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Standard Test Method for Compressive Strength of Lightweight Insulating Concrete¹

This standard is issued under the fixed designation C495/C495M; 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 Department of Defense.

1. Scope*

~~1.1 This test method covers the preparation of specimens and the determination of the compressive strength of lightweight insulating concrete having an oven-dry density not exceeding 50 lb/ft³ (800 kg/m³) as determined by the procedures described herein. This test method covers the preparation and testing of molded 3 by 6-in. (75 by 150-mm) cylinders.~~

~~1.2 The values stated in inch-pound units are to be regarded as the standard.] as determined by the procedures described herein. This test method covers the preparation and testing of molded 75 by 150-mm [3 by 6-in.] cylinders.~~

1.2 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.

1.3 *This standard does not purport to address all of the safety problems, 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:²

C39/C39M Test Method for Compressive Strength of Cylindrical Concrete Specimens

C88 Test Method for Soundness of Aggregates by Use of Sodium Sulfate or Magnesium Sulfate

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

C172 Practice for Sampling Freshly Mixed Concrete

C617 Practice for Capping Cylindrical Concrete Specimens

C670 Practice for Preparing Precision and Bias Statements for Test Methods for Construction Materials

3. Significance and Use

3.1 This test method provides standardized requirements for sampling, molding, curing, and testing lightweight insulating concretes for the purpose of determining compliance with compressive strength and density specifications.

4. Apparatus

4.1 *Testing Machine*—Use a testing machine as prescribed in Test Method C39/C39M.

4.2 *Scales and Weights*—Use scales and weights in weighing specimens that conform to those specified in the Apparatus Section of Test Method C109/C109M.

4.3 *Drying Oven*—Use an oven as specified in Test Method C88.

4.4 *Molds*—Use molds made of nonabsorbent materials or of materials treated to reduce absorption, that are watertight, and not subject to distortion of more than ~~in. (1.6 mm)~~ 2 mm [1/16 in.] in any dimension during molding and early curing of specimens. Coat all mold surfaces that will be in contact with concrete except single use plastic molds with wax or mineral oil, prior to use. Use molds having a diameter of ~~3 7/8 ± in. (75 ± mm)~~ 3 ± 1/16 in. and a length of ~~6 1/2 ± in. (150 ± mm)~~ 3 mm [6 ± 1/8 in.].

¹ This test method is under the jurisdiction of ASTM Committee C09 on Concrete and Concrete Aggregates and is the direct responsibility of Subcommittee C09.21 on Lightweight Aggregates and Concrete.

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² 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.

5. Sampling

5.1 Sample fresh lightweight insulating concrete in accordance with applicable provisions of Practice C172, with the following exceptions:

5.1.1 *Sampling from Pump Equipment*—Fill a bucket of approximately ~~10-qt (9-dm³)~~ 9-L [10-qt] capacity by passing through the discharge stream of the concrete pump hose being used to place the concrete, at the point of placement of the concrete. Exercise care to ensure that the sample is representative of the pour, avoiding the beginning or ending of the discharge from the equipment. Prepare the test specimens as described in Section 6, by filling them with a scoop of lightweight insulating concrete dipped from the bucket.

5.1.2 *Remixing Sample*—Do not remix the sample.

6. Test Specimens

6.1 *Size and Shape*—Use cylindrical test specimens ~~375 ± in. (752 mm [3 ± 1.6 mm])~~ 1/16 in.] in diameter and ~~6150 ± in. (1503 mm [6 ± 3 mm])~~ 1/8 in.] in length, with the base of each specimen perpendicular to the longitudinal axis within the limits prescribed in 6.8.

6.2 *Number*—~~Obtain at least four test specimens for compressive strength tests from each sample of lightweight insulating concrete.~~

~~6.3—The compressive strength of the sample shall be based on the average strength of four cylinders. Obtain at least four test cylinders for compressive strength tests from each sample of lightweight insulating concrete.~~

6.3 *Molding*—In molding the specimens, place the concrete in two approximately equal layers. Tap the sides ~~outside~~ of the mold lightly 10 to 15 times with a ~~rubber mallet~~ an open hand after placing each layer ~~until the surface of the layer has subsided approximately to a plane to close voids and release entrapped air.~~ Over fill the mold when placing the second layer. Do not rod the concrete.

6.4 *Finishing Surface*—Strike off the specimens immediately after filling the molds. Cover them in such a manner as to prevent evaporation without marring the surface (Note 1). If desired, cover the filled mold with a glass or metal plate to obtain a surface that will be suitable for testing without capping and with a minimum of grinding.

NOTE 1—It is desirable to place the filled mold in a moist room if one is available. If this is done, protect the surface from dripping water.

6.5 *Removal from Molds*—Do not remove specimens from molds until danger of damage to the specimens is past. In any event, remove specimens from the molds within 7 days after molding.

6.6 *Curing*—For the first 24 h after molding, maintain the specimens at a temperature of ~~70 ± 10 °F (21.16 °C [70 ± 5.5 °C])~~ 10 °F]. After 24 ± 2 h, store the specimens in a moist condition (Note 2) at a temperature of ~~73.4 ± 3 °F (23.0 ± 1.7 °C)~~ () at a temperature of ~~23.0 ± 2.0 °C [73.5 ± 3.5 °F]~~ (Note 3). Do not expose specimens to a stream of running water nor store in water, unless a saturated lime (calcium hydroxide) solution is used. After 7 days, store the specimens at a temperature of ~~70 ± 6 °C [70 ± 10 °F]~~ and a relative humidity of ~~50 ± 30 %~~ for 18 days. Twenty-five days after molding, dry the specimens in an oven at ~~140 ± 5 °F (60.3 °C [140 ± 2.8 °C])~~ 5 °F] for 3 days (Note 4). ~~Cool specimens to room temperature and test for compressive strength at an age of 28 days.~~ Cool specimens to room temperature and test for compressive strength at an age of 28 days. If cellular concrete made using preformed foam is being tested, moist cure the cylinders from day 2 to day 25. At day 25 air dry the cylinders for 3 days at a temperature of ~~21 ± 6 °C [70 ± 10 °F]~~ and a relative humidity of ~~50 ± 10 %~~. Do not oven dry the specimens prior to load testing.

NOTE 2—A moist condition is that in which free water is maintained on the surfaces of the specimens at all times.

NOTE 3—The temperature within damp sand and under wet burlap or similar materials will always be lower than the temperature in the surrounding atmosphere if evaporation takes place.

NOTE 4—Caution must be observed in loading the oven so that the moisture content of the specimen at time of test does not exceed 5 % of the oven-dry density determined in accordance with 9.1.

6.7 *Preparation for Testing*—Check ~~whether~~ the surfaces of the specimen that will be in contact with the bearing surfaces of the testing machine are within ~~0.02 in. (0.5 mm)~~ 0.5 mm [0.02 in.]. If the bearing surfaces depart from a plane more than ~~0.02 in. (0.5 mm)~~ 0.5 mm [0.02 in.], grind them to conform to this tolerance or cap in accordance with Practice C617. Cap surfaces to be plane within ~~0.002 in. (0.05 mm)~~ 0.05 mm [0.002 in.]. Check the planeness of the bearing surface of the specimen by means of a straightedge and feeler gage, making a minimum of three measurements on different diameters of the specimen. Make sure the surface of the specimen in contact with the lower bearing block of the testing machine does not depart from perpendicularity with the longitudinal axis of the cylinder by more than 1° (approximately equivalent to ~~0.1 in. (2.5 mm)~~ 150 mm [0.1 in. in 150 mm]) 6 in.]) or the combined departure of the two bearing surfaces from perpendicularity by more than 3°.

6.8 *Measurement of Specimen*—~~Determine the diameter of the specimens to the nearest 0.01 in. (0.3 mm) by averaging two diameters measured at right angles to each other at about midheight of the specimen. Use these dimensions in computing the cross-sectional areas. Determine the height of the specimen to the nearest 0.01 in.~~ Determine the diameter of the specimens to the nearest 0.2 mm [0.01 in.] by averaging two diameters measured at right angles to each other at about midheight of the specimen. Use these dimensions in computing the cross-sectional areas. Determine the height of the specimen to the nearest 0.2 mm [0.01 in.] Weigh the cylinders before capping and calculate the density from the measured dimensions. Record the density to the nearest ~~10 kg/m³ [0.5 lb/ft³]~~.