

ITEM 01502.603X M - PORTLAND CEMENT CONCRETE PAVEMENT PARTIAL DEPTH REPAIRS... (Entire Series)

DESCRIPTION. Patch previously prepared portland cement concrete (PCC) pavement areas having depths less than 100 mm. Use Class D concrete, High Early Strength concrete, Concrete Repair Material, Rapid Setting Concrete Repair Material, or Rapid Setting Polymer Concrete as required by the contract documents.

MATERIALS AND EQUIPMENT.

Portland Cement Concrete, Class D	501
Concrete Repair Material	701-04
Rapid Setting Concrete Repair Material	701-09
Coarse Aggregate	703-02
Premoulded Resilient Joint Filler	705-07
Portland Cement Mortar Bonding Grout	705-22
Membrane Curing Compound	711-05
Admixtures	711-08
Water	712-01
Rapid Setting Polymer Concrete	721-20
Non-Chloride Accelerator Admixture	Approved List

Class D Concrete. Apply Section 501, Portland Cement Concrete - General.

High Early Strength (HES) Concrete. Design the HES mix to satisfy the opening to traffic time requirements of the project and Table 1, High Early Strength Concrete Mix Requirements. Submit the HES concrete mix design to the Engineer. Include admixture brands and dosages as well as mixing, transporting, placing, curing, and anticipated strength gain details. Use neutralized vinsol resin based air entraining agents only. Water reducers, if used, must be Type A (Normal). Use only one brand of accelerator at any one time. Use coarse aggregate having a 1A gradation. Do not use Type III cement.

TABLE 1 - HIGH EARLY STRENGTH CONCRETE MIX REQUIREMENTS

Property	Minimum	Desired	Maximum
28 Day Compressive Strength (Trial Batch)	30 MPa	-	-
Opening Compressive Strength (Project)	17 MPa ¹	-	-
Air Content	5.0%	6.5%	8.0%
Slump	40 mm	-	90 mm

¹ See Opening to Traffic below.

Produce and place a 1.0 m³ (minimum) trial batch at an off-project location approved by the Engineer. Produce the trial batch using the same materials and processes as those to be used to produce the project concrete. Provide the Engineer a 7 day minimum advance notice of trial batch production. Coordinate trial batch production to ensure the presence of the Engineer, the Regional Materials Engineer, and Materials Bureau personnel.

ITEM 01502.603X M - PORTLAND CEMENT CONCRETE PAVEMENT PARTIAL DEPTH REPAIRS... (Entire Series)

Provide an ACI Certified Concrete Field Testing Technician, Grade I, or higher, to:

- Measure slump, air content, and unit weight.
- Cast cylinders for compressive strength and freeze-thaw resistance testing.

Determine the compressive strength of the trial batch concrete at the desired time as discussed below in Project Strength Determination.

The Materials Bureau will render a decision on mix acceptability, curing, and opening to traffic requirements within 35 days of trial batch production. Changes other than minor fluctuations in admixture dosage rates require a new mix design and trial batch. Mix design approval does not relieve the Contractor's responsibility of achieving the specified requirements during the project. The Engineer may halt placement and order additional trial batches whenever the specified properties are not achieved.

Concrete Repair Material or Rapid Setting Concrete Repair Material. Use only cementitious repair materials appearing on the Approved List. Give the Engineer the Manufacturer's written instructions for mixing, bonding, placing, and curing the material. Follow the Manufacturer's instructions. Do not exceed the prescribed water amount. Extend concrete repair materials with coarse aggregate having a 1A gradation. Use a maximum aggregate extension rate of 60% of the dry, pre-packaged weight of repair material. Determine the aggregate moisture content and adjust the mix water added accordingly.

Rapid Setting Polymer Concrete. Use rapid setting polymer concrete appearing on the Approved List. Give the Engineer the Manufacturer's written instructions for mixing, bonding, placing, and curing the material. Follow the manufacturer's instructions, including all aspects of the Manufacturer's Safety Data Sheets when handling rapid setting polymer concrete and their primers. Extend rapid setting polymer concrete with coarse aggregate having a 1A gradation. Use a maximum aggregate extension rate of 75% of the dry component weight of the repair material. Extension aggregates must contain no moisture at the time of mixing.

Vibrators. Use hand-held vibrators having a maximum diameter of 25 mm and capable of operating through a frequency range of 6000 - 9000 vibrations per minute.

CONSTRUCTION DETAILS. Convene a pre-repair meeting 7 to 14 days before the planned start of repair preparation with the Engineer to coordinate all aspects of patch preparation and material placement including mixing, transport, and discharge, material requirements and testing, and personnel requirements.

Clean the Repair Bottom and Vertical Faces. Thoroughly abrasive blast all repair faces that will be in contact with the repair material such that uniformly abraded surfaces result, free of any dirt, loose particles, oil, or other material that may prevent bond.

After abrasive blasting, air blast the repair to remove abrasives and any moisture from the repair. The Engineer will check the air stream with a clean, white cloth to ensure no oil or contaminants are included in the air blast.

ITEM 01502.603X M - PORTLAND CEMENT CONCRETE PAVEMENT PARTIAL DEPTH REPAIRS... (Entire Series)

Place Joint or Crack Insert. Fill joints or cracks that abut or cross the repair with a commercial caulk such that no repair material enters the joint or crack. Align premoulded resilient joint filler or commercial waxed corrugated cardboard with joints or cracks that abut or cross the repair area. Use an insert of the same thickness as the joint or crack width, ± 3 mm. Place inserts such that no repair material enters the joint or crack. Leave the filler in place after the repair is complete.

Apply Bonding Agent. Immediately before the bonding agent is applied, the Engineer will check the cleanliness of the repair area receiving faces by wiping them with a dark brown or black cotton cloth or glove. Re-clean the repair bottom and vertical faces as described above if residue is found.

Use Portland Cement Mortar Bonding Grout if the repair material is Class D concrete or HES concrete. Mix the grout in small quantities to ensure freshly mixed grout is routinely placed. Mix the grout to a consistency that can be applied to the prepared surfaces without running or puddling. Evenly apply a thin coat of grout with a stiff bristle brush or broom to all surfaces receiving the repair material such that all cavities are coated. Slightly overlap the surrounding pavement surfaces. Do not apply bonding agent to the joint filler.

Follow the Manufacturer's instructions regarding the type and application of bonding agent, including water, for all other repair materials. If water is used, blow excess from the repair such that no standing water remains.

Placement. Small construction mixers or paddle mixers may be used, provided the proper slump and air is obtained and all Manufacturer's instructions are followed. Ready mix trucks may be used if quantities are sufficient. Use wheelbarrows, buggies, or other transporting vehicles to bring the repair material to the prepared area. Use shovels for very small patches. Place Class D concrete or HES concrete before the bonding grout dries. Slightly overfill the repair area. Consolidate the material with hand-held vibrator.

Finishing. If the pavement will be diamond ground after spalls are repaired, leave the repair material slightly higher (3 mm) than the surrounding pavement. If the pavement will not be diamond ground, finish the repair area to meet the surrounding pavement surface elevation. Keep hand finishing to a minimum. Hand trowel from the center of the patch outward toward the edges. Do not add any additional water to the repair surface.

Curing. Thoroughly coat Class D and HES concrete with a double coat of curing compound meeting §711-05, Membrane Curing Compound at a minimum rate of 7.0 m²/l. Cure other materials in accordance with the Manufacturer's instructions.

Opening Class D or HES Concrete to Traffic. If no opening to traffic time frame is specified in the contract documents, open Class D concrete to traffic five days after placement. If an opening to traffic time frame is specified in the contract documents, open Class D or HES concrete to traffic after it has achieved a compressive of 17 MPa as discussed below in Project Strength Determination. The five day opening to traffic time frame may also be reduced if cylinders cast and tested as discussed below in Project Strength Determination indicate a compressive strength of 17 MPa has been achieved and the joints and cracks are sealed or filled in accordance with the contract documents.

ITEM 01502.603X M - PORTLAND CEMENT CONCRETE PAVEMENT PARTIAL DEPTH REPAIRS... (Entire Series)

Project Strength Determination. Provide an ACI Certified Concrete Field Testing Technician, Grade I, or higher, to cast all cylinders. Unless otherwise noted in the contract documents, use an agency accredited by the AASHTO Accreditation Program (AAP) in the field of construction materials testing of portland cement concrete to perform compressive strength testing. Cast and test in the presence of the Engineer, or the Engineer's representative. Provide acceptable proof of ACI Certification and AASHTO Accreditation to the Engineer before placing any concrete. The Engineer, or Engineer's representative, will complete the Concrete Cylinder Report as cylinders are cast and tested.

Cast a minimum of 3 cylinder pairs (6 total) from each days placement in accordance with Materials Method 9.2, Field Inspection of Portland Cement Concrete. Cast each pair from different delivery trucks. Develop an Engineer-approved marking system that allows a cylinder to be readily associated with the corresponding placement location and placement time. Mark the cylinders and place them adjacent to the pavement under similar curing conditions. Determine the concrete compressive strength at the desired time in accordance with ASTM C39, Standard Test Method for Compressive Strength of Cylindrical Concrete Specimens. A placement may be opened to traffic if all the following apply:

- Average compressive strength of all cylinder pairs exceed 17 MPa.
- Average compressive strength of each cylinder pair exceeds 14 MPa.
- Appropriate time frame has elapsed for the entire area to be opened.

If these conditions are not met, test 3 additional cylinder pairs at a later time, provided the appropriate number of additional cylinders were cast. If the above conditions are not met after additional testing, or, if the required number of additional cylinders were not cast, open the placement to traffic after 5 days.

Project testing for 28 day compressive strength is not required. If subsequent trial batches are required, the engineer may waive the 28 day compressive strength testing.

Opening Other Materials to Traffic. Open other repair materials as follows:

Material	Time to Opening
Concrete Repair Material (701-04)	24 hours after placement
Rapid Setting Concrete Repair Material (701-09)	3 hours after placement
Rapid Setting Polymer Concrete (721-20)	3 hours after placement

METHOD OF MEASUREMENT. The Engineer will compute the square meters of repair material placed calculated to the nearest 0.01 m².

BASIS OF PAYMENT. In the unit bid price include the cost of all materials, equipment, and labor necessary to complete the work. Payment will be made under:

ITEM 01502.603X M - PORTLAND CEMENT CONCRETE PAVEMENT PARTIAL DEPTH REPAIRS... (Entire Series)

Item Number	Item	Pay Unit
01502.6030 M	PCC Pavement Partial Depth Repairs Using Class D Concrete	Square Meter
01502.6031 M	PCC Pavement Partial Depth Repairs Using HES Concrete	Square Meter
01502.6032 M	PCC Pavement Partial Depth Repairs Using Concrete Repair Material	Square Meter
01502.6033 M	PCC Pavement Partial Depth Repairs Using Rapid Setting Concrete Repair Material	Square Meter
01502.6034 M	PCC Pavement Partial Depth Repairs Using Rapid Setting Polymer Concrete	Square Meter
01502.6035 M	PCC Pavement Partial Depth Repairs Using Epoxy Paste	Square Meter

This specification is
DisApproved