SIPLAST LIGHTWEIGHT INSULATING CONCRETE BULLETIN:

TESTING INSULATING CONCRETE CYLINDERS

Bulletin #4: SRIS-965 **December 20, 2023**

SIPLAST*FLASH*

This bulletin is to provide guidance for conducting compressive strength and density testing of lightweight insulating concrete cylinders.

There are two ASTM procedures that apply to lightweight insulating concrete.

They are: ASTM C 495 for 3-inch by 6-inch cylinders taken at the time of pour and ASTM C 513 for samples taken from a deck that is in place. Copies of both standard test methods are attached.

Experience has made us aware of several issues that can come into play during testing and may result in erroneous test results. The following three topics should be discussed with the testing laboratory if they are not familiar with testing lightweight insulating concrete (most laboratories are very familiar with testing structural concrete, but may not be well versed in testing lightweight insulating concrete).

1. <u>Curing Conditions:</u>

ASTM C 495 specifies the following curing sequence:

- 1 day at 70°F+/- 10°F.
- 6 days at 73°F +/- 3°F. under moist conditions.
- 18 days at 70°F +/- 10°F. and 50+/-30 % relative humidity.
- 3 days oven dried at 140°F.
- Sample cooled and tested at room temperature at 28 days.

The most common departures from these conditions have been:

1. Sample is moist cured until testing, not dried and, sometimes, even cured in lime water. **It is absolutely critical that the samples be dried prior to testing.** The most practical way to moist cure for the first 7 days is to leave the samples in the mold. Strip after 7 days and store in the proper environment for the following 18 days.

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2. Testing Machine:

ASTM recognizes that the accuracy of the testing machine is critically important in determining the correctness of the test results.

The maximum load required to break the sample should not be less than 10% of the maximum load range being used. Frequently, testing laboratories use equipment that has the loading capability to break structural concrete. The load to break a lightweight insulating concrete cylinder can be well below 10% of the most sensitive range available on these large machines.

For example, the load to break a 3-inch by 6-inch, 125 psi 1:6 ZIC cylinder will be approximately 880 pounds. A testing machine with a maximum load range of 10,000 pounds is not appropriate for testing this material. (10% of the range equals 1,000 pounds. This is greater than the expected result.)

A testing machine with a load range of 6,000 pounds is appropriate to use when testing lightweight insulating concrete.

3. Cylinder Area:

The diameter of the 3-inch by 6-inch cylinder must be measured. It is not unusual for the actual diameter to be 2.9 inches. When this is translated into the bearing area for calculation of the compressive strength, the result reflects a 6.5% error. Assuming the diameter to be 3 inches when it is actually 2.9 inches will result in a compressive strength 6.5% lower than it should be.

SAMPLE FORMATION:

The preparation of samples (casting cylinders or taking material from an existing deck) can have profound effects on the results of testing. The Siplast Job Superintendents Guide gives proper procedures for casting cylinders in the quality control section. The ASTM documents attached also provide guidance for sampling.

These procedures should be reinforced with field crews. This will ensure that test results are truly representative of the materials being placed.

If the cylinders are being cast by testing lab personnel, be sure they are aware of the proper sampling techniques by providing them with a copy of this bulletin.

Siplast Requirements for Warranty:

Siplast has recognized that there is strong correlation of properly installed LWIC exhibiting the proper wet densities while being placed and ensuring they meet the specification as well as passing the fastener withdrawal test. For these reasons Siplast does not require the use of the aforementioned ASTM testing to qualify newly installed LWIC decks. Siplast provides inspections during and after LWIC installations to help ensure the quality of the installed material meets our requirements.

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Designation: C495/C495M – 12

Standard Test Method for Compressive Strength of Lightweight Insulating Concrete[1]

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 800 kg/m^3 [50 lb/ft^3] 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 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 75 ± 2 mm [3 ± 1/16 in.] and a length of 150 ± 3 mm [6 ± 1/8 in.].

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 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 75 ± 2 mm [3 ± 1/16 in.] in diameter and 150 ± 3 mm [6 ± 1/8 in.] in

[1] This test method is under the jurisdiction of ASTM Committee C09 on Concrete and Concrete Aggregatesand 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

length, with the base of each specimen perpendicular to the longitudinal axis within the limits prescribed in 6.8.

6.2 *Number*—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 outside of the mold lightly 10 to 15 times with an open hand after placing each layer 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 21 ± 6 °C [70 ± 10 °F]. After 24 ± 2 h, store the specimens in a moist condition (Note 2) 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 21 ± 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 60 ± 3 °C [140 ± 5 °F] for 3 days (Note 4). 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 0.5 mm [0.02 in.]. If the bearing surfaces depart from a plane more than 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 0.05 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 2.5 mm in 150 mm [0.1 in. in 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 0.2 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].

7. Procedure

7.1 *Placing of Specimen*—Wipe clean the bearing faces of the upper and lower bearing blocks of the compression test machine and of the test specimen and place the test specimen on the lower bearing block. Carefully align the axis of the specimen with the center of thrust of the spherically seated block. As the spherically seated block is brought to bear on the specimen, gently rotate its movable portion by hand so that uniform seating is obtained.

7.2 *Rate of Loading*—Continuously apply the load without shock at a constant rate such that the maximum load will be reached in 65 ± 15 s. Record the maximum load sustained by the specimen. Note the type of failure and the appearance of the concrete.

8. Calculation

8.1 Calculate the unit compressive strength of the concrete by dividing the maximum load by the average cross-sectional area and record to the nearest 0.1 MPa [10 psi].

9. Oven-Dry Density

9.1 When the oven-dry unit density is desired, mold two companion specimens for this purpose at the same time as the compressive strength specimens. Cure the companion specimens the same as the compressive strength specimens, except dry the companion specimens at the age of 28 days in an oven at 110 ± 5 °C [230 ± 10 °F] and weigh at 24-h intervals until the loss in weight does not exceed 1 % in a 24-h period. Determine the mass and dimensions of the oven-dry specimens and calculate the density from the average data obtained.

10. Report

10.1 For each specimen tested report the following information where applicable:

10.1.1 Identification number,

10.1.2 Cylinder density reported to nearest 10 kg/m³ [0.5 lb/ft³],

10.1.3 Dimensions of test specimen, in mm [in.],

10.1.4 The cross-sectional area in mm² [in.²],

10.1.5 Type of cap,

10.1.6 Maximum load, in kN [lb],

10.1.7 Unit compressive strength shall be reported as the average of testing four cylinders from the same batch of lightweight insulating concrete defined in 6.2, in MPa [psi],

10.1.8 Type of fracture and appearance of the concrete following determination of compressive strength,

10.1.9 Defects in either specimen or caps,

10.1.10 Age of specimen, in days,

10.1.11 Calculated oven-dry density, if determined,

10.1.12 Average ambient temperature and average relative humidity at which specimens were stored during the 18-day curing period, and

10.1.13 Summation of tests of specimens from same sample with average of test results. This summation shall be shown on the report of the last specimen tested and should be referenced in reports of other specimens.

11. Precision and Bias

11.1 *Precision:*

11.1.1 The single operator standard deviation for a test result (where a test result is, as defined in this test method, the average of four separate compressive strength measurements) has been found to be 0.14 MPa [21 psi] (Notes 5 and 6). Therefore, results of two properly conducted tests (each consisting of the average of four individual measurements) by the same operator on concrete samples from the same batch should not differ by more than 0.41 MPa [59 psi] (Note 6). The range (difference between highest and lowest) of the four individual measurements used in calculating the average should not exceed 1.07 MPa [155 psi] (Note 7).

11.1.2 The multilaboratory standard deviation for a test result has been found to be 0.20 MPa [29 psi] (Note 6). Therefore, results of two properly conducted tests (each consisting of the average of four individual measurements) by two different laboratories on concrete samples from the same batch should not differ by more than 0.57 MPa [83 psi] (Note 6).

NOTE 5—The data used to develop the precision statement were obtained using the previous inch-pound version of this test method. The precision indices are exact conversions of the values shown in brackets.

NOTE 6—These numbers represent, respectively, the (1s) and (d2s) limits as described in Practice C670.

NOTE 7—Calculated as described in 3.4.3 of Practice C670.

11.2 *Bias*—The bias of this test method cannot be determined because compressive strength can only be defined in terms of this test method.

12. Keywords

12.1 compressive strength; density; lightweight insulating concrete; oven-dry density

SUMMARY OF CHANGES

Committee C09 has identified the location of selected changes to this test method since the last issue, C495–07, that may impact the use of this test method. (Approved April 1, 2012)

(*1*) Revised the standard as a combined units test method.
(*2*) Revised 6.2 and 10.1.7 to clarify that four cylinders shall be obtained from the same batch of concrete and the compressive strength of that sample is the average of the four cylinders.
(*3*) The tapping procedure in 6.3 was revised.
(*4*) Added requirement in 6.6 that cellular concrete cylinders be moist cured for 23 days and not be oven dried prior to compressive strength testing.
(*5*) Added requirement in 6.8 to weight cylinders and calculate their density.
(*6*) Added 10.1.7 to require reporting the density.
(*7*) Added new Note 5 to clarify how the precision values were obtained and renumbered subsequent notes.

Designation: C513/C513M – 11 (Reapproved 2019)

Standard Test Method for Obtaining and Testing Specimens of Hardened Lightweight Insulating Concrete for Compressive Strength[1]

This standard is issued under the fixed designation C513/C513M; 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 test method covers obtaining, preparing, and testing specimens of hardened, lightweight, insulating concrete made with either lightweight aggregate conforming to Specification C332 or using preformed foam made from a foaming agent conforming to Specification C869/C869M and having an oven-dry density not exceeding 800 kg/m^3 [50 lb/ft^3].

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 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.*

1.4 *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.*

2. Referenced Documents

2.1 *ASTM Standards:*[2]

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

C88/C88M Test Method for Soundness of Aggregates by Use of Sodium Sulfate or Magnesium Sulfate

C125 Terminology Relating to Concrete and Concrete Aggregates

C332 Specification for Lightweight Aggregates for Insulating Concrete

C617/C617M Practice for Capping Cylindrical Concrete Specimens

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

C869/C869M Specification for Foaming Agents Used in Making Preformed Foam for Cellular Concrete

C1005 Specification for Reference Masses and Devices for Determining Mass and Volume for Use in the Physical Testing of Hydraulic Cements

3. Terminology

3.1 *Definitions:*

3.1.1 For definitions of terms used in this test method, refer to Terminology C125.

4. Significance and Use

4.1 This test method is used to determine the compressive strength of hardened lightweight insulating concrete using samples taken from the field. The test results can be used to determine specification compliance when results of tests on specimens molded at the time of construction are not available or are defective, and to establish the strength properties of existing construction.

5. Apparatus

5.1 *Masonry or Carpenter's Saw,* for removing a sample from hardened concrete and cutting cubes from the sample. A core drill is permitted for concrete thicker than 150 mm [6 in.].

5.2 *Testing Machine,* conforming to the requirements in Test Method C39/C39M.

5.3 *Scales and Weights,* used in weighing specimens shall conform to Specification C1005.

5.4 *Drying Oven,* conforming to the requirements in Test Method C88/C88M.

[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.

Current edition approved Dec. 15, 2019. Published December 2019. Originally approved in 1963. Last previous edition approved in 2011 as C513/C513M–11$^{\varepsilon1}$. DOI: 10.1520/C0513_C0513M-11R19.

[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.

6. Sampling

6.1 Remove a sufficiently large sample, from each sample location, so that at least four test specimens for compressive strength, and one for density (unit weight), can be prepared without the inclusion of any concrete that has been cracked, spalled, undercut, or otherwise damaged. The sample shall be of such length and width as to permit the cubes and prisms to be cut therefrom without approaching any edge of the sample closer than 25 mm [1 in.]. Unless otherwise specified, the sample shall not be obtained until the concrete is at least 14 days old. Indicate the casting direction on the sample.

7. Test Specimens

7.1 Compressive strength specimens shall be cubes not less than 50 mm [2 in.], nor more than 100 mm [4 in.] on a side. The dimensions of the cubes shall be equal to the thickness of the concrete slab unless that thickness exceeds 100 mm [4 in.], in which case the depth of the specimen shall be reduced to 100 mm [4 in.] by sawing off the lower portion as placed. The casting direction shall be marked on each prepared cube so that load can be applied in the direction of casting.

7.2 Specimens for density (unit weight) determination shall be oven-dry prism-shaped specimens with a volume of at least 650 mL [40 in.^{3}].

8. Preparation of Test Specimens

8.1 The surfaces of compressive strength specimens that will be in contact with the bearing surfaces of the testing machine shall be plane within 0.5 mm [0.02 in.]). The planeness of the bearing surfaces of the specimens shall be checked by means of a straightedge and feeler gauge, making measurements across both diagonals of the bearing faces of the cube. If the bearing surfaces depart from a plane more than 0.5 mm [0.02 in.], they shall be ground to within this tolerance or capped with materials conforming to Specification C617/C617M. The capped surface shall be plane within 0.05 mm [0.002 in.] (Note 1). The surface of the specimen in contact with the lower bearing block of the testing machine shall not depart from perpendicularity to the axis by more than 1° (approximately equivalent to 0.8 mm [0.03 in.] in 50 mm [2 in.] or 1.7 mm [0.07 in.]) in 100 mm [4 in.]), and the combined departure of the two bearing surfaces from perpendicularity to the axis shall not exceed 3°. The difference between the longest and shortest cube edge shall not exceed 3 mm [⅛ in.].

NOTE 1—These relatively low-strength materials can tolerate greater deviation from planeness of bearing surfaces without affecting strength than can more rigid materials. However, if the specimen is capped, the capped surface shall conform to the more restrictive specification.

8.2 Store specimens in laboratory air until drying is initiated.

8.3 The specimens to be tested for compressive strength shall be dried in an oven at 60 ± 3°C [140 ± 5°F] for 3 days prior to testing if the insulating concrete is made using lightweight aggregate. If the insulating concrete is made using preformed foam, air dry the specimens for 3 days at 23 ± 2°C [73.5 ± 3.5°F].

8.4 Measure the lengths of the sides of each specimen at about midheight to the nearest 0.25 mm [0.01 in.]. Determine the average length of opposite sides and used those values to calculate the cross-sectional area to the nearest 10 mm^2 [0.01 in.^{2}]. Measure the height of the specimen along each vertical edge to the nearest 0.25 mm [0.01 in.] and calculate the average height.

8.5 The specimens for determination of density (unit weight) shall be dried in an oven at 110 ± 5°C [230 ± 10°F] and weighed at 24-h intervals until the loss in mass does not exceed 1 % in a 24 h period. Measure the mass and dimensions of the oven-dry specimens. Calculate the density of each specimen in units of kg/m^3 [lb/ft^3].

9. Procedure

9.1 Test four specimens from a single sample location for compressive strength in accordance with the following:

9.1.1 *Placing of Specimen*—Wipe clean the bearing faces of the upper and lower bearing blocks of the compression testing machine and of the test specimen and place the test specimen on the lower bearing block. Test specimens in the direction in which they were cast. Align the axis of the specimen with the center of thrust of the spherically seated block. Tilt the moveable portion of the spherically seated block by hand so that the bearing face appears to be parallel to the end of the test specimen.

9.1.2 *Rate of Loading*—Apply the load continuously and without shock at a constant rate such that the maximum load will be reached in 50 ± 30 s. Record the maximum load sustained by the specimen.

9.2 Calculate the compressive strength of each specimen by dividing the maximum load by the cross-sectional area. Calculate the average compressive strength of the four specimens representing the sample location, and record this average strength to the nearest 0.1 MPa [10 psi].

10. Report

10.1 Report the following for each specimen tested, where applicable:

10.1.1 Source of sample,
10.1.2 Identification number,
10.1.3 Dimensions to nearest 0.25 mm [0.01 in.],
10.1.4 Cross-sectional area to nearest 10 mm^2 [0.01 in.^{2}],
10.1.5 Type of cap, if used,
10.1.6 Maximum load, kilonewtons [pounds-force],
10.1.7 Average compressive strength of the four specimens from a single sample location, to the nearest 0.1 MPa [10 psi],
10.1.8 Defects in either specimen or caps,
10.1.9 Age, in days, and
10.1.10 Calculated oven-dry density.

11. Precision and Bias

11.1 *Precision:*

11.1.1 *Single Operator Precision*—The single-operator standard deviation of a compressive strength test result (the average of four individual determinations) is given in the first column of Table 1. The results of two properly conducted tests by the same operator on the same concrete are not expected to

TABLE 1 Single-Operator Precision

Standard Deviation, MPa [psi][A]	Acceptable Difference Between Two Test Results, MPa [psi][A]	Acceptable Range for Four Individual Determinations, MPa [psi][B]
Insulating concrete made with preformed foam		
0.28 [40]	0.76 [110]	2.00 [290]
Insulating concrete made with lightweight aggregate		
0.14 [20]	0.41 [60]	1.03 [150]

[A] These numbers represent the (1s) and (d2s) limits described in Practice C670.
[B] Acceptable range is based on Table 2 in Practice C670.

TABLE 2 Multi-Laboratory Precision

Standard Deviation, MPa [psi][A]	Acceptable Difference Between Two Test Results, MPa [psi][A]
Insulating concrete made with preformed foam	
0.28 [40]	0.76 [110]
Insulating concrete made with lightweight aggregate	
0.14 [20]	0.41 [60]

[A] These numbers represent the (1s) and (d2s) limits described in Practice C670.

differ by more than the values in the second column of Table 1. The range (difference between highest and lowest) of the four individual determinations obtained by the same operator are not expected to exceed the values in the third column of Table 1.

11.1.2 *Multi-Laboratory Precision*—The multi-laboratory standard deviation of a test result for compressive strength is given in the first column of Table 2. Therefore, results of two properly conducted tests in different laboratories on the same concrete are not expected to differ by more than the values shown in the second column of Table 2.

NOTE 2—The data used to develop the precision statements were obtained in a study involving three laboratories, three materials, two operators per laboratory, and six replicates. The precision indices shown in SI units are exact conversions of the inch-pound values in brackets.

11.2 *Bias*—No standard reference material is available for determination of the bias of this test method.

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