DS-23024
(New)

DEVELOPMENTAL SPECIFICATIONS
FOR
ADHESIVE-BONDED ANCHORS AND DOWELS FOR TRAFFIC RAILINGS

Effective Date
October 17, 2023

THE STANDARD SPECIFICATIONS, SERIES 2023, ARE AMENDED BY THE FOLLOWING MODIFICATIONS AND ADDITIONS. THESE ARE DEVELOPMENTAL SPECIFICATIONS AND THEY SHALL PREVAIL OVER THOSE PUBLISHED IN THE STANDARD SPECIFICATIONS.

23024.01 DESCRIPTION.

A. Prepare and install adhesive-bonded anchors and dowels in hardened concrete as indicated in the plans, as directed by the Engineer, and in accordance with manufacturer's instructions and these specifications.

B. Anchors and dowels, as described in these specifications, are for use in structural applications where designated on the plans.

23024.02 MATERIALS.

A. For applications involving installation of structural steel traffic railing dowels and anchors to concrete barrier, use only adhesive bonding material systems meeting the requirements of Materials I.M. 491.11 and are included in the approved products listed in Appendix B of that document.

B. Store materials delivered to jobsite in original unopened containers and within an appropriate facility capable of maintaining storage conditions consistent with manufacturer's recommendations.

C. Prior to commencing construction, provide the Engineer complete documentation of adhesive bonding material system manufacturer's requirements and recommendations.

23024.03 CONSTRUCTION.

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

A. Preparation of Concrete Members.

1. Ensure 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. Immediately inform the Engineer of unsound concrete conditions prior to beginning installation. Unless other equipment is recommended by adhesive manufacturer, drill holes using a rotary hammer drill and bit. Drill holes to diameter required by manufacturer, but as a minimum, not

less than 105% of diameter of anchor or dowel including deformations, nor more than 150% of nominal diameter of anchor or dowel.

2. Use a metal detector specifically designed for locating steel reinforcement 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. Thoroughly dry drilled holes prior to cleaning and installing anchors or dowels.

3. Clean and prepare drilled holes in accordance with 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 remaining loose particles. Use a non-metallic bristle brush and avoid over-brushing to prevent polishing the inside surface of drilled holes.

B. Installing Anchors or Dowels.

1. Remove debris, oils, and other deleterious material from anchors or dowels to avoid contamination of adhesive bonding material. Install anchors or dowels in accordance with details shown on the plans and with the adhesive manufacturer's instructions, with particular attention to requirements and/or limitations due to anchor position, dampness, ambient temperature, and curing.

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

C. Testing of Anchors or Dowels.

1. Field test installed anchors or dowels for traffic railing barrier applications using adhesive bonding material systems. The Engineer or the Contract Documents may also require testing of installed anchors and dowels for other applications.

2. Allow a minimum of 3 days between anchor or dowel installation and commencement of testing.

3. Provide an independent testing agency to perform field testing of installed anchors or dowels under the direction of a Professional Engineer licensed in the State of Iowa. Field test anchors or dowels in accordance with ASTM E 488. Submit test reports for each lot signed and sealed by the Professional Engineer. Perform restrained static tension tests to prevent damage to surrounding concrete. A restrained test is defined as a test conducted in accordance with ASTM E 488 except that the test equipment support clearance requirements of ASTM E 488 do not apply. The reaction base of the static tension testing apparatus shall be approximately equal to the drilled hole diameter for the anchor to prevent concrete or masonry failure, but allow bond failure. Anchor displacement measurement for field testing is not required. Test individual anchors or dowels by proof loading to 85% of bond strength specified in the plans, based on the nominal anchor or dowel diameter and embedment depth, but not more than 90% of yield strength of anchor or dowel, unless otherwise shown in the Contract Documents.

4. Divide anchors or dowels into lots for testing and acceptance. Each lot shall contain a maximum of one hundred anchors or dowels of same diameter, embedment length and adhesive bonding material system. Randomly select four anchors or dowels from each lot for testing, except if there are three or less in the lot, in which case test all, 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 remaining lots unless there is a failure; however, regardless of lot size, sample at least 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 or dowels within the lot are tested. For the next lot after a failed lot, the sampling rate shall be 4%, but not less than one dowel per lot and conform to sampling rate procedure above including rate reductions as appropriate.

D. Removal and Replacement of Failed Test Specimens.

Remove anchors or dowels that fail field test, without damaging surrounding concrete. Re-drill holes to remove adhesive bonding material residue and clean in accordance with Article DS-23024.03, A. Following re-drilling, prepared holes shall be in conformance with manufacturer's requirements and these specifications. Reinstall new anchors or dowels in accordance with Article DS-23024.03, B. Do not reuse failed anchors or dowels unless approved by the Engineer. Assign reinstalled anchors into new lots containing only reinstalled anchors or dowels of same diameter, embedment length, and adhesive bonding system; and field test in accordance with Article DS-23024.03, C.

E. Acceptance.

The Engineer will base acceptance of adhesive-bonded anchors or dowels on the determination that the material requirements of the contract documents, installation and testing requirements of these specifications, and placement requirements of the plans have been met.

23024.04 METHOD OF MEASUREMENT.

None.

23024.05 BASIS OF PAYMENT.

Work will be considered incidental to the bid item Structural Steel Rail, Traffic.