FLORIDA DEPARTMENT OF TRANSPORTATION
State Materials Office
5007 NE 39th Avenue
Gainesville, Florida 32609
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FLORIDA TEST METHOD FOR BOND STRENGTH OF REPAIR MATERIALS WITH CONCRETE BY SLANT SHEAR

Designation: FM 5-587

1. SCOPE

1.1 This method covers the determination of the bond strength of repair materials for use with portland cement concrete. This test method covers bonding repair materials to hardened concrete.

1.2 This method does not purport to address all of the safety concerns, if any, associated with its use. It is the responsibility of the user of the method to establish appropriate safety and health practices prior to use.

2. APPARATUS

2.1 Apparatus to Mix Portland Cement Concrete - This apparatus shall be as described in ASTM C 192.

2.2 Specimen Molds - The molds shall be 3 in. diameter 6 in. high, constructed in accordance with ASTM C 470.

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 Repair Materials - The repair material shall be 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.

3. MATERIALS

3.1 Cement - The cement shall meet the requirements of AASHTO M 85, Type I or II.

3.2 Coarse Aggregate - The coarse aggregate shall be a typical concrete aggregate, grade No. 89 meeting the requirements of the Florida Department of Transportation Standard Specifications for Road and Bridge Construction, Section 901.

3.3 Fine Aggregate - The fine aggregate shall be a typical natural silica sand meeting the requirements of the Florida Department of Transportation Standard Specification for Road and Bridge Construction, Section 902.

3.4 Portland Cement Concrete - The portland cement concrete shall be proportioned using ACI 211.1 to conform to the following requirements herein. The portland cement content shall be 658 ± 5 lb/yd^3. For the first trial mixture, refer to the table on

volume of coarse aggregate per unit volume of concrete in ACI 211.1 for 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. The water content shall be adjusted to obtain a slump of 3 in. ± 1 ½ in., with the minimum 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. These conditions shall be achieved by making 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. The concrete shall have an average compressive strength of at least 5500 psi to constitute a valid test *(Note 1).* Make and cure the concrete in accordance with ASTM C 192.

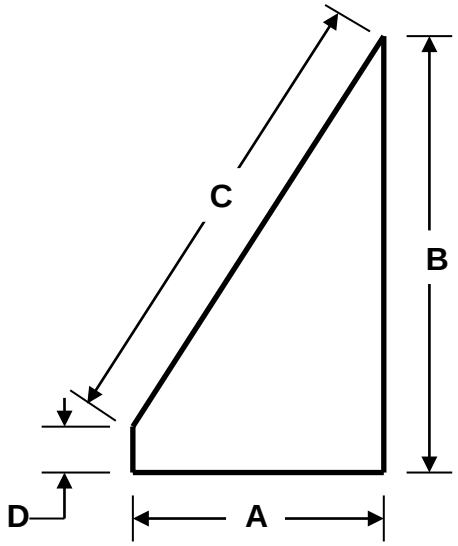
Note 1: Concrete cylinders, when tested in accordance with ASTM C 39, will be needed to confirm this requirement. Chemical admixtures may be used to accelerate strength gain of the concrete.

4. SAMPLE PREPARATION

4.1 Slant Shear Specimens:

4.1.1 Three (3) composite specimens are required for patching materials.

4.1.2 The portland cement concrete test specimens (Fig. 1) 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 concrete cylinder on a 30-degree slope from vertical, giving a maximum height of 5.60 inches to a minimum height of 0.40 inches. The specimens shall be moist cured for at least seven (7) days prior to saw cutting. At the end of this period, the bonding surface shall be prepared by removing all loose particles and oily film. The specimen shall be surface dried only.



		Dimensions, inches
A-	Diameter	3.00 ± 0.10
B-	Height	5.60 ± 0.10
C-	Slant Height	6.00 ± 0.10
D-	Base Height	0.40 ± 0.10

Fig. 1 - Concrete Test Specimens

4.1.3 The portion of the concrete cylinder shall be placed into the bottom of a cylinder mold. The patching material shall be *scrubbed* into the bonding surface of the concrete, filling all exposed pores and voids. After which, the remainder of the mold shall be immediately filled with the patching material, consolidated and finished *(Note 2).* Allow the specimens to moist cure until testing. Grind or Cap the composite cylinders in accordance with ASTM C 39 or ASTM C 617, respectively.

Note 2: Mix the patching material in accordance with the manufacturers' recommendation.

5. PROCEDURE

5.1 Composite Slant Shear Specimens:

5.1.1 Determine the maximum compressive force of three composite specimens, after grinding or capping, in accordance with ASTM C 39.

5.2 Portland Cement Concrete Specimens:

5.2.1 Determine the maximum compressive force of three portland cement concrete cylinders, after grinding or capping, in accordance with ASTM C 39.

6. CALCULATION

6.1 Bond Strength by Slant Shear of Composite Specimen:

6.1.1 Calculate the average bond strength of the composite test cylinders by dividing the maximum load at failure by the area of the bonded surface, 14.13 in^2 *(note 3)*. Report the results to the nearest 10 psi.

6.2 Compressive Strength of Concrete Specimen:

6.2.1 Determine the compressive strength of the portland cement concrete in accordance with ASTM C 39.

Note 3: The area of the elliptical bonding surface of the concrete test specimen specified in this method, Fig. 1.

7. REPORT

7.1 Report the following information:

7.1.1 Identification number
7.1.2 Manufacturer
7.1.3 Product name
7.1.4 Product type
7.1.5 Compressive strength of the concrete cylinders
7.1.6 Bond strength of the composite cylinders

7.1.7 Type and position of the fracture (in the repair material, in the concrete, or at the interface between them),

7.1.8 Defects in either the concrete cylinders or composite cylinders