

PULL-OUT TEST FOR RE-BAR ANCHOR SYSTEMS

1. SCOPE:

- 1.1. This test method outlines the procedure for determining the laboratory pull-out strength of non-epoxy grout adhesives by measuring the force required to pull a bonded rebar from a concrete block. Non-epoxy grout adhesives are classified according to cure time; Category I cures in one hour and Category II cures in 24 hours.
- 1.2. This test method also outlines the procedure for determining the pull-out strength of rebars at the job site.

2. APPARATUS-MATERIALS:

- 2.1. Tinius Olsen Hydraulic Tension Testing Machine, which is calibrated periodically in accordance with the latest revision of AASHTO T67 Verification of Testing Machines.
- 2.2. Three #5 epoxy coated rebar measuring 24 inches, or longer in length.
- 2.3. Three hardened concrete test blocks measuring 10"x10"x10" and with $f'_c = 4000$ psi at 28 days.
- 2.4. Hook-Bolt Testing Equipment consisting of hydraulic ram and pump and associated hardware.
- 2.5. Load cell indicator with a minimum capacity of 36,000 pounds.

3. LABORATORY PROCEDURES:

- 3.1. A dowel hole shall be drilled into the center of each concrete test block, measuring 6 inches in depth and 3/4 of an inch in diameter.
- 3.2. The dowel holes shall be cleaned of all drill or coring dust with water and/or air injected under pressure and then permitted to air dry.
- 3.3. Fill the dowel holes with the adhesive in accordance with the manufacturer's instructions.

- 3.4. Insert the rebar to the bottom of the dowel hole and twist 1/4 turn.
- 3.5. An excess amount of adhesive must be clearly visible as an extruded ring of material surrounding the steel bar at the surface of the concrete.
- 3.6. Allow the adhesive to cure for one hour and 24 hours respectively for Category I and II materials.
- 3.7. Place the load cell in the Tinius Olsen test apparatus and calibrate the load cell at 19,000 pounds test load.
- 3.8. Install the raised base over the rebar and lower to the surface of the concrete block. Then place the hydraulic ram over the rebar until it rests on the raised base.
- 3.9. Next, install a steel plate, the load cell, and another steel plate. Finally, install the wedge chuck on the rebar leaving approximately one inch clearance between the chuck and ram. This will provide space for the chuck to be removed after the test load is released.
- 3.10. After checking to see that all items are in the proper position, raise the ram by activating the hand pump until contact is made by the ram with the wedge chuck.
- 3.11. Apply a tensile load of 19,000 pounds to the rebar. The rebar shall withstand the applied load with zero slippage.
- 3.12. Slowly release the proof load and remove the test equipment in reverse order used for installation.
4. FIELD PROCEDURES:
 - 4.1. The rebars to be tested for pull-out strength shall be randomly selected.
 - 4.2. The surface of the concrete around the rebar shall be reasonably flat to permit proper support for the raised base used to support the hydraulic ram.
 - 4.3. Repeat steps 3.8 through 3.10. If necessary, separate the rebar by sawing or flame cutting.

- 4.4. Apply a tensile load as indicated below to the rebar. The rebar shall withstand the applied load with zero slippage.

REBAR SIZE (#)	PROOF LOAD (Pounds)
3	7,000
4	12,000
5	19,000
6	27,000
7	36,000

- 4.5. Repeat step 3.12.

5. REPORT:

- 5.1. Amount of slippage, if any.
- 5.2. Concrete breakage, if any.
- 5.3. Pull-out strength in pounds.

APPROVED

DIRECTOR
DIVISION OF MATERIALS

DATE

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