Designation: C 1552 – 02

Standard Practice for Capping Concrete Masonry Units, Related Units and Masonry Prisms for Compression Testing[1]

This standard is issued under the fixed designation C 1552; 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 practice covers apparatus, materials, and procedures for capping concrete masonry units, related units, including coupons or other specimens obtained from such units, and masonry prisms for compression testing.

NOTE 1—The testing laboratory performing these test methods should be evaluated in accordance with Practice C 1093.

1.2 The values stated in inch-pound units are to be regarded as the standard. The values given in parentheses are for information only.

1.3 *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:*

C 140 Methods for Sampling and Testing Concrete Masonry Units and Related Units[2]

C 472 Methods for Physical Testing of Gypsum, Gypsum Plasters and Gypsum Concrete[2]

C 617 Practice for Capping Cylindrical Concrete Specimens[2]

C 1093 Practice for Accreditation of Testing Agencies for Unit Masonry[2]

C 1209 Terminology of Concrete Masonry Units and Related Units[2]

C 1232 Terminology of Masonry[2]

C 1314 Method for Compressive Strength of Masonry Prisms[2]

3. Terminology

3.1 Terminology defined in Terminology C 1209 and C 1232 shall apply for this practice.

4. Significance and Use

4.1 This practice describes procedures for providing plane surfaces on the two bearing surfaces of units and prisms. The purpose of this standard is to provide consistent and standardized procedures for capping units and prisms for compression testing. The procedures are based on those contained (or previously contained) in Methods C 140, C 617, and C 1314.

NOTE 2—Specimens capped using this practice will vary significantly in size and weight. Appropriate care and handling may differ based on specimen size and weight. Provide care and handling as needed to provide for proper capping based on the physical characteristics of the specimen being capped.

5. Apparatus

5.1 *Capping Plate*—If used, the capping plate shall be of steel and have a thickness of not less than 1 in. (25.4 mm). The capping surface shall be plane within 0.003 in. in 16 in. (0.075 mm in 400 mm) and shall be free of gouges, grooves, and indentations greater than 0.010 in. (0.25 mm) deep or greater than 0.05 in.^{2} (32 mm^2) in surface area. At the time of capping, the capping surface shall be level within 1⁄16 in. (1.6 mm) over the length of the plate.

NOTE 3—When using gypsum cement capping materials, the placement of a single glass plate directly on top of the capping plate has been found to reduce the potential of damage to the capping plate. The glass plate is typically more resistant to scratches and can be replaced at less cost than that required to resurface the capping plate. The requirements for the casting plate in 5.2 have demonstrated to be sufficient for this purpose.

5.2 *Casting Plate*—If used, the casting plate shall be of transparent glass with a thickness of not less than ½ in. (13 mm). The casting plate shall be plane within 0.003 in. in 16 in. (0.075 mm in 400 mm).

6. Materials

6.1 *Capping Materials*:

6.1.1 *High-Strength Gypsum Cement Capping Materials*:

6.1.1.1 In addition to the compressive strength testing required in 6.2, qualification tests shall be made to determine the effects of water-cement ratio and age on compressive strength.

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[1] This practice is under the jurisdiction of ASTM Committee C15 on Manufactured Masonry Units and is the direct responsibility of Subcommittee C15.04 on Research.

Current edition approved December 10, 2002. Published March 2003.

[2] *Annual Book of ASTM Standards*, Vol 04.05.

Procedures used for preparing the high-strength gypsum cement capping materials shall ensure that water-cement ratios used for each batch provide the required strength.

NOTE 4—The water-gypsum cement ratio should typically be between 0.26 and 0.30. Use of low water-gypsum cement ratios and vigorous mixing will usually permit development of 3500 psi (24.1 MPa) at ages of one or two hours. Higher water-gypsum cement ratios extend working time, but reduce strength.

6.1.1.2 Do not add fillers or extenders to the high-strength gypsum cement.

NOTE 5—Retarders extend working time for capping materials but their effects on required water-cement ratio should be determined prior to use.

NOTE 6—The following two gypsum cements have successfully been used for this purpose: Hydrostone™ and Hydrocal™ white gypsum cement. Both are available from U.S. Gypsum Company.

6.1.2 *Sulfur Capping Materials*:

6.1.2.1 Proprietary or laboratory prepared sulfur mixtures shall contain 40 to 60 % sulfur by weight, the remainder being ground fire clay or other suitable inert material passing a No. 100 (150-µm) sieve with or without a plasticizer.

6.1.3 *Unacceptable Plaster and Cement Based Capping Materials*:

6.1.3.1 Low-strength molding plaster, plaster of paris, or mixtures of plaster of paris and portland cement are unsuitable for capping and shall not be used.

6.2 *Compressive Strength of Capping Materials*—The compressive strength of the capping material shall be at least 3500 psi (24.1 MPa) at an age of 2 h. The cube molds and methods of preparing and testing the cubes shall be in accordance with Method C 617. The capping material shall be placed in the cube at capping consistency. Store the filled molds in laboratory air without cover. Two hours after filling the molds, the hardened cubes shall be removed from the molds and immediately tested.

6.2.1 The strength of the capping material shall be determined on receipt of a new lot and at intervals not exceeding three months. If a given lot of capping materials fails to conform to the strength requirements, it shall not be used, and strength tests of the replacement material shall be made until four consecutive determinations conform to specification requirements.

7. Procedure

7.1 *Preparation of Specimens for Capping*—Use an abrasive stone to remove loose protrusions from the surfaces of the specimens to be capped. Refer to the appropriate compression test method (C 140 or C 1314) for other specimen preparation requirements.

7.2 *Capping Test Specimens*—Cap top and bottom bearing surfaces of specimens by one of the methods in 7.2.1 or 7.2.2. Use alignment devices as needed to make sure the caps meet the requirements of 7.4.

NOTE 7—Various alignment devices have been demonstrated to be effective. For capping with sulfur materials, which sets quickly, alignment jigs make sure that the specimen is placed on the capping plate correctly in the first motion. For capping with gypsum cement materials, levels placed across the top of specimen have proven to work well. Bullseye levels work particularly well with smaller specimens.

7.2.1 *Capping Using Gypsum Cement Materials*—Spread the gypsum cement capping material evenly on the capping plate (or casting plate if used) that has been lightly coated with oil or sprayed with a TFE-fluorocarbon coating (Note 8). Bring the surface of the specimen to be capped into contact with the capping material; firmly press down the specimen with a single motion, holding it so that its axis is at right angles to the capping surface to comply with the requirements of 7.4. Do not disturb the specimen until the capping material has solidified.

7.2.1.1 *Alternative Capping Method Using Gypsum Cement Materials*—Spread the gypsum cement capping material evenly on the top surface of the specimen. Bring the casting plate, which has been lightly coated with oil or sprayed with TFE-fluorocarbon coating (Note 8), into contact with the capping paste; firmly press down the plate with a single motion holding it so it is at right angles to the specimen. Within 30 s, lightly adjust the plate to achieve a resulting cap that will comply with the requirements of 7.4. Do not further disturb the specimen or casting plate until the capping material has solidified.

NOTE 8—The use of oil or TFE-fluorocarbon coatings on capping or casting plates is not necessary if it is found that the plate and specimen can be separated without damaging the cap.

NOTE 9—Generally, specimens can be removed from capping or casting plates after 30 min without damaging the cap. However, the length of time to assure setting of the cap will vary depending on a variety of factors such as the water-gypsum cement ratio used, environmental conditions, the properties of the specimen being capped, and the temperature of the mix water.

7.2.2 *Capping Using Sulfur Capping Materials*:

7.2.2.1 (**Warning** —Hydrogen sulfide gas is often produced during capping when sulfur capping material is contaminated with organic materials such as paraffin or oil. The gas is colorless and has a notoriously bad odor of rotten eggs; however, the odor is not a reliable warning sign, since the sensitivity to the odor disappears rapidly on exposure. High concentrations are lethal and less concentrated dosages may produce nausea, stomach distress, dizziness, headache, or irritation of the eyes. For this and other safety reasons, locate the capping station in a well-ventilated area and the melting pot under a hood with an exhaust fan.)

7.2.2.2 (**Warning**—Sulfur capping materials are used in a hot, molten state. Adequate protection is required to prevent contact with eyes, hands and other parts of the body.)

7.2.2.3 Heat the sulfur mixture in a thermostatically controlled heating pot to a temperature of 265 to 290°F (129 to 143°C) to maintain fluidity after contact with the capping surface. Verify sulfur capping material temperature using an all-metal thermometer placed at the center of the mass. Verify temperature at hourly intervals during capping operations.

7.2.2.4 Empty the pot and recharge with fresh materials periodically to ensure that the oldest material in the pot has not been used more than five times. Fresh sulfur capping material shall be dry at the time it is placed in the pot as dampness may cause foaming. Keep water away from the molten sulfur capping material for the same reason.

7.2.2.5 Warm the capping plate before use to slow the rate of hardening of the molten sulfur capping material and to permit the production of thin caps. Lightly oil the surface of the

capping plate (Note 8) and stir the molten sulfur capping material immediately prior to pouring each cap.

7.2.2.6 Place four 1-in. (25-mm) square steel bars on the capping plate to form a rectangular mold whose dimensions are approximately ½ in. (13 mm) greater than the overall dimensions of the specimen. Fill the mold to a depth of ¼-in. (6 mm) with the hot sulfur compound. Bring the surface of the specimen to be capped quickly into contact with the liquid, holding the specimen so that its axis is at right angles to the surface of the capping liquid to achieve a resulting cap that will comply with the requirements of 7.4.

7.2.2.7 Do not disturb the specimen until the sulfur compound has solidified and cooled.

7.3 Once the caps have solidified and, in the case of sulfur capping materials, cooled, separate the specimen from the capping or casting plates in such manner as to prevent damage to the caps and specimens.

7.4 Caps shall be perpendicular within 0.08 in. in 8 in. (2 mm in 200 mm) to the vertical axis of the specimen. The surfaces of the caps shall be plane within 0.003 in. in 16 in. (0.075 mm in 400 mm).

7.5 The average thickness of the cap shall not exceed ⅛ in. (3 mm).

7.6 Do not patch caps. Remove imperfect caps and replace with new ones. Do not test the specimens until the cap has achieved the desired strength based on qualification testing. Cap age shall be at least two hours.

8. Keywords

8.1 cap; capping; capping materials; capping plate; casting plate; compressive strength; gypsum cement; sulfur