



**DEVELOPMENTAL SPECIFICATIONS
FOR
DOWEL BAR RETROFIT**

**Effective Date
October 16, 2012**

THE STANDARD SPECIFICATIONS, SERIES 2012, ARE AMENDED BY THE FOLLOWING MODIFICATIONS AND ADDITIONS. THESE ARE DEVELOPMENTAL SPECIFICATIONS AND THEY SHALL PREVAIL OVER THOSE PUBLISHED IN THE STANDARD SPECIFICATIONS.

12018.01 DESCRIPTION.

Install epoxy coated dowel bars on transverse joints and transverse cracks as shown in the plans. Place dowels after concrete repair operations and prior to diamond planing operation. Areas with random cracks passing through dowel bar retrofit locations will be reviewed by the Engineer prior to construction.

12018.02 MATERIALS.

A. Epoxy Coated Dowel Bars.

1. Ensure epoxy coated dowel bars, 1.5 inches by 15 inches (40 mm by 375 mm), conform to requirements of Section 4151 of the Standard Specifications. Uniformly coat dowel bars with approved bond breaker according to Article 4151.02, B, of the Standard Specifications.
2. Dowel bars shall have tight fitting end caps made of nonmetallic material that allow for at least 0.25 inch (6 mm) bar movement at each end of the bar.
3. Chair devices for supporting dowel bars shall be either epoxy coated or made of a nonmetallic material. Chair devices shall provide a minimum clearance of 0.5 inch (12 mm) between the bottom of the bar and the surface upon which the bar is placed, and between the bar and the walls of the slot. Chairs shall be designed to prevent movement of the bar during placement of the grout. Submit samples of end caps and chairs to Engineer for approval before installation.

B. Caulking Filler.

Acceptable caulking filler used for sealing the existing transverse joint or crack at the bottom and sides of the slot includes any commercial caulk designed as a concrete sealant that is compatible with the patch material being used.

C. Foam Core Inserts.

Foam core board filler material shall be a closed cell foam faced with plastic film, foil, or poster board material on each side. Foam core board filler shall be 3/8 inch \pm 1/8 inch (9 mm \pm 3 mm) thick. Foam core board filler shall be approved by the Engineer before installation.

D. Grout.

1. Grout material placed around bars shall be a shrinkage compensated rapid set patch material listed in Materials I.M. 491.20, Appendix B.
2. Extend grout according to the manufacturer's recommendations. Aggregate for extending grout shall be pea gravel meeting Section 4112 of the Standard Specifications, with a minimum durability of Class 2 and the following gradation:

<u>Sieve Size</u>	<u>Percent Passing</u>
1/2 inch (12.5 mm)	100
3/8 inch (9.5 mm)	85-100
No. 8 (2.36 mm)	0-8

3. The rapid set cement used to produce any of the rapid set patch materials in Materials I.M. 491.20, Appendix B may be approved to produce a concrete patch mix utilizing sand meeting Section 4110 of the Standard Specifications and pea gravel meeting Section 4112 of the Standard Specifications, at maximum aggregate extension. Concrete patch mix shall meet the following strength requirements:
 - 3 hour minimum compressive strength of 3000 psi (21 MPa), ASTM C 39
 - 24 hour minimum compressive strength of 5000 psi (34 MPa), ASTM C 39
 - 24 hour bond to dry PCC, 1000 psi (7 MPa), ASTM C 882
4. Furnish a list of materials for use in making the grout, and the mix design, to the Engineer at least 30 calendar days prior to installation. The District Materials Engineer may waive mix design testing based on previous testing with the patching materials.
5. Testing of the grout by the Engineer may be done anytime during production.

12018.03 CONSTRUCTION.

A. PROCESS CONTROL PLAN.

Provide the Engineer a process control plan at least one week prior to the beginning of retrofit work. This plan shall include:

- Description of materials and process to be used to achieve required dowel bar alignment.
- Description of materials and processes to be used to prevent grout from entering existing joints.
- Description of materials and processes to be used to place and align foam core inserts.
- Mix design and proportion control for grout mixture

B. Preparing Slots for Dowel Bars.

1. Cut slots in pavement with gang saw capable of cutting at least three slots in each wheel path simultaneously. Cut slots to required depth to place center of dowels at mid-depth of concrete slab. Multiple saw cuts parallel to centerline may be required to remove material from slot.
2. Use jackhammers not larger than 30-pound class to remove concrete from slots. Prevent damage to pavement or vehicles traveling in the adjoining lane.
3. Sandblast and clean exposed surfaces and cracks in slots before bar installation. Fill transverse contraction joint on bottom and sides with non-sag caulking filler.

C. Placing Dowel Bars.

1. Use chair devices to support dowel bars at depth shown on the plans.

2. Place dowel bars parallel to centerline of pavement and parallel to pavement surface.
3. Place dowel bars within $\pm 1/4$ inch (6 mm) of desired alignment.
4. Center dowel bars over transverse joints or cracks so a minimum of 7 inches (175 mm) of dowel bar extends into adjacent panel.
5. Cut a piece foam core board material (angled if joints are skewed) to fit tightly around dowel bar. Place foam core board at center of dowel bar flush with surface of concrete pavement, or slightly recessed. Maintain foam core board in vertical position, tight to edges, during grout placement operations.

D. Grouting Dowel Bars.

1. Produce grout with a portable mixer approved by the Engineer. Place grout immediately after mixing and before grout has attained initial set. Do not re-temper grout with water.
2. Thoroughly moisten all surfaces of the sawed slot immediately prior to filling with grout. Remove all excess water with compressed air.
3. Place grout according to the manufacturer's recommendations. Thoroughly consolidate grout with a hand held vibrator so the grout completely surrounds dowel bars and support chairs. Place grout so that the material is at least 1/8 inch (3 mm) higher than the pavement if the pavement is to be diamond ground. If the pavement is not to be ground, finish the grout flush with the surface.
4. Immediately after placement, thoroughly coat grout with white pigmented curing compound.

E. Re-establishing Joints or Cracks.

Re-establish joint or crack above foam board insert within 8 hours of grout placement by means of sawing when grout has attained sufficient strength. If foam board is visible, sawing of joint or crack will not be required.

F. Replacing Deficient Work.

Replace dowel bars that are to be removed due to poor quality work or material failure with new bars. Provide additional traffic control needed due to required retrofit repairs at no additional cost to the Contracting Authority.

12018.04 METHOD OF MEASUREMENT.

Dowel Bar Retrofit will be measured by each bar satisfactorily placed.

12018.05 BASIS OF PAYMENT.

Payment for Dowel Bar Retrofit will be paid at the contract unit price per each bar. Payment shall be considered full compensation for furnishing all labor, equipment, and materials necessary to perform the work prescribed in this specification.