Special Specification 3009
Dowel Bar Retrofit

1. DESCRIPTION

Furnish and install dowel bars in an existing concrete pavement including the bar supports where required, cutting and preparation of slots for the dowel bar placement, and furnishing and placing the concrete repair material to complete the dowel bar retrofit.

The dowel bar retrofit procedure to be followed and materials to be used shall be as detailed on the plans and as described herein.

2. MATERIALS

2.1 Concrete. All concrete shall conform to the item "Concrete for Structures", with the following exceptions or additions.

- All aggregate shall come from siliceous sources only. The aggregate may be crushed. Limestone will not be permitted.
- The maximum size of coarse aggregate shall be 1/2 in.
- All aggregate shall be supplied washed.
- No more than 15% of the mix shall be composed of any one size of aggregate.
- Water reducing admixtures may be used. Water reducing/retarding admixtures shall not be use. Shrinkage reducing or shrinkage compensating admixtures may be used.
  Any admixtures used shall be documented as to type; quantity and location mix was placed.
  Permanent documents shall be included on the final plans.
- Water to cement ratio shall not exceed 0.38, expressed as pounds to water to pounds of cement.
- The concrete mix shall be designed to achieve a minimum average flexural strength of 570 lb. per sq. in. at the age of 2 days (48 hours when tested in accordance with Test Method Tex-400-A.
- Proprietary, rapid setting mixes may be used, and must meet the requirements of DMS 4655 "Concrete Repair Materials" Type A material. Manufacturer's specifications on the use of proprietary mixes shall modify these specifications where applicable. Such mixes shall be approved by the Engineer and documentation as to prior use and 10 year life in similar applications shall be provided before material is used for repairs. Locations where used a material properties shall be documented on final plans.

2.2 Dowel Bars

- The approved load transmission devices shall be smooth, epoxy coated, steel dowel bars 18 in. in length. Use a 1-1/2 in. diameter dowel bar for existing pavement thickness greater than 10 in. Use 1-1/4 in. diameter dowel bar for existing pavement thickness equal to or less than 10 in. The dowel bars shall conform to ASTMA615 Grade 60. Equivalent non-steel dowel bars may be used when approved by the Engineer.
- The ends of the bars shall be smooth and free of shearing burrs before they are epoxy coated.
- The epoxy coating shall meet the requirements of Special Specification Item 8227, "Epoxy Coating of Reinforcing Steel".
- MC-250 or other approved materials shall be applied to the epoxy coated bar for half the length plus 2 in. to prevent bond. The film shall remain intact.
- The dowel bars shall be supported in the slots so that the bar centerline coincides with the pavement mid-slab depth and is parallel to the pavement centerline.

- The dowel supports shall be metal chairs, other devices, or methods approved by the Engineer prior to use.

2.3 Epoxy materials or bonding new concrete to old concrete or for concrete repair materials shall conform to the Item, “Epoxy”.

2.4 The joint filler shall be a temporary filler board or Styrofoam material to be placed at the mid-length of the dowel to prevent the repair material from entering the joint. The maximum thickness shall be 3/8 in. Plywood, hardwood, or softwood strips shall not be used.

2.5 Membrane curing compound shall comply with the requirements of the Item “Membrane Curing” Type 2.

3. CONSTRUCTION

The dowel bar retrofit procedure is designed to restore load transfer between abutting slabs at the traverse joint. The dowel installation shall be performed after under sealing and slab jacking.

The dowels shall be placed at the locations and spacing as detailed on the plan sheet for “Dowel Bar Retrofit”.

3.1 Slot Formation.

- The slot shall be formed by multiple saw cuts made with a diamond impregnated saw blade, to the mid-depth of the slab plus 1 1/4 in. This depth will provide minimum 1/2 in. clearance under the dowel bars for the support devices and for encasing the dowels in the repair material.
- The slot shall be a minimum of 3 in. wide but shall not exceed 4 in. in width.
- The length of the cut shall allow the dowel bar to be placed at the mid-depth of the slab without touching the ends of the slot.
- The “fins” formed by the sawing shall be removed using lightweight jackhammers (less than 30 lb.) or hand tools.
- Any slab, not broken at the joint prior to slot formation, but broken full depth through the slab at the slot or the formation of cracks propagating into the slab from the slot, shall be replaced by the Contractor performing the work, at the Contractor’s expense.

3.2 Preparation for Dowel Placement.

- The slot shall be rinsed with potable water, sand blasted, and blown clean and dry with high pressure air to remove sand, water and dust.
- The slot shall be prime/coated with an epoxy bonding agent designed to bond fresh concrete to cured concrete.
- The transverse joint/crack at the bottom of the slot shall be sealed or taped to prevent repair material from entering.

3.3 Dowel Placement.

- The dowel shall be placed on support chairs so that the dowel rests horizontal and parallel to the centerline of the pavement at the mid-depth of the slab.
- Temporary filler board, Styrofoam material or styrene board shall be placed at mid-length of the dowel to maintain the joint/crack and prevent the repair material from entering the joint or crack.
  The filler board, Styrofoam or styrene shall be removed during joint sawing and resealing operations.

3.4 Repair Material Placement.

- Concrete shall not be placed when the air temperature is less than 65ºF. The concrete repair material shall be placed and consolidated using a vibrator. The vibrator head shall not exceed 1 in. in diameter. Care must be taken not to dislodge or move the dowel bar out of position, but the repair material must fill space under the bar.
- The repair material shall be finished level with the existing slab surfaces.
- If a Portland cement mixture is used in lieu of a proprietary mixture, curing compound conforming to the Item, "Membrane Curing", shall be applied to the repair surface at 1 1/2 times the normal rate. If a proprietary mix is used, the manufacturer's curing procedure shall be followed.
- Insulation blankets may be used to facilitate curing and the strength gain of repair areas.

3.5 Opening to Traffic.

- All dowel bars at a joint shall be installed and the repair material shall have reached a flexural strength of 570 psi, when tested in accordance with Test Method Tex-420-A, prior to opening to traffic. If installation of all dowel bars at a joint cannot be completed prior to opening to traffic then no dowel bars shall be installed in that joint.
- Test specimens shall be made and cured with the placement to ascertain the condition of the repair prior to opening to traffic.

4. MEASUREMENT

Dowel bar retrofit will be measured as each dowel bar complete in place.

5. PAYMENT

The work performed and materials furnished in accordance with this Item and measured as provided under "Measurement" will be paid for at the unit price bid for "Dowel Bar Retrofit". This price shall be full compensation for all materials, tools, labor, equipment and incidentals necessary to complete the work.