



**CONSTRUCTION SPECIFICATION FOR  
REPAIRING RIGID PAVEMENT WITH PRECAST CONCRETE SLABS**

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**363.01 SCOPE**

This specification covers the requirements for repairing rigid pavement with precast concrete slabs using either the Fort Miller Super-Slab<sup>®</sup> Method or the Michigan Method. The work may include both continuous and intermittent slab repairs.

**363.01.01 Specification Significance and Use**

This specification is written as a municipal-oriented specification. Municipal-oriented specifications are developed to reflect the administration, testing, and payment policies, procedures, and practices of many municipalities in Ontario.

Use of this specification or any other specification shall be according to the Contract Documents.

### **363.01.02 Appendices Significance and Use**

Appendices are not for use in provincial contracts as they are developed for municipal use, and then, only when invoked by the Owner.

Appendices are developed for the Owner's use only.

Inclusion of an appendix as part of the Contract Documents is solely at the discretion of the Owner. Appendices are not a mandatory part of this specification and only become part of the Contract Documents as the Owner invokes them.

Invoking a particular appendix does not obligate an Owner to use all available appendices. Only invoked appendices form part of the Contract Documents.

The decision to use any appendix is determined by an Owner after considering their contract requirements and their administrative, payment, and testing procedures, policies, and practices. Depending on these considerations, an Owner may not wish to invoke some or any of the available appendices.

### **363.02 REFERENCES**

When the Contract Documents indicate that municipal-oriented specifications are to be used and there is a municipal-oriented specification of the same number as those listed below, references within this specification to an OPSS shall be deemed to mean OPSS.MUNI, unless use of a provincial-oriented specification is specified in the Contract Documents. When there is not a corresponding municipal-oriented specification, the references below shall be considered to be the OPSS listed, unless use of a provincial-oriented specification is specified in the Contract Documents.

This specification refers to the following standards, specifications, or publications:

#### **Ontario Provincial Standard Specifications, Construction**

OPSS 350	Concrete Pavement and Concrete Base
OPSS 360	Full Depth Repair of Concrete Pavement or Base
OPSS 369	Sealing or Resealing of Joints and Cracks in Concrete Pavement and Concrete Base
OPSS 510	Removal
OPSS 904	Concrete Structures
OPSS 905	Steel Reinforcement for Concrete
OPSS 929	Abrasive Blast Cleaning - Concrete Construction

#### **Ontario Provincial Standard Specifications, Material**

OPSS 1002	Aggregates - Concrete
OPSS 1302	Water
OPSS 1350	Concrete - Materials and Production
OPSS 1441	Load Transfer Assemblies
OPSS 1442	Epoxy Coated Steel Reinforcement for Concrete

#### **Ontario Ministry of Transportation Publications**

MTO Laboratory Testing Manual:

LS-602	Sieve Analysis of Aggregates
LS-619	Resistance of Fine Aggregate to Degradation by Abrasion in the Micro-Deval Apparatus
LS-704	Plastic Limit and Plasticity Index of Soils

### **CSA Standards**

- A23.1/23.2-04 Concrete Materials and Methods of Concrete Construction/Methods of Test and Standard Practices for Concrete  
A3000-03 Cementitious Materials Compendium  
A3004-C2 Test Method for Determination of Compressive Strengths [Part of CAN/CSA A3000-03, Cementitious Materials Compendium]

### **ASTM International**

- C 939-02 Flow of Grout for Preplaced-Aggregate Concrete (Flow Cone Method)

## **363.03 DEFINITIONS**

For the purpose of this specification, the following definitions apply:

**Bedding Grout** means a thin non-structural grout pumped into the grout distribution system that is cast in the bottom of the Fort Miller Super-Slab<sup>®</sup> Method to fill voids beneath the slabs to provide uniform support to the slab.

**Cement Treated Base** means granular base material stabilized with Portland cement.

**Continuous Precast Concrete Slab Repair** means the continuous replacement of multiple consecutive slabs of concrete pavement with inter-connecting precast concrete slabs.

**Diamond Grinding** means altering the profile and texture of a concrete pavement surface by using grinding equipment that employs diamond tip blades.

**Intermittent Precast Concrete Pavement Slab Repair** means a 2 to 4.5 m long repair carried out using a single precast slab.

## **363.04 DESIGN AND SUBMISSION REQUIREMENTS**

### **363.04.01 Submission Requirements**

#### **363.04.01.01 Precast Concrete Pavement Slab Repair Plan**

At least 2 weeks prior to the start of the work, the Contractor shall provide to the Contract Administrator details on the method of:

- a) Fabrication, transportation, and installation of each precast concrete slab repair method.
- b) Removal of existing concrete (i.e., sawcutting, removal, equipment, and disposal).
- c) Removal of hot mix asphalt repair.
- d) Base preparation.
- e) Precast slab placement.
- f) Grouting (i.e., equipment to be used for mixing and installing).

**363.04.01.02                    Precast Concrete Mix Design**

The Contractor shall be responsible for the precast concrete mix design and shall submit the concrete mix design to the Contract Administrator according to OPSS 1350.

Documentation shall be included with the submission of the mix design that demonstrates the proposed mix design and materials meet the requirements of this specification, including the air void system in the hardened concrete and the minimum specified 28-Day compressive strength.

All supporting test data shall not be more than 12 months old at the time the concrete mix design is submitted to the Contract Administrator.

**363.04.01.03                    Flowable Fill Mix Design - Michigan Method**

When flowable fill is used as a levelling material, the Contractor shall submit a concrete mix design for flowable fill to the Contract Administrator according to OPSS 1350. Trial batch documentation shall also be submitted to the Contract Administrator for review a minimum of 7 Days prior to placement.

**363.04.01.04                    Proprietary Concrete Repair Material (PCRM) - Product Details**

At least 7 Days prior to commencement of the work, the Contractor shall submit to the Contract Administrator the name of the PCRM selected for use and the manufacturer's specifications and recommendations for placement. The submission shall also include documentation verifying the suitability of the product for the application and evidence of successful performance in a similar application. The PCRM and supporting information provided by the Contractor shall be acceptable to the Owner.

**363.04.01.05                    Chipping Hammer**

At least one week prior to commencement of the work, the Contractor shall submit to the Contract Administrator a copy of the manufacturer's published specifications on the chipping hammers to be used.

**363.05                                MATERIALS**

**363.05.01                         Precast Concrete Slabs**

**363.05.01.01                    General**

The minimum compressive strength of concrete at 28 Days shall be 30 MPa. Testing of the concrete compressive strength shall be carried out according to CSA A23.2.

The air void parameters of the hardened concrete shall be a minimum air content of 3% and a maximum spacing factor of 0.230 mm.

Concrete shall meet the requirements of the materials section of OPSS 350 and OPSS 1350 with the following exceptions and additions:

- a) Concrete aggregates shall be according to OPSS 1002.
- b) The nominal maximum size of coarse aggregate shall be 19 mm.

**363.05.01.02                    Finishing**

Finishing of precast concrete slabs shall be according to OPSS 350.

**363.05.01.03                    Texturing of Surface**

Texturing of the precast concrete slab surface shall be according to OPSS 350, except that manual devices may be used to provide the required tined texture.

**363.05.01.04                    Tie Bars and Dowel Bars**

Tie bars shall be according to OPSS 1442. Dowel bars shall be according to OPSS 1441.

**363.05.01.05                    Dimensions**

Precast concrete slabs shall be full-lane width and length of 2 to 4.5 m. Prior to fabrication, the Contractor shall determine the concrete thickness at each repair location. Slabs may be cast a maximum of 15 mm thinner than the existing concrete to be repaired to accommodate the bedding material.

**363.05.02                        Fine Aggregate for Base Preparation - Fort Miller Super-Slab® Method**

Fine aggregate for base preparation shall be 100% crushed fine aggregate with a plasticity index of 0% according to LS-704 and a maximum micro-Deval abrasion loss of 35 according to LS-619. Fine aggregate means that portion of aggregate material passing the 4.75 mm sieve when tested according to LS-602.

**363.05.03                        Flowable Fill - Michigan Method**

Flowable fill shall consist of a mixture of Portland cement, coarse and fine aggregate, fly ash, and water, and may contain air entraining admixture or ground granulated blast furnace slag or both.

Portland cement shall be Type GU cement according to CSA A3000.

Fly ash shall be according to CSA A3000.

Coarse and fine aggregate shall meet the requirements of OPSS 1002 and shall have a maximum aggregate size of 12.5 mm.

The compressive strength of the flowable fill mixture shall not be less than 0.5 MPa or greater than 1.0 MPa at 28 Days.

If an air entraining admixture is used, then the air content of the flowable fill shall not exceed 35% of the flowable fill volume.

**363.05.04                        Bedding Grout - Fort Miller Super-Slab® Method**

Bedding grout shall be a mixture of cement, water, and plasticizing admixture. The grout mixture shall have a flow rate of 17 to 22 seconds as measured by ASTM C 939 to ensure fluidity. The compressive strength of the bedding grout shall be a minimum of 2.0 MPa at 12 hours.

**363.05.05                        Tie Bars and Dowel Bars**

Tie bars shall be according to OPSS 1442. Dowel bars shall be according to OPSS 1441.

**363.05.06                        Expansion Caps for Dowel Bars**

Caps shall be tight-fitting and made of compressible non-absorptive closed cell polyethylene that will allow approximately 6 mm movement at the end of the dowel bar.

**363.05.07 Bond Breaker**

Dowel bars shall be coated with RC-250, Tectyl 506, or an approved equivalent.

**363.05.08 Proprietary Concrete Repair Material**

The PCRМ selected shall be suitable for the application.

The minimum compressive strength of the PCRМ at 28 Days shall be 30 MPa.

The PCRМ for use in the Fort Miller Super-Slab<sup>®</sup> Method shall be capable of being pumped into the inverted dovetail slots.

**363.05.09 Epoxy Adhesives**

Epoxy adhesives shall be from the Owner's approved product list and shall be of the type intended for horizontal dowel application and mixed in the cartridge nozzle.

**363.05.10 Joint Materials**

The joint sealant material shall be according to OPSS 369.

**363.05.11 Water**

Water shall be according to OPSS 1302.

**363.06 EQUIPMENT**

**363.06.01 Screeding Device for Base Preparation**

The screeding device used for fine grading for base preparation shall be laser or otherwise mechanically controlled and shall be capable of fine grading fully compacted fine aggregate or flowable fill to a tolerance of 3 mm.

**363.06.02 Gang Drill**

The gang drill shall consist of not less than 3 independently powered pneumatic drills.

**363.06.03 Chipping Hammer**

Chipping hammers shall be hand held and have a maximum weight of 9.0 kg prior to any handle modification, where applicable, and a maximum piston stroke of 102 mm. All hammers shall have the manufacturer's name and parts or model number engraved on them by the manufacturer. All information shall be clearly legible. The manufacturer's published specifications shall be the sole basis for determining weight and piston stroke.

**363.06.04 Gang Saw**

The gang saw shall have gang-mounted diamond saw blades and shall be capable of cutting at least 3 parallel slots simultaneously at a slot spacing of 300 mm within a tolerance of 3 mm.

**363.06.05 Compressor - Air Blasting**

The compressor for air blasting shall have a minimum capacity of 3.5 m<sup>3</sup>/min. The compressed air shall be free from oil and other contaminants.

### **363.06.06 Consolidating Equipment**

Internal vibrators used to consolidate the PCRM in the dowel bar slots shall have a maximum diameter of 25 mm and shall have a resilient covering that will not damage the epoxy coated reinforcement during use.

### **363.06.07 Hand Finishing Equipment**

Hand finishing equipment shall be according to OPSS 904.

### **363.06.08 Straight Edges**

Straight edges shall be according to OPSS 904.

## **363.07 CONSTRUCTION**

### **363.07.01 General**

Precast concrete pavement slab repairs shall be carried out at the locations identified in the Contract Documents. The work may include both continuous and intermittent slab repairs.

Acceptable methods of intermittent slab repair are the Fort Miller Super-Slab<sup>®</sup> Method and the Michigan Method as modified by the requirements of this specification.

Acceptable methods of continuous slab repair are the Fort Miller Super-Slab<sup>®</sup> Method as modified by the requirements of this specification or the Contractor may elect to use an alternative continuous precast method with demonstrated and documented good field performance under similar conditions, such as precast prestressed concrete.

#### **363.07.01.01 Fort Miller Super-Slab<sup>®</sup> Method**

In the Fort Miller Super-Slab<sup>®</sup> Method, the work shall consist of fabricating precast concrete pavement slab repairs (i.e., Super-Slab<sup>®</sup>), sawcutting and removing the existing concrete pavement, repairing and compacting the existing subbase, as necessary, placing and grading fine aggregate base material, inserting and securing dowel bars and tie bars, placing precast slabs, installing PCRM in inverted dovetail slots, installing bedding grout beneath the slabs, and sealing of joints.

#### **363.07.01.02 Michigan Method**

In the Michigan Method, the work shall consist of fabricating precast concrete pavement slab repairs with dowel bars, sawcutting and removing the existing concrete pavement, constructing dowel bars slots, placing of flowable fill levelling material, placing precast slabs, installing PCRM in dowel bar slots, and sealing of joints.

### **363.07.02 Operational Constraints**

Perimeter sawcutting of the removal area shall not be carried out more than 1 week in advance of the expected date of repair.

The temperature of the flowable fill mixture used for the Michigan Method, as manufactured and delivered, shall be at least 10 °C. Placement of flowable fill shall not be allowed if the anticipated air temperature will be 2 °C or less in the 24-hour period following proposed placement.

The PCRM shall not be placed when the air temperature is outside the manufacturer's recommended temperature range or is likely to fall or rise outside the range throughout the duration of the material

placing operation. Prior to placing the PCRM, the Contractor shall demonstrate to the Contract Administrator that the existing concrete temperature in the repair area meets the manufacturer's requirements by measuring and recording the substrate temperatures using a contact thermometer or infrared thermometer.

Construction vehicles, equipment, or traffic shall not be permitted to travel on the precast repair until the PCRM has attained a minimum compressive strength of 20 MPa.

Each repair location shall be completed within the time period specified in the Contract Documents. If the repair is not progressing at a rate that will permit the full restoration of traffic within the allowable time period, appropriate measures acceptable to the Contract Administrator shall be undertaken to allow opening of the road to traffic. Full-depth precast concrete slab repairs shall replace the above temporary work during the next scheduled closure.

### **363.07.03                      Removals**

A template shall be used to precisely delineate the limits of the areas to be repaired within a tolerance of 12 mm. Repairs shall be the full width of the lane and full depth of concrete or hot mix asphalt repair.

Concrete removal shall be carried out according to OPSS 510. The outer limits of the removal area shall be sawcut full depth and shall not be overcut by more than 250 mm into the adjacent concrete that is to remain in place. Overcuts shall be filled with a proprietary product acceptable to the Owner.

Concrete removal shall be by lift-out method. Removals shall be carried out without damaging the adjacent concrete pavement or asphalt shoulder or disturbing the underlying base. Heavy breaking equipment such as hoe rams shall not be used in the removal operation. The concrete pavement shall not be broken in place.

If the adjacent concrete is damaged or cracked due to the removal procedure, the damaged concrete shall be repaired according to OPSS 360. Asphalt surfaces damaged during the removal process shall be repaired. The Contractor shall provide a proposal for repairs to the Contract Administrator for approval.

### **363.07.04                      Base Preparation**

#### **363.07.04.01                  General**

Levelling material shall be either a flowable fill for the Michigan Method or fine aggregate for the Fort Miller Super-Slab<sup>®</sup> Method meeting the requirements of this specification.

#### **363.07.04.02                  Flowable Fill - Michigan Method**

The batching equipment shall have devices designed to measure the specified quantities of each component material and mixing shall be of sufficient duration to ensure uniform consistency of the mixture. Water content shall be maintained so that compressive strengths are achieved and a uniform flowable mixture is developed that is essentially self-levelling when placed.

#### **363.07.04.03                  Fine Aggregate - Fort Miller Super-Slab<sup>®</sup> Method**

Fine aggregate shall be compacted then fine graded using a screeding device capable of grading the fully compacted bedding material to the required tolerance.

### **363.07.05                      Steel Reinforcement**

Steel reinforcement shall be according to OPSS 905.



**363.07.06 Dowel Bar Installation - Michigan Method**

**363.07.06.01 Sawcutting Dowel Bar Slots**

Slots shall be created using gang saws. The slots shall be 65 mm wide by 450 mm long and to a maximum depth to allow the dowel bar to be placed at mid-slab depth with 12 mm cover under the bar. The slots shall be parallel to the centreline of the roadway with a maximum tolerance of 3 mm from a parallel line.

Equipment shall not cause damage to the existing pavement. All slurry from the sawcutting operation shall be removed from the slot and pavement. Over-cutting dowel bar slots shall not be permitted.

**363.07.06.02 Concrete Removal in Dowel Bar Slots**

Chipping hammers shall be used to remove concrete within the slots. Concrete shall be removed to ensure the bottom of the slot is level and in such a manner as to prevent damage to the concrete remaining in place. If the concrete removal operation causes damage to the adjacent concrete pavement, the Contractor shall immediately take corrective action.

If during the removal process the adjacent concrete is damaged due to the removal operation, the damaged concrete shall be repaired as a partial depth repair according to OPSS 360.

The chipping hammers shall not be permitted to break through the concrete. In the event of a break through or if a crack develops within a slot, the repair shall be treated as a full-depth repair and the entire joint within the lane shall be removed and replaced with a 2 m full depth concrete repair according to OPSS 360.

**363.07.06.03 Slot Cleaning**

All concrete surfaces within the slot shall be solid free from loose or unsound fragments. All concrete surfaces shall be abrasive blast cleaned according to OPSS 929 and all dust and loose material shall be removed from the prepared surface by using compressed air.

**363.07.06.04 Placing Proprietary Concrete Repair Material in Dowel Bar Slots**

All concrete surfaces within the slot shall be according to the manufacturer's requirements. Care shall be taken to prevent standing water in the slot. Prior to placing the PCR, all excess water shall be removed with compressed air.

The treatment of the concrete surfaces within the slot with a bonding agent, if required by the manufacturer, and the mixing, placing, finishing, and curing of the PCR shall be done according to the manufacturer's recommendations. A metering or measuring device shall be used to establish the correct amount of mixing water. The Contractor shall assure that each batch of PCR is consistent.

When placing the PCR in the slot, the Contractor shall not spill any onto the adjacent concrete surface. The PCR shall be vibrated to consolidate the material into the slot and around the dowel bar.

The PCR shall be finished flush with the surface of the concrete and all excess material removed immediately. Hand finishing shall be minimized to prevent overworking of the repair. The PCR shall be cured according to the manufacturer's recommendations.

**363.07.07 Dowel Bar and Tie Bar Installation - Fort Miller Super-Slab® Method**

Gang drills shall be used to drill holes in the existing concrete for insertion of dowel bars. The diameter of the drill holes shall be no more than 5 mm larger than the diameter of the dowel bars or tie bars.

Drill holes shall be thoroughly cleaned by air blowing from the back of the drill hole outwards. Drilling equipment shall be used in a manner to ensure adjacent pavement is not damaged.

Dowel bars and tie bars shall be secured into the existing concrete with an epoxy adhesive. The epoxy adhesive shall be injected into the back of the cleaned drill hole and the dowel bar or tie bar with grout retention disks attached, and shall be inserted to ensure the bars are completely encased with epoxy adhesive for the full depth of the hole. Tie bars and dowel bars shall be installed as specified in the Contract Documents. Tie bars are only required for continuous repairs.

### **363.07.08                      Slab Installation - Fort Miller Super-Slab® Method**

Slabs shall be guided into position during installation using guide bars inserted in bedding grout port holes to align slabs during setting. The use of pry bars or wedges in joints for alignment purposes shall not be permitted.

The vertical differential between adjacent slabs shall be less than 6 mm. If the vertical differential is greater than 6 mm, the slab shall be removed, the base re-graded, and the slab reset until the differential is less than 6 mm prior to moving on to the next slab.

If slabs are to be opened to traffic prior to they are grouted, incompressible shims shall be placed at approximate ¼ points in both the transverse and longitudinal joints to maintain horizontal alignment of the new precast slabs until they are grouted.

If un-grouted slabs are vertically displaced so that the vertical differential is greater than 6 mm as described above, the slab shall be removed, the base re-graded, and the slab reset prior to grouting, or the surface shall be brought to the required tolerance by grinding as required by this specification.

### **363.07.09                      Installing the PCRM - Fort Miller Super-Slab® Method**

Foam grout dams shall be installed at the open ends of the transverse joint to be grouted to prevent dowel grout from escaping during the installation. Dowel grout shall be mixed in strict accordance with the instructions provided by the manufacturer. The volume of water shall be measured accurately for each batch by weighing the batch water or by using calibrated pails that are perforated at a level to ensure the correct amount of water is mixed with each bag of grout. Dowel grout shall be pumped in the back port of each dowel slot until it comes out the second port in the same slot. Foot shall be placed over the second port and pumping shall be continued until the grout flows along the joint to the next slot. The same procedure shall be repeated for the back port of the next slot. The grout level in previously filled ports shall be continually monitored. Grout shall be added, as necessary, to keep the grout level in the ports even with the top of the slab and in the joints above the top of the slots.

Bedding grout shall be placed after the PCRM has been installed. Bedding grout shall be mixed in strict accordance with the instructions provided by the manufacturer of the viscosity-reducing admixture. Bedding grout shall be pumped in the lowest port of the slab until it comes out the corresponding port at the other end of the slab. While filling the remaining ports in the slab, the grout level in previously-filled ports shall be continually monitored and grout added, as required, to keep the grout level in the ports even with the top of the slab. This shall maintain a safe and adequate head pressure on the bedding grout until all voids under the slab are filled. Prior to the bedding grout fully sets, the top 50 mm of bedding grout in each port shall be removed and replaced with PCRM.

The PCRM in all ports shall be finished flush and matching with the surface of the concrete and all excess material removed immediately.

**363.07.10 Tolerances**

**363.07.10.01 Dowel Bar and Tie Bar Tolerances**

Dowel bars shall be installed mid-depth of the concrete slab in a plane with the pavement surface and parallel to the centreline of the road. Tie bars shall be installed mid-depth of the concrete slab in a plane with the pavement surface and perpendicular to the longitudinal lane edge sawcut face. The tolerance for the alignment of dowel bars and tie bars shall be  $\pm 15$  mm along the length of the bar in both the vertical and horizontal planes of the pavement and parallel to the direction of traffic.

**363.07.10.02 Surface Tolerances**

The surface of the precast concrete slab repair shall join flush with the existing concrete pavement. Surface tolerance of intermittent repair slabs shall be so that when tested with a 3 m long straight edge placed in the longitudinal direction there shall not be a gap greater than 6 mm between the bottom of the straight edge and the surface of the pavement. Surface tolerance of continuous slabs shall be so that the gap is not greater than 6 mm when the straight edge is placed in any location and direction, including the edge of pavement, except across the crown or drainage gutters.

**363.07.11 Joint Sealing**

All longitudinal and transverse joints shall be sealed according to OPSS 369.

**363.07.12 Sampling and Testing**

**363.07.12.01 General**

All samples, including those handled by a commercial carrier shall be accompanied by a sample data sheet and any additional documents as specified elsewhere in the Contract Documents. When not specified or not included on the sample data sheet, samples shall be delivered with a transmittal form identifying the following information:

- a) Contract Number.
- b) Name of Contractor, name of contact person and telephone numbers.
- c) Name of Contract Administrator, and telephone numbers.
- d) Quantity and type of sample. When a sample consists of more than one item, each item shall be individually identified.
- e) Date sampled.
- f) Date shipped.
- g) Sample, lot, and subplot number.
- h) Sample location.

**363.07.12.02 Compressive Strength of Concrete in Precast Slab**

The Contractor shall cast, cure, handle, and deliver concrete test cylinders for 28-Day compressive strength testing according to OPSS 1350 based on 1 set of 2 cylinders taken for each batch of concrete.

### **363.07.12.03 Compressive Strength of Flowable Fill**

The compressive strength of the flowable fill shall be determined by casting cylinders. The Contractor shall cast, cure, handle, and deliver two sets of two standard 150 x 300 mm cylinders to represent a day's placement. Cylinders for testing the 3-Day and 28-Day compressive strengths shall be stored and cured according to OPSS 1350, then transported to a quality assurance (QA) laboratory designated by the Owner in the Contract Documents. Testing for 28-Day compressive strength shall be conducted according to OPSS 1350, except that specimens shall be air cured in their moulds until they are to be tested.

### **363.07.12.04 Compressive Strength of Proprietary Concrete Repair Materials and Bedding Grout**

The Contractor shall be responsible for sampling the PCRM from the mixer in the field and making cubes for determination of the early strength and 28-Day compressive strength. The PCRM cubes shall be moulded according to CAN/CSA A3004-C2.

Cubes shall be prepared on-site from the PCRM to be used to fill the slots. For the 28-Day compressive strength, the PCRM shall be sampled once for every 4 hours of production or a minimum of once per day, whichever is greatest. One set of six cubes shall be made from each sample of PCRM.

Additional cubes for determination of early strength shall be prepared by the Contractor. The Contractor shall make one set of six cubes for the final repair area of each closure. These cubes shall be tested to verify that the PCRM in the repair area has attained a compressive strength of 20 MPa. These test results shall be communicated immediately to the Contract Administrator prior to opening to traffic.

The Contractor is responsible for the timing of testing and frequency of testing of the early strength cubes and shall determine when the PCRM has attained a minimum compressive strength of 20 MPa.

The specimens shall be stored at a temperature between 15 °C and 25 °C and shall not be moved prior to demoulding. The Contractor shall demould and transport the specimens to the QA laboratory designated by the Owner within 24 hours ± 4 hours. The samples shall be transported in a sealed white opaque plastic bag containing at least 250 ml of water and maintained at a temperature between 15 °C and 25 °C.

### **363.07.12.05 Falling Weight Deflectometer Testing**

The Contractor shall carry out Falling Weight Deflectometer (FWD) testing on the approach and leave joints of each precast slab to determine the load transfer efficiency across the transverse joints. FWD testing, equipment calibration, and reporting shall be according to MERO-019 using the Load Transfer test with a Detailed Project Level data collection scenario and a JCP Test Plan configuration.

### **363.07.13 Repair or Removal of Unacceptable Concrete**

Precast concrete pavement slabs that arrive on the job site cracked, honeycombed, or showing any other visually detectable deficiencies shall be rejected and not used in the work.

Precast concrete pavement slabs that do not meet the surface tolerance requirements shall be removed and replaced, or corrected by diamond grinding.

Concrete pavement adjacent to precast concrete slab repair, damaged or displaced during installation of the precast repair shall be removed and replaced with new concrete as specified.

### **363.07.14 Management of Excess Material**

Management of excess material shall be according to the Contract Documents.

**363.08 QUALITY ASSURANCE**

**363.08.01 Inspection**

Prior to installation and with notification, the Contractor shall provide access to the Contract Administrator to inspect the precast concrete pavement slabs to ensure that they are properly textured and crack-free without any honeycombing or other visually detectable deficiencies.

**363.08.02 Acceptance or Rejection**

Prior to opening to traffic, the Contractor shall provide access to the Contract Administrator to inspect the precast concrete slab repairs to determine if the completed work contains:

- a) Cracking or spalling.
- b) UngROUTED saw over-cuts from the removal process.
- c) Rocking of precast concrete pavement slab.
- d) Precast concrete pavement slab that does not meet surface tolerance.

The Contract Administrator shall reject precast concrete pavement slab repairs based on the presence of one or more of the defects identified above or one or more of the following conditions:

- a) FWD testing results indicate a load transfer efficiency of less than 70%.
- b) Compressive strength of the precast slab less than 30 MPa at 28 Days.
- c) Air content of the hardened concrete in the precast slab is less than 3% or spacing factor is greater than 0.230 mm.

The Contractor shall submit a detailed remedial plan to the Contract Administrator for approval to address identified deficiencies.

**363.09 MEASUREMENT FOR PAYMENT**

**363.09.01 Actual Measurement**

**363.09.01.01 Precast Concrete Slab Repair**

Measurement of the precast concrete slab repair placed shall be by area in square metres. The total area shall be calculated to the nearest 0.1 m<sup>2</sup>.

**363.09.02 Plan Quantity Measurement**

When measurement is by Plan Quantity, such measurement shall be based on the units shown in the clause under Actual Measurement.

**363.10 BASIS OF PAYMENT**

**363.10.01 Precast Concrete Slab Repair - Item**

Payment at the Contract price for the above tender item shall be full compensation for all labour, Equipment, and Material to do the work.

Measures taken to permit full restoration of traffic within the allowable time period shall be at no additional cost to the Owner.

Precast concrete pavement slabs that do not meet surface tolerance requirements shall be either removed and replaced or repaired by diamond grinding at no additional cost to the Owner.

Precast concrete pavement slabs rejected by the Contract Administrator shall be removed and replaced with new concrete as specified elsewhere in the Contract Documents at no additional cost to the Owner.

Concrete adjacent to and damaged by the removal process shall be cut back full depth to sound concrete and replaced at no additional cost to the Owner.

Asphalt surfaces damaged during the removal process shall be repaired at no additional cost to the Owner.

Full-depth repairs required as a result of chipping hammers breaking through the concrete or a crack developing as a result of chipping operations shall be carried out at no additional cost to the Owner

**Appendix 363-A, November 2014  
FOR USE WHILE DESIGNING MUNICIPAL CONTRACTS**

**Note:** This is a non-mandatory Commentary Appendix intended to provide information to a designer, during the design stage of a contract, on the use of the OPS specification in a municipal contract. This appendix does not form part of the standard specification. Actions and considerations discussed in this appendix are for information purposes only and do not supersede an Owner's design decisions and methodology.

**Designer Action/Considerations**

The designer should specify the following in the Contract Documents:

- Time period allowed to complete each repair location. (363.07.02)
- Location of QA laboratory. (363.07.09.03)

Precast concrete slab repairs are typically used in areas where overnight or short duration repairs are required.

For information on the Fort Miller Super-Slab<sup>®</sup> Method, contact:

The Fort Miller Co. Inc.  
P.O. Box 98  
Schuylerville, NY, USA 12871  
Phone: (518) 695-5000

For information on the Michigan Method, contact:

Research Engineer, Forensic Studies  
Testing and Research Section, Pavement Unit  
Michigan Department of Transportation  
Secondary Complex, 8885 Ricks Road  
P.O. Box 30049  
Lansing, MI, USA 48909  
Phone: (517) 322-5732

The designer should provide pavement and base thickness and condition information based on pre-engineering investigations.

The designer should ensure that the General Conditions of Contract and the 100 Series General Specifications are included in the Contract Documents.

**Related Ontario Provincial Standard Drawings**

No information provided here.