MICHIGAN
DEPARTMENT OF TRANSPORTATION

SPECIAL PROVISION
FOR
DOWEL BAR RETROFIT FOR LOAD TRANSFER ACROSS CRACKS IN PCC PAVEMENT

a. Description.-This work shall consist of cutting slots at transverse cracks, placing dowel bars in the slots, and filling the void with a concrete patching material. All work shall conform to details as shown on the plans and as specified in the 1996 Standard Specifications for Construction, unless modified below.

b. Materials.- Dowel bars shall be 460 mm long and 38 mm in diameter. They shall be epoxy coated, or encased in a sleeve, according to Subsection 914.08 of the 1996 Standard Specifications for Construction, except that the epoxy coating or sleeve shall be the full length of the dowel bar.

Expansion caps shall be made of plastic as approved by the Engineer, and of the dimensions shown in Figure 2, shall have a 38 mm inside diameter, and shall provide a minimum of 13 mm of expansion space beyond the end of the dowel bar if using only one cap. If an expansion cap is used on each end of the dowel bar, each cap shall provide a minimum of 7 mm of expansion space.

Bond release agent for the dowel bars shall be selected from the Qualified Products List (QPL) for Coatings for Dowel Bar (Section 914).

Dowel bar chairs shall be made of either a non-metallic material, or an epoxy coated metallic material as approved by the Engineer.

Material used to re-form the crack shall be able to be cut to the width of slot +6 mm/-0 mm, fit around the dowel bar, and be a minimum of 6 mm below the existing pavement surface. It shall be of a continuous, one-piece, smooth compressible material and shall be a maximum of 6 mm thick. It shall also be semi-rigid such that it will not bend or fold over when the patching material is placed. Rubber materials will not be allowed unless it can be demonstrated to the Engineer that they can withstand bending or folding.

Bond breaker tape or joint sealant for sealing the crack shall be selected from the Qualified Products List. The bond breaker tape shall be selected from the Qualified Products List for Bond Breaker Tapes. The joint sealant shall be selected from the Qualified Products List for Sealant for Perimeter of Beam Repairs.

Concrete patching materials used to backfill the slots shall be selected from the Qualified Products List for Prepackaged Hydraulic Fast-Set Patching. The patching material shall be extended with aggregate up to the maximum amount specified in the QPL. If a curing compound is recommended by the manufacturer of the patching material, it shall be in accordance with Subsection 903.05 of the 1996 Standard Specifications for Construction.

The aggregate used in the patching materials shall be a dry, clean, crushed 26A gradation conforming to Subsection 902.03 of the 1996 Standard Specifications for

Construction, or equivalent as approved by the Engineer.

c. Construction Method.-

1. **Slot cutting.-**The slots shall be cut using a drum-type carbide machine or a diamond-bladed saw machine. The machine shall be capable of cutting a minimum of three slots simultaneously that are centered over the crack. Three slots will be made in each wheel path across each crack designated by the Engineer as shown in Figure 1. They shall be cut parallel to each other and with the longitudinal joints to the dimensions shown in Figure 2. Slots shall also be centered over the crack or as directed by the Engineer. If the crack wanders, the slots shall be cut to have at least 150 mm of the dowel bar on each side of the crack.

   If a minimum of 150 mm of dowel bar on each side of the crack is not achieved, payment for that slot shall be as follows:

Length provided	% of bid price
Less than 150 mm but more than 75 mm	50
Less than 75 mm	0

   The Contractor shall mark the cracks along their length so that the slot cutter can see them to properly place the slots.

   The transverse distance from the shoulder or longitudinal joint to the first slot may be increased by up to 50 mm if the longitudinal portion of the reinforcing mesh is inhibiting the removal of the slot concrete to the desired depth or width.

2. **Removal of Concrete.-**The concrete remaining in the slots after sawing shall be removed with lightweight chipping hammers no greater than 13.6 kg. Concrete shall be removed in such a manner so as to prevent any pavement fractures caused by the removal operations.

3. **Spall Repair.-**Minor spalls, as defined in Subsection 602.03.P of the 1996 Standard Specifications for Construction, shall be repaired using the patching material used to backfill the slot. Intermediate and major spalls shall be repaired according to Subsection 602.03.P.

4. **Slot Cleaning.-**Any loose concrete shall be vacuumed or removed from the slot and all surfaces shall be dry, abrasive blast cleaned. Any exposed steel shall be blast cleaned to remove any rust or laitance. Immediately prior to placement of the dowels and patching material, the slots shall be final cleaned with moisture-free, oil-free compressed air having a minimum pressure of 620 kPa.

5. **Dowel Bar Placement.-**After final cleaning, the crack shall be sealed with a bond breaker tape or joint sealant to prevent the patching material from entering the crack. The chairs shall be made and situated for the dowel bars to be aligned in the center of the slot, horizontal, and lay 13 mm to 16 mm off the bottom of the

slot. When aligned correctly, dowels shall be true to the pavement surface and parallel to the pavement centerline.

When using one expansion cap, it shall be fitted on the trailing end of the dowel bar as shown in Figure 2. Total expansion capability, whether using one cap or two, shall be 13 mm.

The compressible material shall be placed to re-form the crack across the slot. The material shall be cut so that it is a minimum of 6 mm below the existing surface so as not to interfere with the finishing of the slot surface. It shall also be cut to the width of the slot +6 mm/-0 mm to provide a tight fit against that slot sidewalls. It shall be angled if necessary to align the crack on either side of the slot.

The bond release agent shall be applied over the entire dowel bar prior to placing the dowel bar into the slots. Any bond release agent spilled on any slot surface shall be immediately removed and the slot surface cleaned.

6. **Patching.-**The patching material shall be mixed with a portable or mobile mixer. The patching material shall be extended, by weight of the cement, with 26A aggregate up to a maximum extension rate as specified in the QPL, and placed according to the manufacturer's recommendations. The patching material shall then be consolidated using a hand-held vibrator if recommended by the manufacturer. The surface of the patch shall be finished flush with the surrounding concrete and cured according to manufacturer's recommendations, even if diamond-grinding of the concrete surface is to occur afterward.

   Prior to construction, the Contractor shall produce a trial batch of the patching concrete to a slump or consistency approved by the Engineer. The trial batch shall be proportioned and mixed at the maximum water/cement ratio recommended by the manufacturer and the maximum aggregate extension rate as specified in the QPL. During construction, patching concrete that the Engineer determines to be not uniform with the approved slump or consistency, shall either be discharged into a separate container and hand mixed to the specified uniform consistency or rejected and discarded at the Contractor’s expense.

   The slot walls and bottom must be dry before placement of the patching material, unless otherwise recommended by the manufacturer.

   The Department reserves the right to sample the patching material and conduct strength testing to verify that the mixture is meeting the requirements stated below.

Age of sample	Minimum strength
2 hrs.	13.8 MPa
4 hrs.	17.2 MPa
28 days	31.0 MPa

7. **Opening to Traffic.-**The patching material shall be cured for a minimum of four

hours, or as directed by the Engineer, before placing any vehicle loads on the repair.

d. Measurement and Payment.-

Contract Item (Pay Item)	Pay Unit
Dowel Bar Retrofit	Each

Payment for **Dowel Bar Retrofit** includes all labor, equipment, and materials required to cut and clean the slot, place the dowel bar, repair spalls, backfill with a concrete patching material, and cure the patching material.

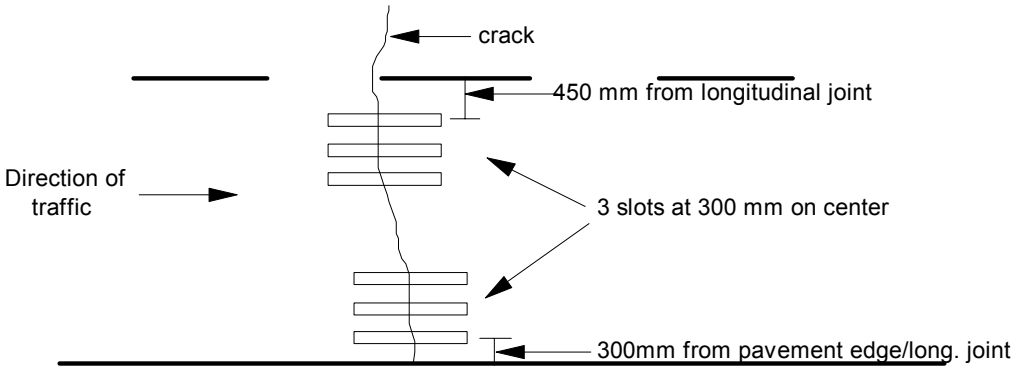

Figure 1. Placement of slots in lanes.

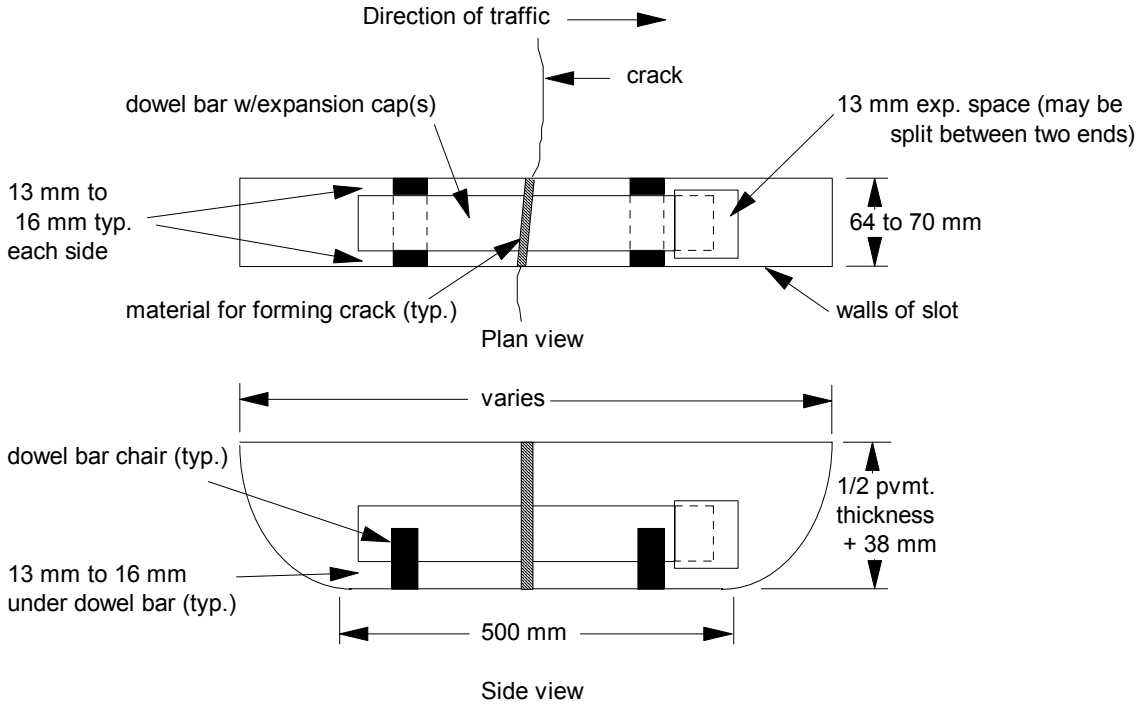

Figure 2. Slot dimensions.