for the proper inspection and identification of each shipment, and in a suitable weathertight building that will protect the cement from dampness and minimize warehouse set.

#### 18. Inspection

18.1 Adequate facilities shall be provided to the purchaser for the necessary inspection and sampling.

18.2 All packages shall be in good condition at the time of inspection.

#### 19. Rejection

19.1 At the option of the purchaser, the cement shall be rejected if it fails to meet any of the requirements of this specification.

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

19.3 At the option of the purchaser, cement remaining in storage prior to shipment for a period greater than six months after testing shall be retested and, at the option of the purchaser, shall be rejected if it fails to meet any of the requirements of this specification.

#### 20. Manufacturer’s Certification

20.1 Upon request of the purchaser in the contract or order, a manufacturer’s report shall be furnished at the time of shipment stating the results of the tests made on samples of the material taken during production or transfer and certifying that the applicable requirements of this specification have been met.

#### 21. Packaging and Package Marking

21.1 When plastic cement is delivered in packages, the brand, name of the manufacturer, net mass of the package in kg (see Note 2) shall be indicated plainly thereon. Similar information shall be provided in the shipping documents accompanying the shipment of plastic cement in bulk.

NOTE 2—To facilitate the change to SI units, a standard SI package size of 35 Kg for Type S and 42 Kg for Type M will provide convenient mass increments reasonably similar to the traditional 77- and 94-lb packages.

#### 22. Keywords

22.1 plaster; plastic cement; portland cement-based plaster; stucco

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