



**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[®] 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 provincial-oriented specification. Provincial-oriented specifications are developed to reflect the administration, testing, and payment policies, procedures, and practices of the Ontario Ministry of Transportation.

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 provincial-oriented specifications are to be used and there is a provincial-oriented specification of the same number as those listed below, references within this specification to an OPSS shall be deemed to mean OPSS.PROV, unless use of a municipal-oriented specification is specified in the Contract Documents. When there is not a corresponding provincial-oriented specification, the references below shall be considered to be to the OPSS listed, unless use of a municipal-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 1440	Steel Reinforcement for Concrete
OPSS 1441	Load Transfer Assemblies

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

MTO Materials Engineering and Research Report:

MERO-019 Falling Weight Deflectometer (FWD) Testing Guideline (ISBN 0-7794-8720-6 Print)

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[®] 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, details on the method of the following operations shall be submitted to the Contract Administrator:

- 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 precast concrete mix design shall be submitted to the Contract Administrator at least 2 weeks prior to the start of the work.

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, a concrete mix design for flowable fill shall be submitted to the Contract Administrator at least 2 weeks prior to the start of the work. 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 name of the PCRM selected for use and the manufacturer's specifications and recommendations for placement shall be submitted to the Contract Administrator. 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 shall be acceptable to the Owner.

363.04.01.05 Chipping Hammer

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

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 Dimensions

Precast concrete slabs shall be full lane width and length of 2 to 4.5 m. Prior to fabrication, the concrete thickness at each repair location shall be determined. 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 1440. 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 (PCRM)

The PCRM selected shall be suitable for the application.

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

The PCRM for use in the dowel grout of the Fort Miller Super-Slab[®] 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 three 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 m³/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[®] 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[®] Method as modified by the requirements of this specification, or 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[®] Method

In the Fort Miller Super-Slab[®] Method, the work shall consist of fabricating precast concrete pavement slab repairs (i.e., Super-Slab[®]), 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.

363.07.01.03 Trial Slab Repair

Prior to carrying out the precast concrete pavement slab repair, the ability to successfully carry out the slab repair according to this specification shall be demonstrated to the Contract Administrator by placing a trial repair slab within the Contract limits.

In lieu of a trial slab repair, the Contract Administrator may accept evidence demonstrating the ability to successfully conduct the slab repair with the same equipment, placing crew, and methodology to meet the Contract requirements for conducting the slab repair on any Contract within the last 12 months.

The trial slab repair shall be conducted on both the intermittent slab and continuous slab. The location of the trial slab repair shall be proposed to the Contract Administrator for approval. The Contract Administrator shall be given a minimum of 48 hours notice prior to the trial slab repair.

The Contract Administrator shall allow the slab repair work to continue based on an acceptable visual assessment of the trial. When the slab repair is rejected by visual assessment, additional trial slab repairs shall be performed until the slab repair meets the requirements of this specification.

Unacceptable trial repair slabs shall be repaired, removed, or reinstalled, as required.

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.

Bedding grout and dowel grout shall be carried out as soon as possible after the installation of the precast concrete pavement slab.

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, it shall be demonstrated 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. A proposal for repairs shall be provided 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[®] Method meeting the requirements of this specification.

Micro-grinding of the existing cement treated base is recommended if minor adjustment for the base level is required.

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[®] 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 is not 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, corrective action shall be taken immediately.

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 the PCRM in Dowel Bar Slots - Michigan Method

All concrete surfaces within the slot shall be in accordance with manufacturer's requirements. Care shall be taken to prevent standing water in the slot. Prior to placing the PCRM, 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 PCRM 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. All batches of PCRM shall be consistent.

PCRM shall not be spilled onto the adjacent concrete surface when placing in slots. The PCRM shall be vibrated to consolidate the material into the slot and around the dowel bar.

The PCRM 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 PCRM 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 moving on to the next slab.

If slabs are to be opened to traffic before 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 Placing the Dowel Grout and Bedding Grout - 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 dowel grout 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 shall be continually monitored in previously filled ports and grout added, as required, to keep the grout level in the ports even with the top of the slab. This will maintain a safe and adequate head pressure on the bedding grout until all voids under the slab are filled.

Before 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 ± 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

Concrete test cylinders shall be cast, cured, handled, and delivered 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. Two sets of two standard 150 x 300 mm cylinders to represent a day's placement shall be cast, cured, and delivered. 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

Samples of PCRM shall be taken from the mixer in the field for the determination of the early strength and 28-Day compressive strength. The PCRM shall be moulded into cubes 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. One set of six cubes shall be made 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 timing of testing and frequency of testing of the early strength cubes shall be determined 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 specimens shall be demoulded and transported 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

Falling weight deflectometer (FWD) testing shall be carried out 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, access shall be provided 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, access shall be provided 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.

Precast concrete pavement slab repairs shall be rejected 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.

A detailed remedial plan shall be submitted 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 m².

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

No information provided here.

Related Ontario Provincial Standard Drawings

No information provided here.