

CW 3230 – FULL-DEPTH PATCHING OF EXISTING PAVEMENT SLABS AND JOINTS

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1. GENERAL CONDITIONS

The General Conditions and Standard Provisions attached hereto shall apply to and be a part of this Specification.

2. DEFINITION

2.1 Full Slab Replacement

One or more slabs, to a maximum of five (5) consecutive slabs, in which the patch area is defined by the existing perimeter of the slab(s). If more than five (5) consecutive slabs require replacement, pavement removal shall be done and paid for in accordance with Specification CW 3110 and construction of Portland cement concrete pavement shall be done and paid for in accordance with Specification CW 3310.

2.2 Partial Slab Patch

Any portion of slab or slabs in a single lane in which the patch area requires a saw-cut along at least one side to define the perimeter of the patch. Patches spanning both sides of a longitudinal joint will be considered as one patch only if the patch can be done as one pour; if the longitudinal joint is repaired one lane-at-a-time, it shall be considered as two patches.

3. DESCRIPTION

This Specification shall cover all operations relating to full-depth patching of concrete pavement slabs and joints, and private approaches.

The work to be done by the Contractor under this Specification shall include the furnishing of all superintendence, overhead, labour, materials, equipment, tools, supplies and all other things necessary for and incidental to the satisfactory performance and completion of all work as hereinafter specified.

5. MATERIALS

5.1 General

The Contractor shall be responsible for the supply, safe storage and handling of all materials set forth in this Specification.

5.2 Handling and Storage of Materials

All materials shall be handled in a careful and workmanlike manner, to the satisfaction of the Contract Administrator.

5.3 Testing and Approval

All materials supplied under this Specification shall be subject to inspection and testing by the Contract Administrator or by the Testing Laboratory designated by the Contract Administrator. There shall be no charge to the City for any materials taken by the Contract Administrator for testing purposes.

The Contract Administrator shall approve all materials before any construction is undertaken. If, in the opinion of the Contract Administrator, such materials, in whole or in part, do not conform to the Specification detailed herein or are found to be defective in manufacture or have become damaged in transit, storage or handling operations, then such materials shall be rejected by the Contract Administrator and replaced by the Contractor at his own expense.

5.4 Concrete Materials

All concrete materials shall conform to the requirements of Sections 5 and 6 of Specification CW 3310.

5.5 Dowels

Dowels shall be Grade 300 plain bars, with the ends of the dowels free of burs and distortion.

5.6 Tie Bars

Tie bars shall be Grade 300 deformed bars.

5.7 Epoxy-Coating

Unless otherwise specified in the Specifications for the Work, tie bars and dowels shall be shop coated with epoxy conforming to the requirements of ASTM Standard D3963. All visible defects in the epoxy coating shall be field-coated with epoxy touch-up paint.

5.8 Bonding Agent

Epoxy resin shall be of a type listed in the Approved Products for Surface Works, conforming to the requirements of ASTM Standard C881. Type 1, Grade 3 epoxy shall be used for bonding tie bars and dowels into hardened concrete.

Bonding agents for bonding tie bars and dowels into holes in hardened concrete other than epoxy resin may be permitted provided that they develop a minimum pullout resistance of 50 kN within 48 hours after installation. Alternative bonding agents are listed in the approved products list.

5.9 Miscellaneous Materials

Miscellaneous materials shall be of the type specified on the Drawings and approved by the Contract Administrator.

8. EQUIPMENT**8.1 Drills**

Drills used to make holes for installing dowels shall be held in a rigid frame.

9. CONSTRUCTION METHODS

9.1 Pavement Removal

When an entire pavement slab is being replaced, care shall be taken to ensure that the remaining pavement along the joints is not chipped or broken.

Where only a portion of a pavement slab is being replaced, the Contractor shall saw-cut the pavement surface along the perimeter of the area designated for removal.

Where the finished pavement shall be a concrete surface, the pavement shall be double cut. First, saw-cut to full-depth, a single cut along the perimeter of the area designated for removal. Then cut full depth a second saw cut, 150mm inside the first cut. Should the adjacent pavement chip, spall or otherwise be damaged, the Contractor shall re-saw cut the pavement edge and remove the damaged concrete to the Contract Administrator's satisfaction.

When the concrete pavement or concrete base exceeds 200 mm in thickness, a 200 mm saw cut will be considered full-depth. Alternately, and where approved by the Contract Administrator, the pavement shall be saw cut to a minimum depth of 50 mm.

Where the perimeter of a patch is within 1000 mm of a joint or the pavement edge, the area to be patched shall be extended to the edge of the pavement slab.

The Contractor shall remove the existing deteriorated concrete within the patch area by carefully breaking down and removing deteriorated concrete, or for full-depth cuts only, by lifting out the deteriorated pavement in one piece.

Removal of deteriorated concrete shall be done in such a manner that the adjacent pavement is not damaged. The edge of the adjacent pavement shall be a vertical face. Where the edge of adjacent pavement is spalled at the surface or undercut below the surface by the removal operation, the Contractor shall re-saw the adjacent pavement beyond the limit of the spalled or undercut pavement area and remove the damaged concrete. This additional patching shall be carried out at the expense of the Contractor.

When an asphalt overlay will be placed over the full depth repairs, the pavement shall be single cut full depth. Up to 35 millimetre wide chips or spalls along the edge of the adjacent pavement will be allowed. No additional saw cutting and removal will be required. When chips or spalls are greater than 35 millimetres in width, the pavement shall be re-saw cut with a single full depth cut to the Contract Administrator's satisfaction.

When concrete curb forms part of the concrete pavement designated for removal, the curb shall be removed prior to the saw cutting of the designated patch area, and paid for in accordance with Specification CW 3240.

Disposal of material shall comply with the requirements of Section 9.5 of this Specification.

9.2 Base Preparation

Excavation of existing in-site material, sub-grade preparation, and sub-base construction, if authorized by the Contract Administrator, shall be supplied, placed, and paid for separately in accordance with Specification CW 3110 and the Standard Details.

Where required as a leveling course, a maximum thickness of 50 mm of approved material shall be supplied, and placed in accordance with Specification CW 3110. Additional base course required by the contract administrator, shall be supplied, placed, and paid for in accordance with Specification CW 3110.

No payment shall be made for leveling course.

Where existing base is adequate, it shall be mechanically compacted to the satisfaction of the Contract Administrator. The cost of compaction shall be incidental to the cost of the patching.

9.3 Placement of Reinforcing Steel, Dowels and Tie Bars

The Contractor shall supply reinforcing steel in conformance with Specification CW 3310 and the Drawings.

The Contractor shall drill holes into adjacent slabs for dowels and tie bars of the diameters and depths shown on the Standard Details. Drill bits shall have a diameter no larger than 2 mm larger than the nominal dowel or tie bar diameter.

Holes shall be located at mid-depth of the slab and spaced as indicated on the Drawings.

Drilling equipment shall be operated so as to ensure that no damage to the pavement results from such drilling operation.

Holes for dowels and tie bars shall be blown clean with compressed air. Bonding agent shall be placed in the back of the drilled hole. The dowel or tie bar shall be worked back into the holes for complete coverage around the portion of the bar that extends into the hole, such that bonding agent is squeezed from the hole.

Dowels shall be installed parallel to one another and to the longitudinal direction of the pavement. A maximum tolerance of 5 mm in the vertical and horizontal direction over the length of the dowel is permitted.

Following installation of dowels, the ends of the dowels that extend into the patch area shall be completely coated with MC 250 asphaltic cut back.

Where dowel assemblies are to be placed across transverse joints, they shall be installed and paid for in accordance with Specification CW 3310.

Once all reinforcing steel is in position, it shall be inspected and approved by the Contract Administrator before any concrete is placed. Otherwise the concrete may be rejected by the Contract Administrator and shall be removed by the Contractor at his own expense.

9.4 Placing Full-Depth Patches

Forms shall be used on all exposed edges of the patch, placed in accordance with the requirements of Specification CW 3310.

Placing, consolidation, finishing, curing and sealing shall comply with the requirements of Specification CW 3310, with the following exceptions:

Each patch shall be placed in one continuous full-depth operation.

Short patches less than 3.5 metres in the longitudinal direction shall be screeded either perpendicular or, where adjacent pavement is worn, parallel to the longitudinal direction. For lane-width patches greater than 3.5 metres long, the screed shall be placed perpendicular to the longitudinal direction.

Lane-width patches greater than 3.5 metres in length which are to be finished flush with adjacent pavement shall be finished with a suitable finishing machine that has at least one vibrating screed.

All patches finished flush with adjacent pavement shall be straight-edged. While the concrete is still plastic, the surface of the patch shall be checked with a 3 metre long metal straight edge. The straight edge shall be in contact with the existing pavement while drawing it across the patch. Any depressions or high spots exceeding 5 mm shall be immediately corrected.

Where a transverse joint is included in a concrete patch and is not aligned with transverse joints in adjacent lanes, tie bars shall be omitted and a bond breaker installed along the longitudinal joint between the transverse joint of the adjacent lane or lanes and the nearest transverse edge of the patch.

Where the distance along the longitudinal joint between the transverse joints in the adjacent lane to the closest end of a concrete patch exceeds one metre, both ends of the new patch shall be tied and a transverse joint saw-cut in the original location and sealed in accordance with the requirements of Specification CW 3310.

Where required, the curb shall be constructed such that it will be consistent with adjacent existing curb, either separate or integral. The curb renewal shall be done and paid for in accordance with Specification CW 3240.

9.5 Disposal of Material

Disposal of material shall be understood to mean the removal of a material from the site, hauling of the material along a route approved by the Contract Administrator and the unloading and grading of the material in a manner satisfactory to the Contract Administrator at a legal disposal site.

If a disposal site is not otherwise indicated in the Specifications for the Work, the Contractor shall locate a legal disposal site and identify a haul route to be approved by the Contract Administrator.

Material dropped or spilled on any street during the hauling operations shall be promptly cleaned up by and at the expense of the Contractor, to the satisfaction of the Contract Administrator.

9.6 Maintenance of Traffic

The renewal of sections of pavement slab must proceed in such a manner as to conform to the requirements for maintenance of traffic as set out in the Standard Provisions or as directed by the Contract Administrator.

9.7 Opening to Traffic

In no case shall traffic or construction equipment be allowed on reconstructed sections of Portland cement concrete pavement until the concrete has reached a minimum compressive strength of 20 MPa.

10. QUALITY CONTROL

10.1 Inspection

All workmanship and all materials furnished and supplied under this Specification are subject to close and systematic inspection and testing by the Contract Administrator including all operations from the selection and production of materials through to final acceptance of the specified work. The Contractor shall be wholly responsible for the control of all operations incidental thereto notwithstanding any inspection or approval that may have been previously given. The Contract Administrator reserves the right to reject any materials or works that are not in accordance with the requirements of this Specification.

10.2 Corrective Action

The Contractor shall, at his own expense, correct such work or replace such materials found to be defective under this Specification in an approved manner to the satisfaction of the Contract Administrator.

11. QUALITY ASSURANCE

11.1 Quality Assurance Testing

Concrete Tests shall be in done in accordance with CSA A23.2

The Contract Administrator shall ensure the number and frequency of quality assurance tests as follows:

One concrete test shall consists of:

- Slump test
- Air test
- One lab cure cylinder – 7 day break
- Two lab cure cylinders – 28 day break

The minimum testing frequency per day for each mix design, shall be as follows:

- If less than 8 cu.m. of concrete per day: One test
- 8 or more cu.m per day per mix design:
One test on the first truck then one test every 50 cu.m. or part thereof, with a minimum of 2 tests per day.

If any air or slump test fails for any concrete load in the day's pour, continue to test slump and air on succeeding trucks until consistency is established.

Additional testing shall be as directed by the Contract Administrator. To establish the field strength for early opening of pavement, take additional field cure cylinders with the break time to match the concrete mix.

11.2 Test Failure

Concrete that fails to meet the requirements of CW 3310 for slump or air shall be retested. If the second test fails to meet the requirements of CW 3310 for slump or air, the load of concrete shall be rejected by the Contractor.

12. METHOD OF MEASUREMENT**12.1 Full Slab Replacement**

Replacement of complete slabs will be measured on a surface area basis. The surface area to be paid for shall be the total number of square metres removed and replaced in accordance with this Specification and accepted by the Contract Administrator, as computed from measurements made by the Contract Administrator.

Replacement of partial slabs adjoining complete slabs will be measured in accordance with Clause 12.2 of this Specification.

12.2 Full-Depth Partial Slab Patches

Full-depth partial slab patches will be measured on a surface area basis and classified in accordance with the following dimensions:

TABLE 1
CW 3230-R4.1

Class of Patch	Patch Area (m²)	x = Shortest Patch Dimension (m)
A	less than or equal to 3.0	$x \geq 1.0$
B	over 3.0	$1.8 \geq x \geq 1.0$
C	less than or equal to 8.0	$x > 1.8$
D	greater than 8.0	$x > 1.8$

The surface area to be paid for shall be the total number of square metres removed and replaced in accordance with this Specification and accepted by the Contract Administrator. Any patch that is less than 1.0 square metre in area will be measured as 1.0 square metre.

12.3 Dowels in Drilled Holes

Installation of dowels into hardened concrete will be measured on a unit basis. The number to be paid for shall be the total number of dowels of specified diameters supplied and installed in accordance with this Specification and accepted by the Contract Administrator.

12.4 Tie Bars in Drilled Holes

Installation of tie bars into hardened concrete will be measured on a unit basis. The number to be paid for shall be the total number of tie bars of specified diameters supplied and installed in accordance with this Specification and accepted by the Contract Administrator.

13. BASIS OF PAYMENT**13.1 Full Slab Replacement**

Replacement of complete slabs will be paid for at the Contract Unit Price per square metre for the "Items of Work" listed here below, measured as specified herein, which price shall be payment in full for supplying all materials and for performing all operations herein described and all other items incidental to the work included in this Specification.

Items of Work: Slab Replacement

- i. 250mm Concrete Pavement (**)
 - ii. 230mm Concrete Pavement (**)
 - iii. 200mm Concrete Pavement (**)
 - iv. 150mm Concrete Pavement (**)
- ** Specify either Reinforced or Plain-Dowelled

13.2 Full Depth Partial Slab Patches

Full-depth partial slab patches will be paid for at the Contract Unit Price per square metre for "Items of Work", listed here below, measured as specified herein, which price shall be payment in full for supplying all materials and for performing all operations herein described and all other items incidental to the work included in this Specification.

Items of Work: Partial Slab Patches *

- i. 250mm Concrete Pavement
 - ii. 230mm Concrete Pavement
 - iii. 200mm Concrete Pavement
 - iv. 150mm Concrete Pavement
- * Specify class of patch

13.3 Dowels in Drilled Holes

Installation of dowels into hardened concrete will be paid for at the Contract Unit Price for "Drilled Dowels", measured as specified herein, which price shall be payment in full for supplying all materials and for performing all operations herein described and all other items incidental to the work included in this Specification.

*Specify diameter(s) of dowels

13.4 Tie Bars in Drilled Holes

Installation of tie bars into hardened concrete will be paid for at the Contract Unit Price for "Drilled Tie Bars", measured as specified herein, which price shall be payment in full for supplying all materials and for performing all operations herein described and all other items incidental to the work included in this Specification.

*Specify size(s) of tie bars.