



**Florida Test Method
for
PERFORMANCE OF EPOXY-RESIN SYSTEMS WITH CONCRETE
BY SLANT SHEAR AND COMPRESSIVE STRENGTH**

Designation: FM 3-C 882

1. SCOPE

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

2. APPARATUS

- 2.1 Apparatus to Mix Portland-Cement Concrete- This apparatus shall be as described in ASTM C 192/ C 192M.
- 2.2 Specimen Molds- The molds shall be 3 in. diameter 6 in. high, constructed in accordance with ASTM C 470/ C 470M.
- 2.3 Tamping Rod- The tamping rod shall be a round steel rod, 3/8 in. diameter and approximately 12 in. long, having both ends rounded to hemispherical tips.
- 2.4 Apparatus for Mixing Epoxy-Resin Bonding Systems- The bonding system shall be hand mixed in accordance with the manufacturers recommendations.
- 2.5 Testing Machine- The testing machine shall be as described in ASTM C 39.
- 2.6 Moist Room- The moist room shall conform to the requirements of ASTM C 511.
- 2.7 Cube Molds- Cube molds shall be 2 in., conforming to the requirements of ASTM C 109.

3. MATERIALS

- 3.1 Coarse Aggregate- The coarse aggregate shall be a typical concrete aggregate, FDOT grade No. 89 meeting Section 901.



- 3.2 Fine Aggregate- The fine aggregate shall be a typical natural silica sand meeting Section 902.
- 3.3 Concrete- The concrete shall be proportioned using ACI 211.1 to conform to the following requirements herein. The cement content shall be $658 \pm 5 \text{ lb/yd}^3$. For the first trial mixture, refer to the table on volume of coarse aggregate per unit volume of concrete as identified in ACI 211.1. In addition, this same reference will provide the guidance on the amount of coarse aggregate to use, given the nominal maximum size of the aggregate and the fineness modulus of the fine aggregate being used. Adjust the water content to obtain a slump of 3 in. \pm 1 ½ in., with the maximum water content possible not exceeding a 0.41 water-cement ratio. The concrete shall be air-entrained within a range of 1% to 6%. After evaluation of the trial mixtures, aggregate proportions shall be adjusted as needed to obtain a properly proportioned workable concrete mixture. Achieve these conditions by final adjustments in the proportion of fine aggregate to total aggregate or in the amount of total aggregate, or both, while maintaining the yield, slump and air content in the required ranges. Make and cure the concrete in accordance with ASTM C 192.

4. SAMPLE PREPARATION

4.1 Slant Shear Specimens:

- 4.1.1 Three (3) composite specimens for each application and three (3) reference specimens for each mix are required for the evaluation of epoxy systems.
- 4.1.2 The test specimens of concrete shall be prepared in a 3 in. by 6 in. mold. The first portion of the test specimens shall be formed by saw cutting a full size cylinder on a 45-degree slope from vertical, giving a maximum height of 4 ¼ in. to a minimum height of 1 ¼ in. Reference cylinders shall be prepared with each batch. The specimens shall be moist cured for at least four (4) days. At the end of this period, prepare the bonding surface by removing all loose particles and oily film. Allow specimen to surface dry.
- 4.1.3 The portion of the cylinder shall then be placed into the bottom of a cylinder mold, the bonding surface shall then be covered with a thick coat of the epoxy compound (*Note 1*). Depending on the application, place plastic concrete of the same mix proportions or the matching hardened concrete portion into the mold to form the composite 3 in. by 6 in. cylinder. Reference cylinders shall be prepared with each batch. Allow the specimens to moist cure for at least three (3) days prior to testing.



4.2 Compressive Strength Specimens:

4.2.1 Three (3) epoxy mortar cubes are required for the evaluation of epoxy systems.

4.2.2 Epoxy mortar cubes shall be prepared for testing using two parts of dry standard concrete sand to one part of mixed epoxy compound or at a mix ratio and/or filler recommended by the manufacturer (*Note 1*). Three (3) 2 in. cubes shall be cast from the epoxy mortar and cured for three days.

Note 1: *Mix epoxy compound in accordance with the manufacturers' recommendation.*

5. PROCEDURE

5.1 Slant Shear Specimens:

5.1.1 Determine the compressive strength of the composite and reference cylinders in accordance with ASTM C 39. The reference cylinders shall have an average compressive strength of at least 5500 psi to constitute a valid test (*Note 2*).

Note 2: *Additional cylinders may be needed to confirm this requirement. Chemical admixtures may be used to accelerate strength gain of the concrete.*

5.2 Compressive Strength Specimens:

5.2.1 Determine the compressive strength of the epoxy mortar cubes in accordance with ASTM C 109.

6. CALCULATION

6.1 Slant Shear Specimens:

6.1.1 Calculate the average compressive strength of the composite test cylinders and the reference cylinders to the nearest 10 psi. Compare the strength of the composite test cylinders to the strength of the reference cylinders and determine the ratio between them (*Note 3*). Report the ratio to the nearest 0.01.

Note 3: *If two reference mixes are used, compare the weaker of the two mixes.*

6.2 Compressive Strength Specimens:



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- 6.2.1 Calculate the average compressive strength of the epoxy mortar cubes.
Report the average compressive strength to the nearest 10 psi.

7. REPORT

- 7.1 Report the following information:

- 7.1.1 Identification number
- 7.1.2 Product name
- 7.1.3 Product type
- 7.1.4 Compressive strength of the reference cylinders
- 7.1.5 Compressive strength of the composite cylinders
- 7.1.6 Compressive strength of the mortar cubes
- 7.1.7 Ratio of bond strength