



Designation: C 932 – 98a03

## Standard Specification for Surface-Applied Bonding Compounds for Exterior Plastering<sup>1</sup>

This standard is issued under the fixed designation C 932; 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.

*This standard has been approved for use by agencies of the Department of Defense.*

### 1. Scope\*

1.1 This specification covers minimum requirements for exterior surface-applied bonding compounds for improving the adhesion of cementitious material to concrete or other masonry surfaces or any structurally sound surfaces.

1.2 This specification also covers test methods for determining performance requirements and physical properties.

1.3 The values stated in inch-pound units are to be regarded as the standard. The SI metric values given in parentheses are approximate and are provided for information purposes only.

1.4 The following safety hazards caveat pertains only to the test methods described in Sections 9, 10, 11, and 12 in 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 and health practices and determine the applicability of regulatory limitations prior to use.*

### 2. Referenced Documents

2.1 *ASTM Standards:*

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<sup>1</sup> This specification is under the jurisdiction of ASTM Committee C-11 on Gypsum and Related Building Materials and Systems and is the direct responsibility of Subcommittee C11.02 on Specifications and Test Methods for Accessories and Related Products.

Current edition approved ~~Oct. 10, 1998~~ June 10, 2003. Published ~~March 1999~~ August 2003. Originally published as C 932 – 80, approved in 1980. Last previous edition approved in 1998 as C 932 – 98a.

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

C 11 Terminology Relating to Gypsum and Related Building Materials and Systems<sup>2</sup>

C 109/C 109M Test Method for Compressive Strength of Hydraulic Cement Mortars (Using 2-in. or [50-mm] Cube Specimens)<sup>2</sup>

C 150 Specification for Portland Cement<sup>2</sup>

C 305 Practice for Mechanical Mixing of Hydraulic Cement Pastes and Mortars of Plastic Consistency<sup>2</sup>

C 511 Specification for Moist Cabinets, Moist Rooms, and Water Storage Tanks Used in the Testing of Hydraulic Cements and Concretes<sup>2</sup>

C 778 Specification for Standard Sand<sup>2</sup>

### 3. Terminology

3.1 Definitions used in this specification shall be in accordance with Terminology C 11.

### 4. Physical Properties

4.1 *Surface Applied Bonding Compound*—A freeze-thaw stable composition, suitable for brush, roller, or spray application. It shall be tinted to show by visual inspection where it has been applied. The tint shall not bleed through the material being bonded.

4.2 *Consistency*—The bonding compound shall be free of foreign matter as determined by visual inspection and shall be of such uniform consistency that when applied in accordance with the producer's directions by brush, roller, or spray to concrete, masonry, or other structurally sound surface, the bonding compound shall flow on evenly and dry uniformly.

4.3 *Film Characteristics*—The film-forming property shall be determined by visual inspection to determine the presence of a continuous film not broken by fisheyes, cracking, pull-back, or any other discontinuity in the film surface. It shall not be noticeably affected by alkaline surfaces or weak acids.

### 5. Performance Requirements

5.1 *Bonding Capability*—The bonding compound shall be capable of bonding cementitious materials when applied in accordance with the producer's directions and tested as specified in Section 12.

5.2 *Degradation*—Bonding compound which separates shall be able to be re-mixed to a uniform consistency when tested as specified in Section 10.

5.3 *High Temperature Test*—The bond strength shall be not less than 150 psi (1034 kPa) when tested as specified in Section 9.

5.4 *Freeze-Thaw Stability*—The bond strength shall be not less than 150 psi (1034 kPa) and 100 psi (690 kPa) when tested under the dry and wet conditions, respectively, as specified in Section 11.

5.5 *Tensile Bond Strength*—Bond strength of a fresh sample or a 6-month old sample of bonding compound shall have an average tensile strength of not less than 150 psi (1034 kPa) and 100 psi (690 kPa) when tested under the dry and wet conditions, respectively, as specified in Section 12.

### 6. Sampling

6.1 Take a sample of not less than 2.2 lb (1000 g) from each shipment or consignment for analysis and tests. Except in special cases, take the sample from not less than three separate containers, chosen at random. In addition, take samples from containers that appear to be nonrepresentative, and test separately. Place the samples immediately in airtight glass containers and transport to the testing laboratory in these containers. Take precautions to reduce evaporation or drying to a minimum. Thoroughly mix the bonding compound in the container if there is a tendency for liquid phase separation.

### 7. Apparatus

7.1 *Moist Cabinet*—Specification C 511.

7.2 *Oven*—A forced draft type oven, having a temperature controlled at  $140 \pm 5^\circ\text{F}$  ( $60 \pm 3^\circ\text{C}$ ) for high temperature tests.

7.3 *Freezer*—A freezer having a controlled temperature of  $-10 \pm 2^\circ\text{F}$  ( $-23 \pm 1^\circ\text{C}$ ).

7.4 *Balance*—A balance capable of weighing not less than 5.5 lb (2500 g) at a precision of 0.0002 lb (0.1 g).

7.5 *Timing Device*—An instrument capable of reading to the nearest second.

7.6 *Tamper*—A tamper made up of a nonabsorptive, nonabrasive, non-brittle material and having a cross section of  $\frac{1}{2}$  in. by 1 in. (13 × 25 mm) and approximately 5 to 6 in. (130–to 150 mm) long. The tamping face shall be flat and at right angles to the length of the tamper.

7.7 *Straight Edge*—A steel straight edge not less than 4 in. (100 mm) long and not less than  $\frac{1}{16}$  in. (1.6 mm) nor more than  $\frac{1}{8}$  in. (3.2 mm) in thickness.

7.8 *Spatula*—A spatula with a metal blade 6 in. (150 mm) in length and  $\frac{1}{2}$  in. (13 mm) in width, with straight edges.

7.9 *Paint Brush*—A standard 1 in. (25 mm) wide brush, with synthetic bristles.

<sup>2</sup> Annual Book of ASTM Standards, Vol 04.01.

7.10 *Testing Machine*—Any type that is of sufficient capacity and that is capable of applying the load continuously and without shock at the rate of 0.05 in. (1.27 mm) per minute, with provision for adjustment of the rate of loading.

7.11 *Briquet Molds*—The molds for making test specimens shall be made of metal not attacked by the mortar and shall have sufficient material in the sides to prevent spreading during molding. Gang molds, when used, shall be of the type shown in Fig. 1. The dimensions of the briquet molds shall conform to the following requirements: width of mold, between inside faces, at waist line of the briquet, 1 in. (25.4 mm) with permissible variations of  $\pm 0.01$  in. (0.25 mm) for molds in use and  $\pm 0.005$  in. (0.13 mm) for new molds; thickness of molds measured at the point of greatest thickness on either side of the mold at the waist line, 1 in. (25.4 mm) with permissible variations of  $+0.004$  in. (0.10 mm) and  $-0.002$  in. (0.05 mm) for new molds and  $-0.02$  in. (0.5 mm) for molds in use. The briquet specimens shall conform to the dimensional requirements shown in Fig. 2.

7.12 *Saw*—A table saw equipped with an abrasive cutting blade or other blade suitable for cutting cementitious materials.

7.13 *Clips for Briquet Testing Machine*— The clips for holding the tension test specimen shall be in accordance with Fig. 3.

## 8. Conditioning

8.1 *Room Temperature and Humidity*— Maintain the air temperature in the vicinity of the mixing and testing area at  $70 \pm 5^\circ\text{F}$  ( $21 \pm 3^\circ\text{C}$ ). Maintain the relative humidity at  $50 \pm 2\%$ .

8.2 *Temperature of the Mixing Water*—  $72 \pm 2^\circ\text{F}$  ( $22 \pm 1^\circ\text{C}$ ).

## 9. High Temperature Test

9.1 *Significance and Use*—This test method provides procedures for evaluating the adhesive strength of bonding compounds after being exposed to accelerated aging at high temperature.

9.2 *Specimen Preparation*—For each test specimen, transfer the bonding compound, taken from the sample obtained, into a standard 1 pt. (500 mL) glass container.

9.3 *Procedure*—Place the specimen in the oven for 30 days. Remove the container, allow the compound to cool to room temperature, mix the compound to a uniform consistency, and test as specified in Section 12.

9.4 *Tests and Retests*—Test six briquets and report the average of the test results. If the result of any one of the six tests varies more than 15 % from the average, reject it and report the average of the other five tests. If the results from more than two tests vary more than 15 % from the average, reject the series and retest.

9.5 *Precision and Bias*—The precision and bias of the high temperature test for determining bond strength after exposure to high temperature are essentially the same as specified in the test method for bond strength, paragraph 12.7.

## 10. Degradation Test

10.1 *Significance and Use*—This test method simulates the effects of high temperature storage on the physical properties of bonding compound.

10.2 *Specimen Preparation*—For each test, transfer the bonding compound, from the sample obtained, into a standard 1 pt. (500 mL) glass container.

10.3 *Procedure*—Place the specimen in the oven for 15 days. Remove the container from the oven and examine the contents for settling and separation. Place the container back in the oven for an additional 15 days. Remove the container and examine the contents again for settling and separation. Allow the compound to come to room temperature, and mix to a uniform consistency. Mix by hand stirring with a wood, metal, or plastic paddle for not more than five minutes.

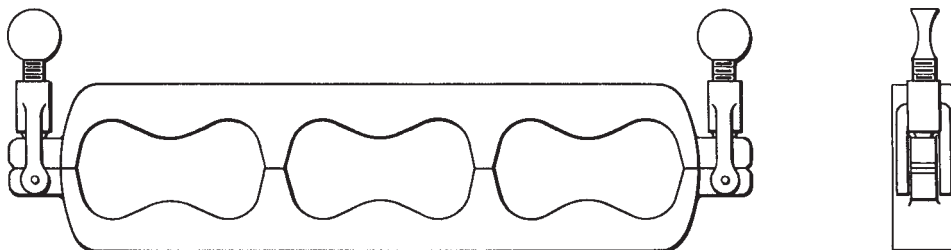
10.4 *Tests and Retests*—Bonding compound that fails to be remixed to a uniform consistency shall be considered to have failed the test.

10.5 *Report*—Determine the extent of settling and separation by measuring and report as a percentage of the height of the specimen in the clear glass container, represented by the location of the liquid/solid interface.

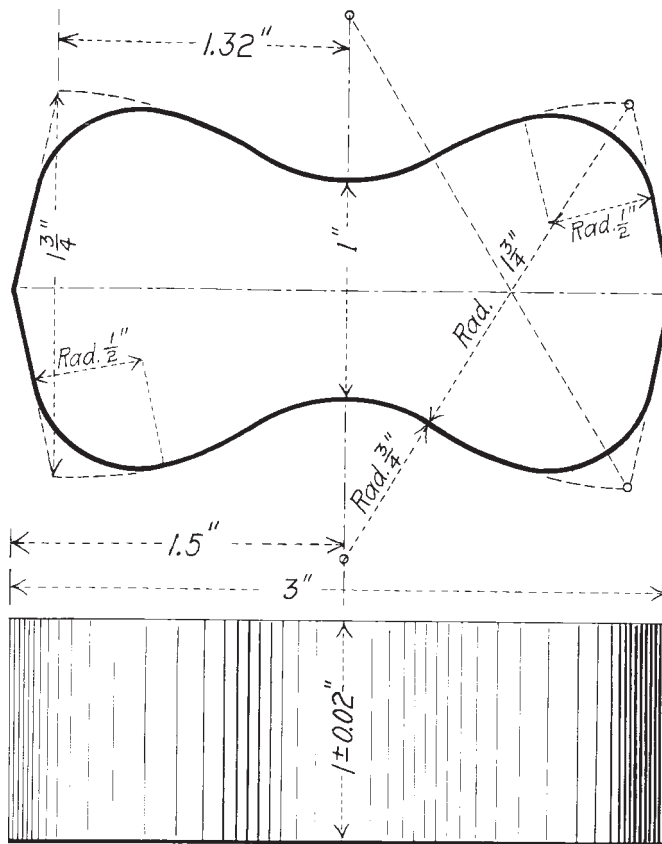
10.6 *Precision and Bias*—No information is presented about either the precision or bias of the Degradation test for measuring settling, separation, or the ability to be mixed to a uniform consistency since the test result is non-quantitative.

## 11. Freeze-Thaw Cycle Test

11.1 *Significance and Use*—This test method provides procedures for determining the bond strength of bonding compounds after being exposed to accelerated storage conditions of alternate freezing and thawing.



**FIG. 1 Briquet Gang Mold**



NOTE 1—1 in. = 25.4 mm.

FIG. 2 Briquet Specimen for Tensile Strength Test

11.2 *Specimen Preparation*—For each test specimen, transfer the bonding compound, taken from the sample obtained, into a standard 1 pt. (500 mL) glass container having a screw on or friction fit cover.

11.3 *Procedure*—Place a covered specimen in the freezer for 16 h. Remove the specimen and allow to thaw at room temperature for 8 h. Repeat this procedure for 5 cycles. After the fifth cycle, allow the compound to come to room temperature, then test as specified in Section 12.

11.4 *Tests and Retests*—Test six briquets and report the average of the test results. If the result of any one of the six tests varies more than 15 % from the average, reject it and report the average of the other five tests. If the results from more than two tests vary more than 15 % from the average, reject the series and retest.

11.5 *Precision and Bias*—The precision and bias of the freeze-thaw cycle test for determining bond strength after exposure to alternate freezing and thawing are essentially the same as specified in the test method for bond strength, paragraph 12.7.

## 12. Bond Strength Test

12.1 *Significance and Use*—This test method provides a method for determining the ability of bonding compound, after being subject to various simulated conditions of aging and exposure to temperature extremes, to adhere cementitious materials to a properly prepared substrate.

### 12.2 Materials:

12.2.1 *Cement*—Specification C 150.

12.2.2 *Graded Standard Sand*—Specification C 778.

### 12.3 Preparation of Briquets:

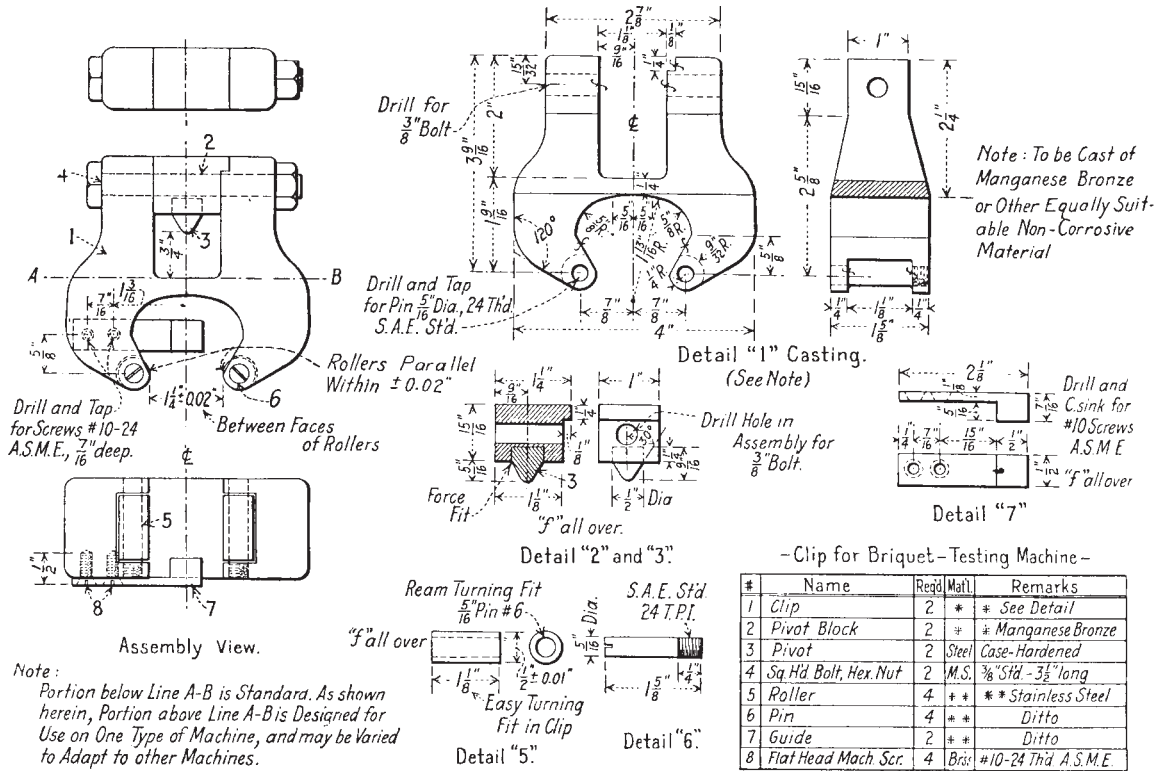
12.3.1 Prepare not less than six briquets for each series of tests.

12.3.2 Prepare the proportions of the standard mortar in accordance with the procedure given in Test Method C 109/C 109M.

12.3.3 Mechanically mix the mortar in accordance with the procedure given in Practice C 305.

12.3.4 Prepare molds by coating the molds with a thin film of mineral oil. Support the molds on a lightly oiled glass or metal plate.

12.3.5 Cast the briquets immediately after completely mixing the mortar, half fill the molds and puddle the mortar uniformly with the tamper, taking care not to displace the divider. Slightly over fill the molds with additional mortar and repeat the puddling. After the mortar has set, cut off the excess to a plane surface flush with the top of the mold, using a broad knife or similar implement.



NOTE 1—1 in. = 25.4 mm.

FIG. 3 Clips for Briquet Testing Machine

- 12.3.6 Immediately after molding, place the molds, on the base plate, into the moist cabinet for 48 h.
- 12.3.7 Remove the briquets from the mold and store them at room temperature and humidity for not less than 48 h.
- 12.3.8 Examine the specimens, discard any that have air holes or excessively rough surfaces.
- 12.3.9 Saw the specimens in half at the mid-point of the waist line, aligning the saw blade so that the entire saw kerf is taken out of one side of the briquet, and the remaining side maintains a 1 in. cross section. Discard the smaller portion of the briquet.
- 12.4 Procedure:
- 12.4.1 Thoroughly clean dust and loose particles from the flat waist surface of the specimen. Apply the bonding compound, in accordance with the producer's directions, to the flat waist surface of the briquet by means of a paint brush.
- 12.4.2 Place the half briquet, coated with bonding compound, into the mold. Fill the remaining space in the mold with mortar, mixed and molded as specified in 12.3.
- 12.4.3 The time between coating the briquet with compound and casting the mortar against it shall be immediately after the compound has dried, or as recommended by the manufacturer, except when otherwise specified for a ten day waiting period.
- 12.4.4 Place the filled briquet mold in the moist cabinet for 24 h, then remove the briquets from the molds.
- 12.5 Test Method:
- 12.5.1 Test the briquets at the following intervals:
- 12.5.1.1 Dry Condition— Air cure three briquets for ~~four~~ seven days, soak in water for ~~two~~ seven days, air cure for 24 h, and test;
- 12.5.1.2 ~~Air cure three briquets for seven 14 days and test;~~
- 12.5.1.3 Wet Condition— Air cure three briquets for ~~25~~ seven days, soak in water for ~~two~~ seven days, air cure 24 h, and test;
- 12.5.1.4 ~~Air cure three briquets for 28 days and test.~~
- 12.5.2 Remove any loose particles or flash from the surfaces that will be in contact with the clips of the testing machine. Make sure the bearing surfaces of the clips are clean and free of sand, and the roller bearings are lubricated and maintained to ensure freedom of turning. Keep the stirrups supporting the clips free of accumulations. Keep the pivots in proper adjustment so that the clips swing freely on the pivots without binding the stirrups. Carefully center the briquets in the clips and apply the load continuously at the rate of 0.05 in. (1.27 mm)/min.
- 12.6 Tests and Retests—Test each group of three briquets for bond strength and report the average of the test results. If the result of any one of the six tests varies more than 15 % from the average, reject it and report the average of the other five tests. If the results from more than two tests vary more than 15 % from the average, reject the series and retest.
- 12.7 Precision and Bias—Precision and bias have not been determined for the test method specified.

### 13. Inspection

13.1 Inspection of the bonding compound shall be agreed upon between the producer or purchaser and the supplier as part of the purchase agreement.

### 14. Rejection

14.1 Rejection of bonding compound that fails to conform to the requirements of this specification shall be reported to the producer or supplier promptly and in writing. The notice of rejection shall contain a statement documenting how the product has failed to conform to the requirements of this specification.

### 15. Certification

15.1 When specified in the purchase agreement, the producer or supplier shall furnish a report certifying that, at the time of shipment, the bonding compound is in compliance with the requirements of this specification.

### 16. Package and Package Marking

16.1 *Packaging*—The bonding compound shall be packed in standard commercial containers. The containers shall be so constructed as to ensure acceptance by common or other carriers for safe transportation at the lowest rate to the point of delivery, unless otherwise specified in the purchase order.

16.2 *Marking*—Shipping containers shall be marked with the name of the bonding compound, the quantity contained therein, the name, brand, or trade mark of the producer or supplier, the shelf life, the batch number, and the ASTM designation.

### 17. Keywords

17.1 bond; bonding compound; mortar; surface-applied bonding compound

## SUMMARY OF CHANGES

~~(1) Inch-pound units were substituted for SI units in 7.4.~~

~~(2) Test Method C 109/C 109M was substituted for specific mortar proportioning requirements in 12.3.2. Table 1 was deleted~~

Committee C11 has identified the location of selected changes to this standard since it is no longer referenced in 12.3.2, and the information is covered in Test Method C 109/C 109M.

~~(3) Practice C 305, containing mechanical mixing instructions, was substituted for hand mixing requirements in 12.3.3.~~

~~(4) Test Method C 109/C 109M and Practice C 305 were placed in 2.1, and Test Method C 187 was deleted, as it is no longer referenced in 12.3.2. last issue (C 932 – 98a) that may impact the use of this standard. (Approved June 10, 2003.)~~

(1) Revised paragraph 5.4.

(2) Revised paragraph 5.5.

(3) Revised paragraph 12.5.

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