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Standard Test Method for Bond Strength of Epoxy-Resin Systems Used With Concrete By Slant Shear¹

This standard is issued under the fixed designation C882/C882M; 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.

~~^{ε1}Note—The designation was changed editorially to agree with the existing values statement in the Scope in March 2008.~~

1. Scope

1.1 This test method covers the determination of the bond strength of epoxy-resin-base bonding systems for use with portland-cement concrete. This test method covers bonding hardened concrete to hardened or freshly-mixed concrete.

1.2 The values stated in either ~~inch-pound~~SI units or ~~SI~~inch-pound units are to be regarded separately as standard. ~~Within the text, the SI units are shown in brackets. The values stated in each system are~~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 ~~this test method, 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 and health practices and determine the applicability of regulatory limitations prior to use.* A specific hazard statement is given in Section 8. **(Warning —Fresh hydraulic cementitious mixtures are caustic and may cause chemical burns to exposed skin and tissue upon prolonged exposure.²)**

2. Referenced Documents

2.1 ASTM Standards:³

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

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

C125 Terminology Relating to Concrete and Concrete Aggregates

C150 Specification for Portland Cement

C192/C192M Practice for Making and Curing Concrete Test Specimens in the Laboratory

C511 Specification for Mixing Rooms, Moist Cabinets, Moist Rooms, and Water Storage Tanks Used in the Testing of Hydraulic Cements and Concretes

C617 Practice for Capping Cylindrical Concrete Specimens

C881/C881M Specification for Epoxy-Resin-Base Bonding Systems for Concrete

3. Terminology

~~3.1 See Section on Terminology of Specification C881/C881M~~

3.1 Definitions:

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

3.2 Definitions of Terms Specific to This Standard:

3.2.1 *bonding system, n*—the product resulting from the combination of all the components supplied for use as a bonding material.

¹ This test method is under the jurisdiction of ASTM Committee C09 on Concrete and Concrete Aggregates and is the direct responsibility of Subcommittee C09.25 on Organic Materials for Bonding.

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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.

³ See Section on Safety Precautions, Manual of Aggregate and Concrete Testing, *Annual Book of ASTM Standards*, Vol. 04.02.

³ 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.

3.2.2 *component, n*—a constituent that is intended to be combined with one or more other constituents to form a bonding system.

3.2.3 *contact strength, n*—bond strength measured by slant shear after a specified contact and cure time.

3.2.4 *contact time, n*—specified time between when the bonding system is applied and when the two segments are bonded together and still achieve a specified bond strength after a specified curing time and temperature.

3.2.5 *formulator, n*—the agency responsible for preparing the separate components and for recommending the proportions to be used in preparing the final bonding system.

4. Summary of Test Method

4.1 The bond strength is determined by using the epoxy system to bond together two equal sections of a $3\frac{7}{8}$ by 6-in. [$75/150\text{-mm}$ [3 by 150-mm] 6-in.] portland-cement mortar cylinder, each section of which has a diagonally cast bonding area at a 30° angle from vertical. After suitable curing of the bonding agent, the test is performed by determining the compressive strength of the composite cylinder.

5. Significance and Use

5.1 The strength developed by a bonding system that joins two regions of concrete is its most important property.

6. Apparatus

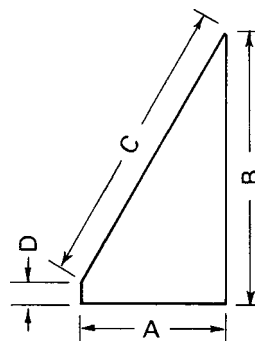
6.1 *Apparatus to Mix Portland-Cement Mortar*—This apparatus shall be as described in Test Method C109/C109M, except for the sections on specimen molds, tamper, and testing machine.

6.2 *Specimen Molds*—The molds shall be constructed in the form of right cylinders, $3\frac{7}{8} \pm \text{in.}$ [75.2 mm [$3 \pm 2\text{-mm}$] $1/16 \text{ in.}$] in inside diameter and $6\frac{1}{2} \pm \text{in.}$ [150.2 mm [$6 \pm 2\text{-mm}$] $1/16 \text{ in.}$] high. All molds shall be either selected or machined so that the maximum range of the differences in each of the dimensions of the group of molds is less than in. [0.5-mm] 0.5 mm [$1/64 \text{ in.}$]. The molds shall be made of metal not attacked by portland-cement mortar. The side of the mold shall be sufficiently rigid to prevent spreading or warping. The molds shall be made watertight before use. A satisfactory material for this purpose is the paraffin-rosin mixture described in Test Method C109/C109M.

6.3 *Dummy Section*—A dummy section (Fig. 1) shall be machined of a hard material that is not attacked by portland-cement mortar. It shall fit the mold and be equal to half the volume of the cylinder, but at an angle of 30° from the vertical. Additional dummy sections can be made by casting an epoxy-resin mortar against the machined dummy section contained in a specimen mold. Due precautions, such as waxing, shall be taken to prevent the bonding of the epoxy-resin mortar to the machined dummy section or the mold.

6.4 *Tamping Rod*—The tamping rod shall be a round rod of brass or plastic, in. [10-mm] 10 mm [$3/8 \text{ in.}$] in diameter and approximately 12 in. [300 mm] long, having both ends rounded to hemispherical tips.

6.5 *Apparatus for Mixing Epoxy-Resin Bonding System*—A glass, plastic, or metal container of approximately 3-oz. [0.1 L] 3 oz. [3 oz.] capacity shall be used to hand-mix the bonding system. A tongue depressor or wooden stick of similar dimensions shall be used as a paddle.



| | Dimensions | |
|----------------|-------------|-----------------------|
| | mm | in. |
| A—Diameter | 3.000 | $1\frac{1}{8}$ |
| A—Diameter | 75 ± 2 | 3.000 |
| B—Height | 5.598 | $1\frac{1}{4} \pm 2$ |
| B—Height | 140 ± 2 | 5.598 |
| C—Slant height | 6.000 | $1\frac{1}{2} \pm 2$ |
| C—Slant height | 150 ± 2 | 6.000 |
| D—Base height | -0.402 | $-1\frac{1}{8} \pm 2$ |
| D—Base height | 10 ± 2 | 0.402 |

FIG. 1 Dummy Section