



**CONSTRUCTION SPECIFICATION FOR  
HOT MIX ASPHALT**

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<b>310.01</b>	<b>SCOPE</b>

This specification covers the requirements for the placement and compaction of hot mix asphalt designed using the Marshall or Superpave methods.

**310.01.01 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.

### **310.01.02 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.

### **310.02 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 914      Waterproofing Bridge Deck with Hot Applied Asphalt Membrane

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

OPSS 1003      Aggregates - Hot Mix Asphalt  
OPSS 1101      Performance Graded Asphalt Cement  
OPSS 1103      Emulsified Asphalt  
OPSS 1150      Hot Mix Asphalt  
OPSS 1151      Superpave and Stone Mastic Asphalt Mixtures

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

MTO Laboratory Testing Manual:

LS-261      Preparation of Marshall Specimens  
LS-262      Bulk Relative Density of Compacted Bituminous Mixtures  
LS-263      Resistance to Plastic Flow of Bituminous Mixtures Using Marshall Apparatus

LS-264	Theoretical Maximum Relative Density of Bituminous Paving Mixtures
LS-265	Percent Air Voids in Compacted Dense Bituminous Pavement Mixtures
LS-282	Quantitative Extraction of Asphalt Cement and Analysis of Extracted Aggregate from Bituminous Paving Mixtures
LS-287	The Determination of Percent Compaction of Compacted Bituminous Paving Mixture (MRD Method)
LS-292	Quantitative Determination of Asphalt Cement Content by Ignition and Analysis of Remaining Aggregate from Bituminous Paving Mixtures
LS-306	Bulk Relative Density of Compacted Bituminous Mixtures Using Paraffin-Coated Specimens

### **ASTM International**

D 6752-17	Standard Test Method for Bulk Specific Gravity and Density of Compacted Bituminous Mixtures Using Automatic Vacuum Sealing Method
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### **American Association of State Highway and Transportation Officials (AASHTO)**

M320-16	Standard Specification for Performance Graded Asphalt Binder
M323-13	Standard Specification for Superpave Volumetric Mix Design
T40-02(2012)	Sampling Bituminous Materials
T166-13	Bulk Specific Gravity of Compacted Bituminous Mixtures Using Saturated Surface-Dry Specimens
T209-12	Theoretical Maximum Specific Gravity and Density of Bituminous Paving Mixtures
T275-07	Bulk Specific Gravity of Compacted Bituminous Mixtures Using Paraffin-Coated Specimens

### **310.03 DEFINITIONS**

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

**AMRL** means the AASHTO Materials Reference Laboratory.

**Anti-Stripping Treatment** means a treatment used to minimize stripping of asphalt cement from HMA aggregates as defined in OPSS 1151.

**Attribute** means one of the following: Designated Large Sieve (DLS), 4.75 mm sieve, 600 µm sieve, 75 µm sieve, asphalt cement content, air voids, or compaction.

**Binder Course** means a HMA course between a surface course and either a granular base course or stabilized base course, an existing pavement, or another HMA binder course.

**CCIL** means the Canadian Council of Independent Laboratories.

**Designated Large Sieve (DLS)** means the sieve size specifically designated for each mix type for gradation testing according to Table 1.

**Draindown** means that portion of stone mastic asphalt or stone matrix asphalt (SMA) mix, fines, and asphalt cement that separates and flows downwards through the mix.

**Fat Spot** means an area of pavement substantially blacker than the surrounding pavement.

**Hot Mix Asphalt (HMA)** means hot mixed, hot laid asphaltic concrete. The terms are used interchangeably. HMA may include recycled or specialty mixes.

**Hot Mix Asphalt Miscellaneous** means HMA that is placed in areas other than the roadway, as specified in the Contract Documents.

**Hot Mix Asphalt Padding** means an HMA layer used for correcting crossfall and profile deficiencies in the existing pavement before placing the levelling, binder, or surface course.

**Hot Mix Asphalt Patching** means an HMA surface course placed over localized areas of distressed pavement, generally for the purpose of improving strength, rideability, or safety.

**Job-Mix Formula (JMF)** means the percentage passing on each designated sieve of the total mass of aggregate and the amount of asphalt cement as a percentage by mass of the mix that are based on specified mix design procedures that when mixed result in an HMA that is according to this specification.

**Joint** means a vertical contact between a new HMA pavement course and any HMA pavement or any rigid object that exists at the time the HMA is laid.

**Levelling Course** means an HMA course of variable thickness used to eliminate transverse and longitudinal irregularities on an existing surface prior to placing an HMA binder or surface course.

**Lot** means a specific quantity of material or a specific amount of construction normally from a single source and produced by the same process.

**Mix Properties** means the percent passing the DLS, 4.75 mm sieve, 600 µm sieve, and 75 µm sieve; the asphalt cement content; and the air voids.

**Paving in Echelon** means two or more pavers are used to pave multiple adjacent lanes simultaneously.

**Performance Graded Asphalt Cement (PGAC)** means asphalt cement that is produced from petroleum residue, either with or without the addition of non-particulate modifiers, according to AASHTO M320.

**Protection Board** means a durable panel specifically designed to provide an interface protection barrier between the HMA and the asphalt waterproofing membrane.

**Quality Assurance (QA)** means a system or series of activities carried out by the Owner to ensure that materials received from the Contractor meet the specified requirements.

**Quality Control (QC)** means a system or series of activities carried out by the Contractor to ensure that materials supplied to the Owner meet the specified requirements.

**Random Sample** means a sample from a location chosen by the Contract Administrator based on random numbers such that any portion of a lot or subplot has an equal probability of being selected.

**Range** means the numerical difference between the maximum and minimum test results within a lot.

**Reclaimed Asphalt Pavement (RAP)** means the processed HMA material that is recovered by partial or full-depth removal.

**Referee Testing** means testing by an independent laboratory selected by the Owner and acceptable to the Contractor, the results of which are used for resolving differences between QC and QA testing.

**Screed** means the unit of the paver that strikes off and imparts initial compaction to the HMA.

**Segregation** means a condition of the pavement characterized by areas with comparatively coarser or finer texture than that of the surrounding pavement.

**Southern Ontario** means that area of Ontario south of a line joining Waubaushene, Severn Bridge, Bancroft, and Ottawa.

**Stone Mastic Asphalt or Stone Matrix Asphalt (SMA)** means HMA consisting of a gap graded, stone-on-stone coarse aggregate skeleton with an asphalt cement-rich mortar.

**Sublot** means approximately equal divisions or portions of a lot.

**Superpave** means the method for specifying material components and asphalt mix design using the Superpave gyratory compactor (SGC).

**Surface Course** means an HMA wearing course of any flexible or composite pavement.

**Vertical Surface** means all edges of concrete curbs, catch basins and other appurtenances, longitudinal joints, and transverse joints for application of tack coat.

## **310.05 MATERIALS**

### **310.05.01 Hot Mix Asphalt**

The materials used in the production of the HMA shall be according to OPSS 1150 for Marshall mixes and OPSS 1151 for Superpave and SMA mixes.

### **310.05.02 Tack Coat Material**

Tack coat shall consist of SS-1 or SS-1HH emulsified asphalt diluted with an equal volume of water. The undiluted material shall be according to OPSS 1103.

The use of an alternate product may be permitted at the Contractor's request, provided that such a request is submitted in writing to the Contract Administrator a minimum of 14 Days prior to the intended use of the alternate product. The Contractor's proposal shall include, but not be limited to, the following:

- a) The reasons for the use of the alternate material.
- b) Material Safety Data Sheets and any other information for the safe handling, transportation, and storage of the product.
- c) Testing protocols to be used in confirming the properties of the material.
- d) Typical test results.
- e) Required application rates.
- f) Cost implications for the use of the alternate product.

The Contract Administrator shall review this proposal and respond in writing within 7 Days of receiving it, either accepting the use of the alternate product or not accepting its use with reasons. The alternate product shall not be used until permission has been granted in writing by the Contract Administrator.

## **310.06 EQUIPMENT**

### **310.06.01 Tack Coat Distributors**

For main lane paving, tack coat shall be applied using self-propelled or tow-along pressure distributors capable of applying the product at the specified rate and in a continuous and uniform manner both longitudinally and transversely for the full lane width. The distributors shall be equipped with a volume-metering system of sufficient sensitivity to measure the quantity of tack coat dispensed, measurable to within four or five litres.

The use of a hand held pressure applicator is acceptable for tack coating protection board and small irregularly shaped areas such as tapers.

## **310.06.02 Paving Equipment**

Asphalt pavers shall be self-propelled and capable of laying a consistent satisfactory mat that is true to the crossfall, profile, cross-section, and alignment specified in the Contract Documents. Pavers shall be equipped with hoppers and distributing augers capable of placing the HMA evenly in front of the screeds. Screeds shall be capable of being heated and being adjustable as to level and crown. Pavers shall be capable of simultaneously placing the shoulder pavement and roadway pavement whether the shoulder pavement is at the same or different crossfall from the roadway pavement.

In all cases, pavers shall be equipped with automatic longitudinal and transverse grade and slope controls capable of being operated from either side of the paver. The longitudinal grade control shall be adjustable for mat thickness in small increments, without the necessity of stopping the paver. The paver shall be equipped to operate from a 12 m ski or floating beam, a 3 m ski, or a joint matching shoe. When the ski is a flexible unit, it shall be equipped with a spring-tensioned wire extending between brackets fitted on and slightly above each end of the ski. The sensing grid shall ride on the wire, not on the ski.

Plows or other edge ramping devices that are attached to or towed by the screed portion of the paver shall not be permitted.

A 3 m straight edge shall be provided on each paver. The straight edge shall be made of metal with a level recessed in its upper surface parallel to the lower edge.

## **310.06.03 Rollers**

### **310.06.03.01 Classification of Rollers**

Rollers shall be classified into categories as follows:

Class S Self-propelled steel-drum, tandem, or three-wheel rollers according to Table 2.

Class R Self-propelled pneumatic-tired rollers according to Table 3.

Class V Self-propelled vibratory rollers specifically designed for HMA compaction having either dual vibratory rolls or a combination of vibratory roll and pneumatic tires with a contact area equal to or greater than 70% of the roll width according to Table 4.

### **310.06.03.02 Requirements for Rollers**

#### **310.06.03.02.01 General**

All rollers shall be capable of reversing without backlash.

The Contract Administrator shall be provided with the mass of the rollers and may require the weighing of the rollers in his presence.

The rolls or drums shall be kept moist with water or non-petroleum based release agents to prevent adhesion of HMA to them. Excess water or release agents shall not be permitted.

#### **310.06.03.02.02 Steel-Drum Rollers**

The drums of tandem steel-drum rollers shall not be less than 1.20 m in width.

#### **310.06.03.02.03 Pneumatic-Tired Rollers**

Pneumatic-tired rollers shall be constructed so that the wheels on either the front or back oscillate either independently or in pairs. The wheels shall be mounted with smooth rubber tires. Tire inflation pressure shall be a minimum of 350 kPa when the tires are cold. All tires shall have equal pressure. Skirts or

windbreaks shall be provided at all times to protect all tires from the cooling effects of atmospheric conditions. Each roller shall be equipped with a suitable tire pressure gauge for checking tire inflation pressure.

For SMA mixes, pneumatic-tired rollers are not permitted.

#### **310.06.03.02.04          Vibratory Rollers**

Vibratory rollers shall be according to the following requirements:

- a) Frequency of vibrations of the vibratory roller shall be 2,200 vibrations per minute or greater.
- b) Rollers shall be equipped with provision for automatic shut-off of vibrations before coming to a stop.

### **310.07                      CONSTRUCTION**

#### **310.07.01                  Quality Control**

QC procedures shall be conducted to ensure the HMA meets the requirements of the Contract Documents. The Contractor shall be responsible for the interpretation of the QC test results and the determination of any action to be taken to ensure that all materials and work are according to the requirements of the Contract Documents. QC documentation shall be made available to the Contract Administrator upon request. Sampling and testing methods shall be included in the QC documentation.

A laboratory that has current CCIL Type B Certification or AMRL equivalent certification or other equivalent certified laboratory acceptable to the Contract Administrator shall be used. Testing of the samples shall be conducted under the direction and constant supervision of technicians certified to perform the QC tests according to CCIL or equivalent certification.

#### **310.07.02                  Preparation of Foundation and Existing Pavement**

##### **310.07.02.01              Granular Grade**

Prior to placing any course of HMA on a granular grade, a Class S roller of a minimum of 7 tonnes or an equivalent Class V roller with a drum width of at least 1.2 m shall be used to finish roll the grade ahead of the paver to ensure a compacted, smooth, and float-free surface. Any distortion that will impact the specified thickness of the pavement to be placed shall be repaired.

##### **310.07.02.02      Existing Pavement**

Prior to placing any HMA, all HMA and concrete surfaces shall be clean of all loose, broken, and foreign materials. Milled surfaces shall be swept with a power broom.

##### **310.07.03                  Tack Coat**

###### **310.07.03.01              Application of Tack Coat**

Surfaces to be tack coated shall be free of standing water and contamination, such as mud, loose aggregate, or debris.

Protection board shall be dry and clean when the tack coat is applied.

Tack coat shall be placed sufficiently ahead of the paving operation to allow for curing.

Paving and construction equipment shall not be permitted onto the tack coat until it has broken and set.

Traffic shall be prevented from travelling upon the tack coat.

Tack coat shall be applied to the following:

- a) Protection board.
- b) All pavement surfaces including, but not limited to, hot mix and Portland cement concrete.
- c) Milled pavement surfaces.
- d) Expanded asphalt surfaces.
- e) Cold-in-place recycled surfaces.

Tack coat may also be applied to other surfaces as specified in the Contract Documents.

### **310.07.03.02 Tack Coat Rate of Application**

The diluted emulsion shall be applied at the rate of 0.35 kg/m<sup>2</sup> to all existing pavement surfaces, milled pavement surfaces, expanded asphalt surfaces, and any binder course surface that has been left open to traffic over at least one winter.

For cold-in-place recycled surfaces and new surfaces that have been paved in the same calendar year, the rate of application shall be 0.20 kg/m<sup>2</sup>.

The rate of application on protection board shall be 0.50 kg/m<sup>2</sup>.

### **310.07.03.03 Tack Coating of Joints**

Vertical surfaces at which joints are made shall be tack coated with a thin uniform and continuous coating of tack coat material, except for longitudinal joints between lanes paved in echelon.

The joint between pavement lanes paved with an infrared joint heater shall not be painted.

### **310.07.04 Transportation of Hot Mix Asphalt**

The HMA shall be transported from the asphalt plant to the work in leak proof truck boxes that have been previously cleaned of all foreign materials. If required, truck boxes shall be lightly coated with a uniform application of a non-petroleum based release agent. Truck boxes shall be drained after each application and before loading. No release agents shall be used that can adversely affect the quality or performance of the HMA. Release agents shall be used according to the proprietary requirements.

Each truck shall use a tarpaulin of sufficient size to completely cover the load at all times.

### **310.07.05 Sampling**

#### **310.07.05.01 Asphalt Cement**

##### **310.07.05.01.01 General**

When specified in the Contract Documents, the Contractor shall obtain asphalt cement samples according to OPSS 1101 for QA testing.

##### **310.07.05.01.02 Frequency and Location**

The asphalt cement sampling frequencies and locations shall be as specified in the Contract Documents. A minimum of one sample shall be randomly chosen for each asphalt cement used on the Contract.

**310.07.05.01.03            Labelling**

Asphalt cement samples shall be labelled with the following:

- a) Contract number.
- b) Date (i.e., yyyy-mm-dd) and time of sampling.
- c) Performance grade of the asphalt cement.
- d) Supplier's name.
- e) Refinery name.
- f) Waybill number.
- g) Tanker number.
- h) Whether the sample was taken from a delivery tanker or from a storage tank at the plant.
- i) Name and proportions of additives in the asphalt cement.

**310.07.05.01.04            Delivery**

Samples for the Owner shall be delivered within 4 hours of sampling to the location specified in the Contract Documents.

**310.07.05.02            Hot Mix Asphalt**

**310.07.05.02.01            General**

The Contractor is responsible for obtaining QA and referee HMA samples using sample plates for Marshall mixes and other methods approved by the Contract Administrator for Superpave and SMA mixes. The Contractor may obtain a QC sample at the same location of the QA and referee samples. Samples shall be taken in accordance with the Contract Documents under the direction and in the presence of the Contract Administrator. Samples shall be placed in an appropriate container supplied by the Contractor. The Contract Administrator may apply security seals to the samples prior to transportation.

**310.07.05.02.02            Frequency and Location**

The minimum frequency for sampling and testing shall be as specified in Table 6.

**310.07.05.02.03            Labelling**

HMA samples shall be labelled with the following:

- a) Contract number.
- b) Location of sampling.
- c) Date (i.e., yyyy-mm-dd) and time of sampling.
- d) Asphalt type.

#### **310.07.05.02.04 Cores**

When a coring and testing program is undertaken to resolve a dispute related to HMA compaction, the Contractor shall be responsible for all traffic control required to carry out the coring, obtaining and labelling the core samples, delivery of the samples to a mutually agreed upon third part referee laboratory, and repairing core sample holes.

Cores shall be 150 mm in diameter.

The minimum frequency of sampling and testing shall be as determined by the Contract Administrator.

Core samples shall be labelled with the following:

- a) Contract number.
- b) Location of core sample.
- c) Date (i.e., yyyy-mm-dd) and time of sampling.
- d) Asphalt type.

#### **310.07.05.02.05 Delivery**

All samples for the Owner shall be delivered within 4 hours of sampling to the location specified in the Contract Documents.

#### **310.07.05.03 Repair of Sampling Locations**

HMA and compaction requirements for filling all sample holes shall be the same as the adjacent undisturbed pavement. All sample holes shall be cleaned, dried, and filled and then compacted using a mechanical, self-powered gas, electric, or air powered compactor immediately after sampling.

#### **310.07.06 Placing Hot Mix Asphalt**

##### **310.07.06.01 General**

Prior to roller compaction, obvious defects in the HMA material placed shall be corrected. Irregularities in the alignment and grade along the outside edges shall be corrected.

A through lane paving course shall be completed prior to the placement of adjacent side roads, speed change lanes, and other paved areas. For all courses, each adjacent lane shall be completed to approximately the same location at the end of each day's paving.

At the end of each completed portion and prior to opening the lanes to traffic, the completed sections of HMA course shall be ramped transversely to the existing pavement to a maximum of 30H:1V. In all cases, the ramps shall not form part of the permanent asphalt pavement and shall be removed prior to continuing paving operations.

The temperature of the HMA prior to placement shall be within the temperature range that corresponds to the PGAC manufacturer's recommended mix temperature.

The temperature of the HMA immediately after spreading and prior to initial rolling shall not be less than 120 °C.

##### **310.07.06.02 Operational Constraints**

Paving shall not be carried out if the roadbed is frozen.

The granular grade shall be free of standing water at the time of HMA placement.

The surface of a pavement upon which HMA is to be placed shall be dry at the time of HMA placement. An HMA course shall not be placed on a previously laid course until a minimum 4 hours have elapsed, following final compaction of the previous course, and the temperature of the previous course is 60 °C or less.

Binder courses shall not be placed unless the air temperature at the surface of the road is a minimum of 2 °C and rising.

For surface course, the air temperature at the surface of the road shall be at least 7 °C, except for SMA and Superpave 12.5 FC2, the air temperature at the surface of the road shall be at least 12 °C.

Traffic shall be kept off the SMA surface until it has cooled below 60 °C.

### **310.07.07 Use of Paving Equipment**

Levelling, binder, and surface courses shall be laid by means of mechanical self-propelled pavers.

Pavers working in echelon shall maintain a distance of less than 60 m between them.

The longitudinal alignment of the spreader shall be controlled by the use of a string line placed at each outer edge of the pavement. The spreader shall be directed at all times by the string line and not by the edge of the preceding course, except for the trailing paver when paving in echelon.

The automatic screed controls and all compaction aids on the paver shall be operational while the HMA is being placed, except when placing padding, a levelling course, or paving around appurtenances.

Single pavers or the lead paver when paving in echelon shall be controlled as to longitudinal grade by a 12 m ski or floating beam.

The pavers shall operate continuously at a uniform speed necessary to match the output of the HMA plant. However, in no case shall the speed of the paver exceed 18 m/min.

If the HMA for surface course paving comes from more than one mixing plant, the HMA from each plant shall be placed by a separate paver.

### **310.07.08 Widening and Irregular Sections**

When it is necessary to hand-spread the HMA in sections adjacent to machine-laid areas, such hand-spreading shall be carried out concurrently with machine-laying operations.

#### **a) Widening**

The HMA shall be placed in widenings so that the top of the compacted HMA is flush with the top of the existing pavement. When stepped joints are specified in the Contract Documents, the layers placed in the widening shall be placed to the top of each step in separate operations.

HMA shall be placed in the widening using equipment specially designed for this purpose.

#### **b) Irregular Sections**

In turn-outs, driveways, and other irregular sections where it is impractical to use machine methods to spread and finish the binder, levelling, or surface courses, the Contractor shall use other spreading equipment or shall spread the HMA by hand.

### **310.07.09 Hot Mix Asphalt Padding**

HMA padding shall be carried out as specified in the Contract Documents.

### **310.07.10 Hot Mix Asphalt Patching**

Prior to HMA patching, temporary patching material shall be removed from the locations designated for such removal in the Contract Documents. The resulting areas shall be filled and compacted with HMA, as specified in the Contract Documents.

The HMA patching material shall be machine laid to the required thickness, grade, and crossfall.

Transverse and longitudinal joints between the existing pavement and the patch shall be perpendicular butt joints formed by a milling process or keyed in, as specified in the Contract Documents.

### **310.07.11 Longitudinal and Transverse Joints**

#### **310.07.11.01 General**

All joints shall be made to ensure a full face bond and a smooth riding surface.

Longitudinal and transverse butt or stepped joints between the new HMA pavement and the existing pavement shall be constructed by trimming the existing pavement edge to a straight clean vertical surface of at least 40 mm.

All dirt or other foreign material and all loose material shall be removed from all vertical surfaces.

When matching a compacted joint, the depth of the uncompacted mat shall be set to allow for compaction. The paver screed shall overlap the adjoining mat by no more than 50 mm.

#### **310.07.11.02 Longitudinal Joints**

Longitudinal joints shall be properly set up, with the back of a rake or lute, at the proper height and grade prior to rolling, unless the Contractor has demonstrated acceptable joint construction.

For multiple lifts of HMA, the width of subsequent courses shall be staggered to an offset of 150 to 300 mm so that longitudinal joints do not coincide. This shall also apply to the joint between through lanes and speed change lanes and other similar longitudinal joints. The longitudinal joints in the surface course shall correspond to the demarcation between the driving lanes, speed change lanes, and tapers specified in the Contract Documents.

During surface course paving, excess material shall not be cast onto the surface of the freshly laid mat.

When resurfacing against a rigid object, a butt joint shall be constructed by milling the existing pavement to provide an exposed vertical surface of at least 25 mm at the face of the rigid object. The milling shall be feathered out to zero over a minimum length of 1.25 m from and parallel to the exposed face of the rigid object providing a minimum of 40 mm of resurfacing material over the area of removal.

#### **310.07.11.03 Transverse Joints**

The paver shall not move more than 15 m from any transverse joint until that joint has been rolled and checked with a straight edge. If the joint is not satisfactory, it shall be corrected immediately before the paver is allowed to proceed.

Joints between HMA pavement laid under this Contract and existing HMA courses not laid under this Contract shall be constructed as follows:

- a) When a binder course is placed flush against an existing HMA pavement and a butt joint is to be made, the existing pavement shall be trimmed back to form a straight vertical surface.
- b) When a surface course is placed flush against an existing HMA pavement, a stepped joint shall be prepared by removing the existing surface course to its full depth for a minimum length of 0.5 m and the remaining face shall be trimmed to form a straight vertical surface.
- c) When a binder course and surface course are not placed flush against an existing HMA pavement, the binder course shall be feathered out and the surface course shall be butt jointed by removing the existing surface course to a minimum depth of 40 mm and for a longitudinal distance not less than 3 m.

#### **310.07.11.04 Paving on Bridge Decks**

The temperature of the HMA immediately after spreading shall not be less than 115 °C. The temperature of the HMA mat ahead of initial rolling shall be measured and recorded. Compaction shall be accomplished using, as a minimum,

- a) a Class S roller with a minimum mass of 9 tonnes and minimum mass of 4.5 kg per mm total roll width, and
- b) a Class R roller with a minimum mass of 18 tonnes and minimum mass of 2,500 kg per tire.

The operating speed of Class S rollers shall not exceed 5 km/h and shall be operated in a manner to avoid undue displacement of the HMA. If Class V rollers are used, they shall be used in static mode. Rollers shall operate with the drive wheel forward in the direction of paving.

The mixture shall be uniformly compacted as soon after placing as it can support the rollers without checking or undue displacement. Rolling shall start longitudinally at the lower edge and proceed towards the higher edge of the course, overlapping on successive passes. Alternate passes of the roller shall be staggered.

Passes by the Class R roller shall overlap previous passes. The roller shall be operated to prevent pick-up of the HMA on the tires.

### **310.07.12 Compaction**

#### **310.07.12.01 Rolling**

##### **310.07.12.01.01 Static Rolling**

Compaction shall be accomplished using the minimum combination number of rollers specified in Table 5.

The Contractor shall determine the correct sequence of rollers used for compacting in order to achieve compaction requirements.

The operating speed of steel drum rollers shall not exceed 5 km/h and shall be operated in a manner to avoid undue displacement of the mix. Rollers shall operate with the drive wheel forward in the direction of paving.

Rolling procedures shall be as follows:

- a) Breakdown Rolling

The mix shall be uniformly compacted as soon after placing as it can support the roller without checking or undue displacement. Rolling shall start longitudinally at the lower edge and proceed towards the higher edge of the course, overlapping on successive passes. Alternate passes of the roller shall be staggered.

- b) Intermediate Rolling

The intermediate roller shall follow the breakdown roller as closely as possible. Passes shall overlap previous passes. The roller shall be operated to prevent pick-up of the HMA on the tires.

c) Finish Rolling

Finish rolling shall start longitudinally at the higher edge and proceed towards the lower edge.

**310.07.12.01.02 Vibratory Rolling**

For all HMA being compacted on bridge decks, vibratory rollers shall be operated in static mode.

**310.07.12.02 Compaction of Irregular Sections and Inaccessible Areas**

At all places not accessible to rollers, the mix shall be compacted by mechanical, self-powered gas, electric, or air powered equipment.

**310.07.13 Tolerances**

After final compaction, each course shall be smooth and true to the established crown and grade. HMA binder and surface courses shall be free from deviations exceeding 6 mm and 3 mm, respectively, as measured in any direction with a 3 m straight edge.

**310.07.14 Surface Appearance**

Each course after final compaction shall be of uniform texture and shall be free of defects such as segregation, fat spots, oil spills, and roller marks. Defective areas shall be removed and replaced with HMA of the same type and compacted to the satisfaction of the Contract Administrator.

If the Contractor's actions fail to prevent continued medium or severe segregation regardless of cause, the Contract Administrator may instruct the Contractor to cease paving until the problem has been corrected.

From the time that the Contractor receives notification of midlane segregation, the Contractor shall be allowed a maximum of 500 tonnes of mix to be placed on the Contract, in order to demonstrate the effectiveness of any repairs and adjustments that have been made to a defective paver. The Contractor shall demonstrate his repairs or adjustments or both to the Contract Administrator. If the Contractor is unable to eliminate midlane segregation to the satisfaction of the Contract Administrator by making repairs or adjustments to the paver within the allowable 500 tonnes of HMA, then the Contractor shall discontinue the use of that paver.

**310.07.15 Management of Excess Material**

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

**310.08 QUALITY ASSURANCE**

**310.08.01 General**

The Contract Administrator is responsible for conducting QA procedures for all HMA aggregates, asphalt cement, and compaction to meet the requirements of the Contract Documents. QA HMA testing shall be conducted at a frequency specified in Table 6 or as specified in the Contract Documents.

Acceptance of hot mix aggregates and asphalt cement shall be according to OPSS 1003 and OPSS 1101, respectively.

All QA testing shall be completed in a certified laboratory that is CCIL Type B and C, or AMRL accredited, or equivalent. Testing of the samples shall be conducted under the direction and constant supervision of technicians certified to perform the QA tests.

The Contract Administrator may reject visually defective HMA areas based on, but not limited to the following defects: flushing, bleeding, segregation, fat spot, surface damage, and surface contamination. Such defective HMA or areas shall be removed from the work and replaced with acceptable HMA.

When the HMA fails to consistently meet the requirements of the Contract Documents, the Contract Administrator may refuse further material until the mix properties are verified for compliance by one of the following methods:

- a) For Marshall mixes, samples shall be used to determine compliance to asphalt cement content, aggregate gradation, air voids, flow, voids in mineral aggregate, and stability requirements.
- b) For Superpave mixes, samples shall be used to determine compliance to asphalt cement content, aggregate gradation, and Superpave mix properties.

#### **310.08.02 Acceptance of Tack Coat Application Rate**

Tack coat application shall be visually uniform. Areas of insufficient or non-uniform tack coat coverage shall be re-sprayed. When tack coating is performed using hand held devices, the visual appearance of such areas shall be consistent with the adjacent areas of machine applied material.

#### **310.08.03 Acceptance of Joint Painting Application Rate**

The joint painting shall provide a thin, uniform, and continuous coating to the satisfaction of the Contract Administrator.

#### **310.08.04 Aggregate Gradation and Asphalt Cement Content Acceptance**

Aggregate gradation and asphalt cement content test results for HMA samples based on LS-282 and LS-292 shall meet the JMF tolerance requirements as specified in Table 7.

If the HMA is deemed borderline for aggregate gradation or asphalt cement content according to Table 7, the Contractor shall be notified in writing by the Contract Administrator and shall take immediate corrective action through process control at the HMA plant. A total of three borderline test results for the same attributes representing up to 5,000 tonnes of HMA production shall result in the work being deemed rejectable.

If the HMA is deemed rejectable according to Table 7, both the Contract Administrator and the Contractor shall review, agree, and identify the limits of rejected HMA that has been placed. Referee samples within the limits of the affected area shall be delivered by the Contractor to a mutually agreed upon third party referee laboratory to verify aggregate gradation or asphalt cement content or both. When the results from the referee samples are deemed rejectable according to Table 7, the HMA pavement shall be removed and replaced with acceptable HMA pavement. Alternatively, the Contract Administrator may accept a guaranteed maintenance bond, an increased maintenance period, or a negotiated price adjustment.

#### **310.08.05 Hot Mix Asphalt Properties Acceptance**

Marshall test results for hot mix samples based on LS test procedures shall meet the requirements specified in Table 8. The production air voids for all HMA mixes shall be evaluated according to Table 9.

If the HMA is borderline for air voids as specified in Table 9, the Contractor shall be notified in writing by the Contract Administrator and shall take immediate corrective action through process control at the HMA plant.

If the HMA does not meet Table 8 minimum requirements for Marshall stability or Marshall flow or is deemed rejectable for air voids according to Table 9, both the Contract Administrator and Contractor shall review, agree, and identify the limits of rejected HMA that has been placed. Referee samples within the limits of the affected area shall be delivered by the Contractor to a mutually agreed upon third party referee laboratory to verify Marshall test or air void results or both. When the results from the referee samples do not meet Table 8 minimum requirements or are deemed rejectable according to Table 9, the HMA pavement shall be removed and replaced with acceptable HMA pavement. Alternatively, the Contract Administrator may accept a guaranteed maintenance bond, an increased maintenance period, or a negotiated price adjustment.

### **310.08.06                    Compaction Requirements**

#### **310.08.06.01                General**

Compaction testing of the placed HMA shall meet the requirements specified in Table 10.

Nuclear density test gauge results shall be used to assess in-place compaction. When compaction test results do not meet the minimum percent compaction specified in Table 10, the Contractor shall be notified in writing and either the affected area of HMA pavement shall be removed and replaced with acceptable HMA pavement or, in the case of a dispute, the Contractor or the Owner may request that a coring and testing program be undertaken to verify compaction percentage of the mix. The cores shall be provided to the Owner and compaction shall be determined according to the Compaction Determined by Core Density Testing clause using a mutually agreed upon third party referee laboratory. When compaction results from core densities do not meet the minimum percent compaction specified in Table 10, the HMA pavement shall be removed and replaced with acceptable HMA pavement.

#### **310.08.06.02                Compaction Determined by Nuclear Density Gauge**

Compaction testing shall be conducted randomly at a minimum frequency of every 100 m per lane or 150 m<sup>2</sup> area.

##### **310.08.06.02.01            Marshall Hot Mix Asphalt**

Percent compaction shall be determined by comparing the nuclear density in situ Bulk Relative Density (BRD) according to LS-262 to the average plant produced HMA Maximum Relative Density (MRD) according to LS-264.

##### **310.08.06.02.02            Superpave Hot Mix Asphalt**

Percent compaction shall be determined by comparing the nuclear density in situ BRD to the average plant produced HMA MRD both according to AASHTO T209.

#### **310.08.06.03                Compaction Determined by Core Density Testing**

##### **310.08.06.03.01            Marshall Hot Mix Asphalt**

Density testing of the cores shall be in accordance with LS-287. Percent compaction shall be determined by comparing the core BRD according to LS-262 to the average MRD according to LS-264 of the plant produced HMA.

##### **310.08.06.03.02            Superpave Hot Mix Asphalt**

Density testing of the cores shall be according to AASHTO T166. If the percent water absorbed by the specimen is found to exceed 2% by volume as described in AASHTO T166, then the bulk specific gravity shall be according to AASHTO T275, LS-306, or ASTM D 6752. Percent compaction shall be determined by comparing the core BRD to the average MRD both according to AASHTO T209 of the plant produced HMA.

**310.09 MEASUREMENT FOR PAYMENT**

**310.09.01 Actual Measurement**

**310.09.01.01 Hot Mix Asphalt**

Measurement of each type of HMA shall be by mass in tonnes or by area in square metres as specified in the Contract Documents.

**310.09.01.01.01 By Mass**

When payment is by mass:

All HMA that is delivered to the Work site shall be accompanied by a truck weigh ticket showing the truck number, type of hot mix, Contract number, truck time in and out of the hot mix plant, tare mass to the nearest 50 kg, gross mass to the nearest 50 kg, net mass in kg, and the driver's signature.

The truck weigh ticket shall be printed by an electronic printer interfaced with the truck scale readout and capable of recording the tare mass, gross mass, and net mass. The tare mass for the truck shall include the vehicle, operator, fuel, spare tire, etc. The tare mass of the truck shall be taken at least once per shift.

The Contractor shall be responsible for ensuring that the truck weigh ticket or delivery ticket for each load is handed to the Contract Administrator inspecting the HMA paving operation at the time the delivery truck unloads at the paving site. The Contract Administrator may not accept delivery tickets that are not submitted at the proper time or are submitted in groups after the delivery trucks have left the paving site.

The Contractor shall permit the Contract Administrator to make random checks of the gross mass and tare mass of trucks hauling HMA by requiring them to be driven over an independent certified scale.

**310.09.01.01.02 By Area**

When payment is by area:

Random pavement cores, maximum 100 mm in diameter, shall be taken to verify the actual thickness approximately every 100 m along the length of the roadway or 300 m<sup>2</sup> of pavement surface area. The average thickness for a core shall be based on the measurement from each quadrant of the core. The average thickness for the area shall be determined by averaging the core thicknesses.

When the average thickness is more than or equal to 95% of the specified thickness, the payment area shall be the total surface area of the HMA type laid for the course.

When the average thickness is less than 95% of the specified thickness, the surface area for payment purposes shall be calculated as follows:

$$\text{Payment area} = \frac{\text{actual area} \times \text{average thickness}}{\text{specified thickness}}$$

**310.09.01.02 Tack Coat**

Measurement for tack coat shall be of the area applied in square metres.

**310.09.01.03 Hot Mix Asphalt Miscellaneous**

Measurement for HMA miscellaneous shall be of the area in square metres, regardless of the number of lifts placed.

**310.09.02 Plan Quantity Measurement**

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

**310.10 BASIS OF PAYMENT**

- 310.10.01 Hot Mix HL (“type”) - Item**
- Hot Mix HL (“type”) Patching - Item**
- Heavy Duty Binder Course Mix - Item**
- Medium Duty Binder Course Mix - Item**
- Dense Friction Course Mix - Item**
- Superpave (“type”) - Item**
- Superpave (“type”) Patching - Item**
- SMA - Item**

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

Removal and replacement of the following shall be at no extra cost to the Owner:

- a) Defective areas of HMA, including but not limited to those due to flushing, bleeding, segregation, fat spots, surface damage, and surface contamination.
- b) HMA that does not meet the requirements of the Contract Documents.

Referee testing undertaken to resolve a dispute shall be at no extra cost to the Owner if the referee test results confirm that the HMA does not meet the minimum requirements of Table 8 or is deemed borderline or rejectable according to Table 9.

A coring, testing, and traffic control program undertaken to resolve a dispute shall be at no extra cost to the Owner if the mix compaction is confirmed to be below the minimum specified compaction.

No additional payment shall be made for any delays or costs attributed to verification of the gross mass and tare mass of trucks requested by the Contract Administrator.

**310.10.02 Hot Mix Asphalt Miscellaneous - 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.

**310.10.03 Tack Coat - 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.

Payment for the tack coating of protection board shall be included under the Tack Coat tender item.

Payment for the tack coating of concrete surfaces completed in association with bridge deck waterproofing shall be included in the bridge deck waterproofing item according to OPSS 914.

**TABLE 1**  
**Designated Large Sieve for Mix Types**

<b>Mix Type</b>	<b>Designated Large Sieve mm</b>
Superpave 25.0	19.0
Superpave 19.0	12.5
Superpave 12.5, 12.5 FC1, and 12.5 FC2, HL 1, HL 3, HL 3F, HL 3HS, DFC, and SMA 12.5	9.5
Superpave 9.5	4.75
Superpave 4.75	2.36
HL 8, MDBC, and HDBC (Note 1)	16.0
HL 4 and HL 4F	13.2
HL 2	2.36
Note:	
1. HDBC is also known as HL 8HS.	

**TABLE 2**  
**Requirements for Class S Rollers**

<b>Roller</b>	<b>Minimum Mass t</b>	<b>Minimum Mass Per mm Total Roll Width kg</b>
S 1	7	3.5
S 2	9	4.5

**TABLE 3**  
**Requirements for Class R Rollers**

<b>Roller</b>	<b>Minimum Mass t</b>	<b>Minimum Mass Per Tire kg</b>
R 1	8	900
R 2	18	2,500
R 3	25	3,600

**TABLE 4**  
**Requirements for Class V Rollers**

<b>Roller</b>	<b>Minimum Roll Diameter m</b>	<b>Minimum Roll Width m</b>	<b>Minimum Static Mass Per mm Total Roll/Tire Width kg</b>
V1	1.00	1.40	2.0
V2	1.20	1.60	2.6
V3	1.40	1.90	2.9

**TABLE 5**  
**Maximum Production Rates Per Paver for Combinations of Rollers**

<b>Maximum Production t/h</b>	<b>Minimum Roller Combinations</b>	
	<b>Southern Ontario</b>	<b>All Ontario</b>
120	S2 + R1 + S1	S2 + R2 + S1
	V1 + R1	V1 + R2
135	V2 + R1	V1 + R3
	V1 + R2	V2 + R2
150	S2 + 2 x R1 + S1	S2 + 2 x R2 + S1
	S2 + R2 + S1	S2 + R3 + S1
	V2 + R2	
200	V3 + R2	V3 + R2
220	V3 + R3	V3 + R3

**TABLE 6**  
**Sampling and Testing Frequency of Hot Mix Asphalt**

Quantity Per Day Per HMA Type	Minimum Frequency of Sampling and Testing	Minimum Marshall Sampling Size kg	Minimum Superpave Sampling Size (Note 1) kg
≤ 500 tonnes	One sample	10	20
> 500 and ≤ 1,500 tonnes	One sample per 500 tonnes or part thereof		
> 1,500 tonnes	One sample per 500 tonnes (Note 2), minimum of 3		

Notes:

- One additional 5 kg sample is required for SMA mixes to test for draindown.
- The Contract Administrator may reduce the testing frequency for HMA that is consistently being produced to meet the specification requirements.

**TABLE 7**  
**Tolerances for the Job-Mix Formula Aggregate Gradation and Asphalt Cement Content**

Mix	Attribute	Tolerances on the Job-Mix Formula (Note 1) %		
		Acceptable	Borderline	Rejectable
Surface Course	DLS, 4.75 mm Sieve size	< 5.0	5.0 to 7.5	> 7.5
	600 µm sieve size	< 3.5	3.5 to 5.0	> 5.0
	75 µm sieve size	< 2.0	2.0 to 3.0	> 3.0
Binder and Levelling Courses	DLS, 4.75 mm sieve size	< 7.0	7.0 to 10.0	> 10.0
	600 µm sieve size	< 4.5	4.5 to 6.0	> 6.0
	75 µm sieve size	< 2.0	2.0 to 3.0	> 3.0
All Mixes	Asphalt Cement Content	< 0.30	0.30 to 0.50	> 0.50

Note:

- Tolerances on the job-mix formula apply as both plus and minus from the job-mix formula percent.

**TABLE 8**  
**Marshall Stability and Flow Properties for Hot Mix Asphalt Types**

<b>Production Properties and Test Methods</b>	<b>DFC</b>	<b>HL 1, HL 3, HL 3HS, HL 4, HL 8, HDBC, and MDBC</b>	<b>HL 2, HL 3F, and HL 4F</b>
Minimum Marshall Stability: Newtons (N) at 60 °C, LS-261, and LS-263	(Note 1)	(Note 1)	(Note 1)
Marshall Flow at 3.5% Air Voids: LS-261, and LS-263	8.0 minimum	8.0 - 14.0	9.0 - 18.0
Note: 1. Stability requirements shall be according to OPSS 1150.			

**TABLE 9**  
**Air Void Criteria for Hot Mix Asphalt Types (LS-265)**

<b>Mix</b>	<b>Acceptable %</b>	<b>Borderline %</b>	<b>Rejectable %</b>
DFC	2.5 to 4.5	2.0 to 2.4 and 4.6 to 5.0	< 2.0 and > 5.0
All Other Mixes	3.0 to 5.0	2.0 to 2.9 and 5.1 to 6.0	< 2.0 and > 6.0

**TABLE 10**  
**Minimum Pavement Compaction Based on Maximum Relative Density**

<b>Mix</b>	<b>Minimum Compaction %</b>
HDBC, Superpave 19.0 and 25.0	91.0
All Other Mixes	92.0

**Appendix 310-A, November 2017  
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 be aware that excluded from the specification is recycled ratio and Owner specified use of reclaimed asphalt pavement in hot mix asphalt (HMA).

The designer should specify the following in the Contract Documents:

- HMA crossfall, profile, cross-section, and alignment. (310.06.01)
- HMA type requirements. (310.07.01)
- Sampling frequencies and locations for asphalt cement. (310.07.05.01.02)
- Asphalt cement sample delivery location. (310.07.05.01.04)
- Quality assurance (QA) sample requirements. (310.07.05.02.01)
- HMA sample delivery location. (310.07.05.02.04)
- Stepped joints when required. (310.07.08)
- HMA padding requirements. (310.07.09)
- Temporary patching material removal locations. (310.07.10)
- Existing HMA patching locations requirements. (310.07.10)
- Butt joint forming method. (310.07.10)
- Lane demarcation. (310.07.11.02)
- QA HMA testing frequency if different than OPSS 310, Table 6. (310.08.01)
- Unit of measure for each HMA type. (310.09.01.01)

The designer should determine if the following is required and, if so, specify it in the Contract Documents:

- Tack coating of surface not listed in this specification and the tack coat application rate for that surface. (310.07.03)

Application rates for tack coat may vary depending on surface characteristics. (310.07.03)

The designer may specify in a special provision when quality control (QC) test results are to be used for acceptance in place of QA test results.

## **Appendix 310-A**

The designer may consider extending delivery times for samples required on Contracts in remote areas. (310.07.05.01.04)

The designer should be aware that there is a 4 hour delivery requirement for samples and the laboratory should be open to receive them. (310.05.01.04 and 310.07.05.02.05)

The designer may consider specifying a joint heater to address cold joint conditions. (310.06.01)

For smaller projects, the borderline category for tolerances on the job-mix formula in Table 7 may not be appropriate. The designer may consider specifying that all work represented by borderline test results shall be deemed rejectable. (310.08.03.01)

The complete tender item description for HMA should include a “type” of HMA according to Table 1 of OPSS 1150 for Marshall mixes and according to Tables 1 and 2 of OPSS 1151 for Superpave mixes.

For Superpave mixes, the designer should refer to the appropriate lift thickness guidelines according to National Asphalt Pavement Association (NAPA), Information Series 128, HMA Pavement Mix Type Selection Guide, page 10, Figure 5, Recommended Minimum Lift Thickness Ranges for Dense Graded Mixes. Fine and coarse graded mixes as defined using primary control sieves are defined in OPSS 1151.

The designer may refer to the Best Practices for Testing of Superpave Hot Mix Quality Control Samples guidelines developed by the Ontario Superpave Implementation Committee. When the designer is including bonus or penalty clauses or both in relation to OPSS 310, more stringent laboratory procedures should be considered.

In times of volatile asphalt cement prices, on multi-year contracts, and on Contracts with greater than 500 tonnes of machine laid HMA, municipal designers may consider using the MTO PGAC price index for payment adjustment. If the designer wishes to use the PGAC price index, Appendix 310-B should be invoked in the Contract Documents. Appendix 310-B contains information that amends OPSS 310 to include the requirements for using the MTO PGAC price index for payment adjustment on municipal contracts.

The MTO PGAC price index is available on the Ontario Ministry of Transportation website at [www.raqs.mto.gov.on.ca](http://www.raqs.mto.gov.on.ca), by clicking on Contractor, Contract Bulletin, Asphalt Price Index.

The MTO PGAC price index is only a tool for qualifying hot mix prices and is not intended as a standard asphalt cement price to be incorporated into the contract bid.

The MTO PGAC price index calculation for a given month takes in the average of the 4 weeks of the month and is published on the last day of the month.

If the designer wishes to allow the use of warm mix asphalt, Appendix 310-C should be invoked in the Contract Documents. Appendix 310-C contains information that amends OPSS 310 to include the requirements for using warm mix asphalt on municipal contracts.

The following warm mix asphalt (WMA) processes are available: wax based, chemical based, and foam based.

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.

**Appendix 310-B, November 2017  
FOR USE IN MUNICIPAL CONTRACTS, WHEN REFERENCED IN THE CONTRACT DOCUMENTS**

**Note:** This is a non-mandatory Additional Information Appendix intended to provide supplementary requirements for the OPS specification in a municipal contract, when the appendix is invoked by the Owner. It is written in mandatory language to permit invoking it by reference in the Contract Documents. If the appendix has not been invoked by reference in the Contract Documents, it does not apply.

**Supplemental Requirements for Using the MTO Performance Graded Asphalt Cement (PGAC) Price Index in Municipal Contracts**

OPSS 310, Hot Mix Asphalt, is amended as follows:

**310.02 REFERENCES**

Section 310.02 is modified by the addition of the following to the Ontario Ministry of Transportation Publications:

Contract Bulletin:  
Asphalt Price Index

**310.10 BASIS OF PAYMENT**

Section 310.10 is amended by the addition of the following:

**310.10.04 Payment Adjustment for Changes in the MTO Performance Graded Asphalt Cement Price Index**

Payment to the Contractor shall be adjusted based on changes to the MTO PGAC price index. The MTO PGAC price index shall be published monthly in the Contract Bulletin. The MTO PGAC price index shall be used to calculate the amount of the payment adjustment per tonne of new asphalt cement accepted into the Work.

The MTO PGAC price index is based on the price, excluding taxes, f.o.b. (free on board) the depots in the Toronto area, of asphalt cement grade PG 58-28 or equivalent. One MTO PGAC price index shall be used to establish and calculate the payment adjustment for all grades. The MTO PGAC price index is published on the last day of the month and shall be applied to the hot mix asphalt placed in the same month.

A payment adjustment per tonne of new asphalt cement shall be established for each month in which paving occurs when the MTO PGAC price index for the month differs by more than 5% from the MTO PGAC price index for the month prior to tender opening. When the MTO PGAC price index differential is less than 5%, there shall be no payment adjustment established for that month. Payment adjustments due to changes in the MTO PGAC price index are independent of any other payment adjustments made to the hot mix asphalt tender items.

The payment adjustment per tonne shall apply to the quantity of new asphalt cement in the hot mix asphalt accepted into the Work during the month for which the payment adjustment is established. A payment adjustment for paving work done after the approved time for completion of the Contract has expired, including the expiration of any extensions of time that have been granted, shall be the lesser of the MTO PGAC price index in the last month of the Contract or the month in which the paving is completed.

## Appendix 310-B

The payment adjustment for the month shall be calculated from one of the following formula:

- a) When  $I_p$  is greater than  $1.05 I_{TO}$ , the payment adjustment per tonne of asphalt cement shall be  $(I_p - 1.05 I_{TO})$  and the Contractor shall receive additional compensation of:

$$PA = (I_p - 1.05 I_{TO}) \times \text{quantity of new asphalt cement in tonnes}$$

- b) When  $I_p$  is less than  $.95 I_{TO}$ , the payment adjustment per tonne of asphalt cement is  $(.95 I_{TO} - I_p)$  and the Owner receives a rebate of:

$$PA = (.95 I_{TO} - I_p) \times \text{quantity of new asphalt cement in tonnes}$$

where:

- PA = payment adjustment for new asphalt cement, in dollars  
 $I_{TO}$  = MTO PGAC price index published for the month prior to Tender opening  
 $I_p$  = MTO PGAC price index published for the month in which paving occurs

The quantity of new asphalt cement includes all grades of asphalt cement supplied by the Contractor with and without polymer modifiers. For each month in which a payment adjustment has been established, the quantity shall be calculated using the hot mix quantity accepted into the Work and its corresponding asphalt cement content as required by the job mix formula except for mixes that contain reclaimed asphalt pavement (RAP).

For mixes that contain RAP, the quantity of new asphalt cement shall be determined from the difference between the asphalt cement content required by the job mix formula and the asphalt cement content of the RAP incorporated into the hot mix, as calculated by the Owner.

For mixes containing a liquid anti-stripping additive, the quantity of anti-stripping additive shall be deducted from the quantity of new asphalt cement. No other deductions shall be made for any other additives.

For progress payment purposes, payment adjustments shall be made on the monthly progress payment certificate for the months in which hot mix paving occurs.

**Appendix 310-C, November 2012  
FOR USE IN MUNICIPAL CONTRACTS, WHEN REFERENCED IN THE CONTRACT DOCUMENTS**

**Note:** This is a non-mandatory Additional Information Appendix intended to provide supplementary requirements for the OPS specification in a municipal contract, when the appendix is invoked by the Owner. It is written in mandatory language to permit invoking it by reference in the Contract Documents. If the appendix has not been invoked by reference in the Contract Documents, it does not apply.

**Supplementary Requirements for Using Warm Mix Asphalt in Municipal Contracts**

OPSS 310, Hot Mix Asphalt, is amended as follows:

**310.01 SCOPE**

Section 310.01 of OPSS 310 is amended by the addition of the following:

This specification covers the requirements for the placement and compaction of warm mix asphalt (WMA) designed using the Marshall or Superpave methods.

**310.03 DEFINITIONS**

Section 310.03 is amended by the deletion of the definition for Hot Mix Asphalt (HMA) and replaced with the following:

**Hot Mix Asphalt (HMA)** means hot mixed, hot laid asphaltic concrete and includes mix produced using WMA technologies. The terms are used interchangeably. HMA may include recycled or specialty mixes.

Section 310.03 is amended by the addition of the following:

**Warm Mix Asphalt (WMA)** means warm mixed, warm laid asphaltic concrete produced using technologies that allow for the mixing, handling, and compaction of the asphaltic concrete mixture at a temperature typically 20 to 50 °C lower than conventional hot mix asphalt.

OPSS 310 is amended by the addition of the following:

**310.04 DESIGN AND SUBMISSION REQUIREMENTS**

**310.04.01 Design Requirements for Warm Mix Asphalt**

The Contractor shall be responsible for the following:

- a) Selecting the WMA technology to be used on this Contract from recognized WMA technologies or from the WMA technologies specified in the Contract Documents.
- b) The WMA mix design and the job mix formula at the anticipated WMA production temperature, both of which shall be according to the requirements detailed in the Contract Documents, except as amended by this specification.
- c) Ensuring that, during the development and verification of the WMA mix design, the WMA technology does not adversely affect the asphalt cement performance grade and the WMA mixture performance.

## **Appendix 310-C**

### **310.04.02 Submission Requirements for Warm Mix Asphalt**

A minimum of 14 Days prior to paving with WMA, the following information shall be submitted to the Contract Administrator in writing:

- a) The name of the WMA technology selected for use on the Contract.
- b) The complete name and address of the WMA technology supplier, if applicable.
- c) Details on how the requirements of this specification shall be met.
- d) If applicable, the type and dosage of WMA additives, how the additives are to be incorporated to produce the WMA, and the WMA technology supplier's established recommendations for usage.

### **310.05 MATERIALS**

Subsection 310.05.01 is deleted in its entirety and replaced with the following:

#### **310.05.01 Warm Mix Asphalt**

The materials used in the production of WMA shall be according to OPSS 1150 for Marshall mixes or OPSS 1151 for Superpave and SMA mixes.

The Contractor shall be responsible for the following:

- a) Identifying and using a facility capable of producing the WMA according to the WMA technology supplier's instructions for the use of its WMA technology.
- b) Obtaining from the WMA technology supplier all information required for the proper preparation, handling, storage, and use of the WMA materials, including Material Safety Data Sheets.
- c) Obtaining materials; producing mixes; and the transportation, storage, and use of all materials.
- d) Ensuring that the WMA is produced according to the WMA technology supplier's recommendations to prevent any deleterious effects to the finished product.
- e) Using an anti-stripping additive recommended by the WMA technology supplier when an anti-stripping additive is to be incorporated into the WMA.

The WMA shall be produced within the temperature range recommended by the WMA technology supplier to achieve target compaction in the field and to meet the requirements specified in the Contract Documents.

#### **310.06.02.02 Requirements for Rollers**

The last paragraph in clause 310.06.02.02.01, General, is deleted in its entirety and replaced with the following:

The rolls or drums shall be operated according to the WMA technology supplier's requirements to avoid mat segregation or roller pickup or both.

## **Appendix 310-C**

Subsection 310.07.04 is deleted in its entirety and replaced with the following:

### **310.07.04                   Transportation of Warm Mix Asphalt**

The WMA shall be transported from the asphalt plant to the work in leak-proof truck boxes that have been previously cleaned of all foreign materials. If required, truck boxes shall be lightly coated with a uniform application of release agent in accordance with the WMA technology supplier's recommendations. Truck boxes shall be drained after each application and before loading. No release agents shall be used that can adversely affect the quality or performance of the WMA. Release agents shall be used according to the proprietary requirements.

Each truck shall use a tarpaulin of sufficient size to completely cover the load at all times.

### **310.07.06                   Placing Warm Mix Asphalt**

#### **310.07.06.01               General**

Subsection 310.07.06.01 is deleted in its entirety and replaced with the following:

The Contractor shall provide notice of intent to pave in writing to the Contract Administrator a minimum of 7 Days prior to placing the WMA.

The WMA technology supplier's recommendations for placing the WMA mix shall be followed.

The temperature of the WMA immediately after spreading shall be within the limits identified in Table 11.

Prior to roller compaction, obvious defects in the WMA material placed shall be corrected. Irregularities in the alignment and grade along the outside edges shall be corrected.

A through lane paving course shall be completed prior to the placement of adjacent side roads, speed change lanes, and other paved areas. For all courses, each adjacent lane shall be completed to approximately the same location at the end of each day's paving.

At the end of each completed portion and prior to opening the lanes to traffic, the completed sections of WMA course shall be ramped transversely to the existing pavement to a maximum of 30H:1V. In all cases, the ramps shall not form part of the permanent asphalt pavement and shall be removed prior to continuing paving operations.

## **310.08                   QUALITY ASSURANCE**

### **310.08.01               General**

Clause 310.08.01 of OPSS 310 is amended by the addition of the following:

When the selected WMA technology requires that additives be added to the asphalt cement, acceptance of the asphalt cement shall be based on the samples that contain the WMA additive. Acceptance of WMA emulsion shall be based on testing the asphalt cement residue obtained from the WMA emulsion.

**Appendix 310-C**

**310.10 BASIS OF PAYMENT**

Subsection 310.10.01 is deleted in its entirety and replaced with the following:

- 310.10.01 Warm Mix HL ("type") - Item**
- Warm Mix HL ("type") Patching - Item**
- Heavy Duty Binder Course Warm Mix - Item**
- Medium Duty Binder Course Warm Mix - Item**
- Dense Friction Course Warm Mix - Item**
- Superpave Warm Mix ("type") - Item**
- Superpave Warm Mix ("type") Patching - Item**
- SMA Warm Mix**

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

Removal and replacement of the following shall be at no extra cost to the Owner:

- a) Defective areas of WMA, including but not limited to those due to flushing, bleeding, segregation, fat spots, surface damage, and surface contamination.
- b) WMA that does not meet the requirements of the Contract Documents.

Referee testing undertaken to resolve a dispute shall be at no extra cost to the Owner if the referee test results confirm that the WMA does not meet the minimum requirements of Table 8 or is deemed borderline or rejectable according to Table 9.

A coring and testing program undertaken to resolve a dispute shall be at no extra cost to the Owner if the mix compaction is confirmed to be below the minimum specified compaction.

No additional payment shall be made for any delays or costs attributed to verification of the gross mass and tare mass of trucks requested by the Contract Administrator.

Table 11 is added:

**TABLE 11**  
**Allowable Limits for WMA Paving Temperature**

<b>Minimum Allowable WMA Paving Temperature</b>	<b>Maximum Allowable WMA Paving Temperature</b>
The higher of 60 °C and the minimum temperature recommended by the WMA technology supplier.	The lower of 125 °C and the maximum temperature recommended by the WMA technology supplier.