

**ITEM 01502.4441 M - RETROFIT DOWELS IN PORTLAND CEMENT CONCRETE (PCC)**  
**PAVEMENT**

**DESCRIPTION.** Furnish and install new load transfer devices (LTDs) at transverse cracks and joints where indicated in the contract documents. Include sawing channels into which the devices will be placed, removing existing PCC to form the channels, abrasive blast cleaning all channel faces, caulking the crack or joint, placing and aligning the devices, and backfilling with a patching material.

**MATERIALS.**

**Retrofit LTDs.** Obtain retrofit LTDs from a supplier appearing on the Approved List for §705-15, Transverse Joint Supports. Each retrofit LTD consists of one dowel, two expansion caps providing 6 mm of expansion room each, a joint forming medium, and two epoxy coated or non-metallic supporting chairs having a width equal to the channel width which is 65 mm - 70 mm.

Use 460 mm long, 38 mm diameter, smooth, epoxy-coated steel dowels coated with a bond breaker. Dowels, epoxy coating, and bond breaker must meet §705-15, Transverse Joint Supports, except the "Tests" and "Basis of Acceptance" portions of §705-15 will not apply.

Use a joint forming medium that is:

- Compressible, yet rigid enough to maintain its shape during installation and backfilling.
- Treated with a release agent that prevents bond to the backfill material.
- Deep enough to extend from the channel bottom to the pavement surface.
- Equal to the joint or crack width (+ 6 mm/- 0 mm).
- Capable of being routed to accommodate joint or crack sealing.

Different widths of joint forming material are required for cracks of different crack widths.

At least 7 days prior to saw cutting channels, provide the Engineer certification from the supplier that the dowels meet the "Tests" requirements of §705-15, certification from the rolling mill as to the type and grade of steel used, and at least two shop drawings from the supplier that detail the:

- Expansion caps.
- Width, type, and positioning of chairs used to support and align the LTD.
- Material used as a joint forming medium.
- Brand of epoxy coating and the name and address of the Manufacturer.
- Name and address of the epoxy coating applicator.
- Brand of bond breaker and the name and address of the Manufacturer.

The Engineer will transmit a shop drawing to the Director, Materials Bureau, for approval. The Materials Bureau will approve, approve as noted, or reject the drawing within 14 days of submission to the Engineer. Revise rejected drawings as required by the Materials Bureau and re-submit them to the Engineer. Do not begin work until the Materials Bureau approves the drawings.

**Backfill Material.** Use HD-50, Five Star Highway Patch, Patchroc 10-60, or L & M Durapatch HiWay. Extend the prepackaged material with clean, surface dry crushed stone or crushed gravel

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meeting §703-02, Coarse Aggregate, and having a 1A gradation, maximum. Use an extension rate of 50 - 60 % by weight of the prepackaged material. Do not use crushed slag aggregate. Follow the Manufacturer's mixing instructions. Supply those instructions to the Engineer.

Alternate prepackaged portland cement based patching material may be submitted for use. Submit alternate materials and extension aggregate in 30 kg (maximum) bags to the Engineer for transmittal to the Materials Bureau for approval. Submit the same aggregate that will be used on the project. Alternate material must meet the requirements of Table 1, Backfill Material Requirements. The Materials Bureau will render a decision on material acceptability within 45 days of submission to the Engineer.

**TABLE 1 - BACKFILL MATERIAL REQUIREMENTS**

Property	Extension	Minimum	Maximum
3 Hour Compressive Strength	None	24 MPA	-
24 Hour Compressive Strength	None	35 MPA	-
Contraction	None	-	0.05 %
Freeze - Thaw Loss	60 %	-	1.0 %
Bond to SSD PCC	60 %	2.8 MPA	-
Bond to Dry PCC	60 %	2.1 MPA	-
Working Time	60 %	15 Minutes	-
Chloride Content		-	0.0 %
Magnesium Phosphate Content		-	0.0 %

**CONSTRUCTION DETAILS.**

Channel Construction. Construct four channels per wheelpath (eight per lane). Space channels 300 mm apart on center. For 3.6 m wide slabs, construct the outer channels 300 mm from the longitudinal joints. For 4.2 m wide slabs, slabs with nonstandard widths, or pavements with longitudinal joints offset from permanent longitudinal pavement markings that define a travel lane, construct the outer channels 300 mm from the nearest edge of the permanent longitudinal markings. In any case, do not construct channels within 300 mm of a longitudinal joint. The Engineer may require additional channels in non-standard slab widths to ensure four dowels are placed in each wheelpath.

Make saw cuts with a diamond blade concrete saw equipped with a minimum of three saw blades of the same diameter. Space the blades on the saw arbor such that resulting channel width equals the supporting chair width. Make the saw cuts parallel to the pavement longitudinal joint and to each other, with equal lengths on either side of the crack. Make the saw cuts sufficiently deep such

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that, when placed, the longitudinal axes of the dowels are at midslab and 13 mm - 19 mm of backfill material will surround the dowels and expansion caps.

Remove concrete between the outer saw cuts with a pneumatic chipping hammer weighing no more than 13.6 kg, including muffler and bit. Remove concrete burrs such that the dowels will sit parallel to the pavement surface and the backfill material will completely encase the bar. Schedule operations such that the concrete between saw cuts is removed as close to dowel installation as possible. Do not allow traffic on the channels after the concrete has been removed.

Cleaning Channels. As close to backfill placement as possible, thoroughly abrasive blast all faces of the channel to remove all residue and roughen the surface. Immediately before placement, air blast the channel to remove remaining any debris. The Engineer will check for dust by wiping the channel faces with a dark cloth or glove.

LTD Installation. Before placing LTDs, apply a commercial caulk to all crack faces within the channel. Apply bonding agents, including water, to the channel faces in accordance with the Manufacturer's instructions. Provide those instructions to the Engineer. If water is used, blow the excess from the repair such that no standing water remains. Do not place primer or backfill material when the concrete substrate is outside the temperature range of 7°C to 38°C.

Place and support the LTDs in accordance with the approved shop drawings such that the:

- Joint forming medium is aligned with the crack or joint.
- Supporting chair abuts the vertical channel faces to prevent movement during backfilling.
- Longitudinal axis of each dowel is at the mid-depth of the pavement slab ( $\pm 6$  mm).
- Longitudinal midpoint of each dowel is within 25 mm of the crack.
- Longitudinal axis of each dowel is aligned parallel with the pavement centerline and pavement surface such that the maximum misalignment of one dowel end relative to the other is 4 mm.

Backfill Placement. After the dowel is positioned, slightly overfill the entire channel with backfill material. Follow Manufacturer's instructions regarding placement time limits. Supply those instructions to the Engineer. Thoroughly consolidate the material using narrow (less than 25 mm), hand-held spud vibrators. Do not touch the LTD with the vibrator.

Fill whole channels with each batch of material. Discard the remaining portion of a mixed batch if it will not completely fill a channel, if placement time limits are exceeded, or if the material is not uniformly consolidating under vibration.

Finish the surface of the backfill material with as little hand finishing as possible. If the retrofit patches will not be diamond ground, finish the surface at the same elevation and cross-slope as the adjacent concrete. If the retrofit patches are to be diamond ground, leave the patch surface approximately 3 mm higher than the surrounding pavement surface.

Cure the backfill material in accordance with the Manufacturer's instructions. Supply those instructions to the Engineer.

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**METHOD OF MEASUREMENT.**

The Engineer will count the number of retrofit LTDs installed.

**BASIS OF PAYMENT.**

The unit bid price per LTD includes the cost of furnishing all labor, equipment and material necessary to complete the work. No additional payment will be made for items required by the Contractor to repair damage to the adjacent pavement incurred during any operation. Additional payment will be made for extra work required by the Engineer if the PCC surrounding or below the channel is unsound.

This specification is  
DisApproved