

SECTION 416
INSTALLING ADHESIVE-BONDED ANCHORS AND DOWELS
FOR STRUCTURAL APPLICATIONS

416-1 Description.

Prepare and install adhesive bonded anchors and dowels in hardened concrete as indicated in the Contract plans, as directed by the Engineer, and in accordance with the manufacturer's instructions and this Section.

Anchors and dowels in this Section are intended for use in structural applications where designated on the Contract plans.

416-2 Materials.

Use adhesive bonding material systems which meet the requirements of Section 937, and are included on the Qualified Products List. For applications involving installation of traffic railing barrier reinforcement and anchor bolts to existing bridge decks and approach slabs, use only Type HSHV adhesives.

416-2.1 Storage of Materials: Store materials delivered to the job-site in the original unopened containers within an appropriate facility capable of maintaining storage conditions consistent with the manufacturer's recommendations.

416-3 Equipment.

Ensure that the equipment used to install adhesive-bonded anchors and dowels is in conformance with the recommendations of the manufacturer.

416-4 Preparing of Concrete Members.

Ensure that concrete members receiving adhesive-bonded anchors or dowels are structurally sound and free of cracks in the vicinity of the anchor or dowel to be installed. Unless other equipment is recommended by the adhesive manufacturer, drill holes to the diameter required by the manufacturer, but as a minimum, not less than 105% of the diameter including deformations, nor more than 150% of the nominal diameter of the steel bar anchor or dowel, using a rotary hammer drill and bit.

Use a metal detector specifically designed for locating steel in concrete to avoid conflicts with existing steel reinforcement whenever placement tolerances and edge clearances permit. Perform core drilling to clear existing steel reinforcement only when approved by the Engineer. Dry the drilled holes completely prior to cleaning and installing the anchors or dowels.

Clean and prepare drilled holes in accordance with the manufacturer's recommendations, but as a minimum, use oil-free compressed air to remove loose particles from drilling, brush inside surface to free loose particles trapped in pores, then use compressed air again to remove the remaining loose particles. Use a non-metallic bristle brush and avoid over-brushing to prevent polishing the inside surface of the drilled hole.

416-5 Installing of Anchors or Dowels.

Remove all debris, oils, and any other deleterious material from the anchors and dowels to avoid contamination of the adhesive bonding material. Install anchors or dowels in accordance with the details shown on the plans and the manufacturer's

instructions, with particular attention to requirements and/or limitations due to anchor position, dampness, ambient temperature, and curing.

Use adequate quantities of the adhesive bonding material to fill the drilled hole to within 1/4 inch of the concrete surface measured after placement of the steel bar or anchor. For horizontal and inclined installations, provide temporary supports to maintain the anchors or dowels in the center of the drilled holes until the adhesive bonding material has cured.

416-6 Testing of Anchors or Dowels.

Field test installed anchors and dowels for traffic railing barrier applications using Type HSHV adhesives. The Engineer may also require testing of installed anchors and dowels for other applications. Testing must be conducted by an Independent Testing Agency approved by the Engineer.

416-6.1 Field Testing: Provide a qualified professional Independent Testing Agency to perform field testing of the installed anchors and dowels in accordance with the applicable sections of ASTM E 488 and ASTM E 1512, in the presence of the Engineer. Perform restrained static tension tests to prevent damage to the surrounding concrete. Displacement measurement for field testing is not required. Test individual anchors and dowels by proof loading in tension to 85% of the Specified Bond Strength in Section 937, based on the nominal anchor or dowel diameter and embedment depth, but not more than 90% of the yield strength of the anchor or dowel.

Divide the anchors and dowels into LOTs for testing and acceptance. Each LOT must contain a maximum of 100 anchors or dowels, of the same diameter, embedment length and Adhesive Bonding Material System. Randomly select four of the anchors and dowels in each LOT for testing, except if there are three or less in the LOT, in which case, test all anchors, unless otherwise directed by the Engineer. If three consecutive LOTs have no failing tests, sample the next three LOTs at a 2% rate and if these LOTs have no failing tests, sample at a rate of 1% for the remaining LOTs unless there is a failure; however, regardless of LOT size, sample at less one dowel per LOT. For every failed field test, perform two additional field tests on adjacent untested anchors or dowels within the LOT. Continue additional field tests until no more test failures occur, or all anchors and dowels within the LOT are tested. For the next LOT after a failed LOT, the sampling rate must be 4% but not less than one dowel per LOT and conform to the sampling rate procedure above including rate reductions as appropriate. Determine failure of the field test in accordance with ASTM E 488. Submit certified test reports from the Independent Testing Agency to the Engineer for each LOT.

416-6.2 Removal & Replacement of Failed Test Specimens: Remove all anchors and dowels that fail the field test, without damage to the surrounding concrete. Redrill holes to remove adhesive bonding material residue and clean in accordance with 416-4. Reinstall new anchors and dowels in accordance with 416-5. Do not reuse the failed anchors and dowels unless approved by the Engineer. Assign reinstalled anchors into new LOTs only containing reinstalled anchors or dowels of the same diameter, embedment length and adhesive bonding material system, and field test in accordance with 416-6.1.

416-7 Acceptance.

The Engineer will base acceptance of adhesive-bonded anchors and dowels on determining that the material requirements of Section 937, the installation and testing requirements of this Section, and the placement requirements of the plans have been met.

416-8 Basis of Payment.

The work specified in this Section will not be paid for directly, but will be considered as incidental work.