CONSTRUCTION SPECIFICATION FOR
HOT MIXED, HOT LAID ASPHALTIC CONCRETE PAVING, AND
HOT MIX PATCHING, INCLUDING RECYCLED AND SPECIALTY MIXES

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This specification covers the requirements for placing and compacting of hot mixed, hot laid asphaltic concrete.

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

Ontario Provincial Standard Specifications, General:
OPSS 102 Weighing of Materials

Ontario Provincial Standard Specifications, Material:
OPSS 1001 Aggregates - General
OPSS 1103 Emulsified Asphalt
OPSS 1149 Hot Mixed, Hot Laid Asphaltic Concrete, Including Recycled and Specialty Mixes

Ministry of Transportation Publications:
MTO Laboratory Testing Manual: tests
LS-200 - Penetration of Bituminous Materials
LS-282 - Quantitative Extraction of Asphalt Cement and Analysis of Extracted Aggregate from Bituminous Paving Mixtures
LS-284 - Recovery of Asphalt from Solution by Abson Method

American Society for Testing and Materials (ASTM):
ASTM D 140-88 - Standard Practice for Sampling Bituminous Materials

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

Binder Course: means an asphalt course between a surface course and either a base course (aggregate base, stabilized base, etc.), an existing pavement or another asphalt binder course.

Blending Material: means any coarse or fine aggregate which is added to the primary coarse or primary fine aggregate, in order to produce hot mix which conforms to the requirements of the Contract.
**Blending Sand:** means any fine aggregate which is added to the primary fine aggregate in order to produce hot mix which conforms to the requirements of the Contract.

**Business Day:** means any day except a Saturday, Sunday, or statutory holiday.

**Fat Spot:** means an area of pavement substantially blacker than the surrounding acceptable pavement due to high asphalt cement content and/or dust content.

**HL, Hot Mix, Mixture, Mix:** means hot mixed, hot laid asphaltic concrete.

**Hot Mix Miscellaneous:** means asphaltic concrete which is placed in areas other than the roadway, and is designated as Hot Mix Miscellaneous in the Contract.

**Hot Mix Padding:** means a hot mix layer used for correcting crossfall and profile deficiencies in the existing pavement before placing the levelling, binder, and/or surface course.

**Hot Mix Patching:** means a hot mix surface course placed over segments of distressed pavement generally for the purpose of improving strength, rideability or safety.

**Hydraulic Strike-off:** means an extension of the paver mould board and strikeoff which can be extended beyond the screed while the paver is operating, to place, shape and strike off mixtures in narrow widenings of variable width.

**Joint:** means a vertical contact between a bituminous pavement course and any bituminous pavement, or any rigid object which exists at the time the course is laid.

**Levelling Course:** means a course of variable thickness used to eliminate irregularities in the contour of an existing surface prior to placing an asphalt binder and/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.

**Mean:** means the arithmetic average of the test results within a lot.

**Modified Mixes:** means those mixes which conform to the requirements specified in this specification but for which some aspect of the mix has been altered. These deviations would be specified in the Contract.

**Northern Ontario:** means that area of Ontario north of a line joining Waubaushene, Severn Bridge, Bancroft and Ottawa.

**Paving in Echelon:** means the situation when the trailing paver is not more than 60 m behind the lead paver and uses a joint matching shoe to match the undisturbed mat laid by the lead paver when placing the mixture in the adjacent lane.

**Random Number:** means a number generated by chance and obtained from a random number table.

**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 sublot, as appropriate, has an equal probability of being selected.

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

**Recovered Penetration:** means the penetration of the asphalt cement recovered from the hot mix, expressed in standard penetration units as defined in test LS-200.
Recycling Ratio, Ratio: means the percentage relationship between the reclaimed asphalt pavement and new (virgin) aggregate which make up the recycled hot mix. (For example, a 40/60 ratio is 40 percent RAP and 60 percent new (virgin) aggregate.)

Screed: means the unit of the paver which strikes off and imparts an initial compaction to the mix.

Screed Extension: means the sections of screed plate, mould board, tamper bar/vibrator, and spreading screw which are used to extend the basic screed to the desired paving width.

Segregation: means a lack of surface uniformity where areas of pavement are either too stony or too sandy in relation to the surrounding acceptable pavement.

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

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

Surface Course: means the top course of an asphalt pavement, sometimes called a wearing course.

313.05 MATERIALS

313.05.01 Asphaltic Concrete

Asphaltic concrete shall conform to OPSS 1149.

Unless otherwise specified in the Contract, the Contractor shall be responsible for all mix designs and the determination and designation of the mix proportions and job-mix formulae.

313.05.02 Joint Painting, Tack Coating and Seal Coating Material

Joint painting and seal coating materials shall be SS-1 emulsified asphalt and shall conform to OPSS 1103.

Tack coating materials shall be SS-1 or SS-1H emulsified asphalts and shall conform to OPSS 1103.

313.06 EQUIPMENT

313.06.01 Spreading Equipment

a. Mechanical Pavers

Pavers shall be self-propelled and capable of laying a consistent, satisfactory mat which is true to the specified geometrics, cross-section and alignment. Pavers shall be equipped with hoppers and distributing screws capable of placing the mixture evenly in front of the screeds. Pavers shall be capable of simultaneously placing the shoulder pavement and roadway pavement where the shoulder pavement is at the same or different crossfall from the roadway pavement and the shoulder pavement is placed coincidentally with the adjacent lane.

In all cases, pavers shall be equipped with automatic longitudinal and transverse grade and slope controls which are capable of being operated from either side of the paver. The longitudinal grade control shall be readily adjustable for mat thickness in small increments without the necessity of stopping the paver and shall be equipped to operate from either a 12 m ski or floating beam, a 3 m ski, or a joint matching shoe, as required. Where 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.
Screeds shall be capable of being heated and being adjustable for crossfall and crown.

Plows or other edge ramping devices which 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. This straight edge shall be of metal or wood, with a level recessed in its upper surface parallel to the lower edge.

Pavers used to place Open Friction Course Mix shall be equipped with either tamper bars or vibratory screeds.

b. Blade Graders

Self-propelled blade graders shall have sufficient gross mass, blade length, wheel base, and power to shape a full 3.75 m lane width of hot mix asphalt in one pass. The hot mix so shaped shall yield, after compaction, the final desired elevation of the lift being placed.

313.06.02 Rollers

a. Classification of Rollers

Rollers shall be classified into categories as follows:

Class "S" Self-propelled steel-tired, tandem or three-wheel rollers conforming to Table I.

Class "R" Self-propelled pneumatic-tired rollers conforming to Table II.

Class "V" Self-propelled vibratory rollers specifically designed for hot mix compaction, having front and rear vibratory rolls conforming to Table III.

b. Requirements for all Rollers

All rollers shall be capable of reversing without backlash.

The mass of all rollers, except for Class "V" rollers, shall be determined in the presence of the Contract Administrator and they shall be ballasted, if required, immediately before commencing work on this Contract and whenever subsequently required by the Contract Administrator.

c. Requirements for Steel-tired Rollers

Steel-tired rollers shall conform to the following requirements:

1. To prevent adhesion of asphalt mixture to the rolls, the rolls shall be kept moist. Excess water will not be permitted.

2. The rear rolls of three wheel rollers shall each be not less than 0.45 m in width.

3. The rolls of tandem rollers shall each be not less than 1.20 m in width.
TABLE I  
REQUIREMENTS FOR CLASS “S” ROLLERS

<table>
<thead>
<tr>
<th>Roller Class</th>
<th>Minimum Mass t</th>
<th>Minimum Mass Per mm Total Roll Width kg</th>
</tr>
</thead>
<tbody>
<tr>
<td>S 1</td>
<td>7</td>
<td>3.5</td>
</tr>
<tr>
<td>S 2</td>
<td>9</td>
<td>4.5</td>
</tr>
</tbody>
</table>

d. Requirements for Pneumatic-tired Rollers

Pneumatic-tired rollers shall be constructed such that wheels on either the front or back shall 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.

TABLE II  
REQUIREMENTS FOR CLASS “R” ROLLERS

<table>
<thead>
<tr>
<th>Roller Class</th>
<th>Minimum Mass t</th>
<th>Minimum Mass Per Tire kg</th>
</tr>
</thead>
<tbody>
<tr>
<td>R 1</td>
<td>8</td>
<td>900</td>
</tr>
<tr>
<td>R 2</td>
<td>18</td>
<td>2500</td>
</tr>
<tr>
<td>R 3</td>
<td>25</td>
<td>3600</td>
</tr>
</tbody>
</table>

e. Requirements for Vibratory Rollers

Vibratory rollers shall conform to the following requirements:

1. To prevent adhesion of asphalt mixture to the rolls, the rolls shall be kept moist. Excess water will not be permitted.

2. Frequency of vibrations shall be not less than 2200 vibrations per minute.

3. Rollers shall be equipped with provision for automatic shutoff of vibrations before coming to a stop.

TABLE III  
REQUIREMENTS FOR CLASS “V” ROLLERS

<table>
<thead>
<tr>
<th>Roller Class</th>
<th>Minimum Roll Diameter m</th>
<th>Minimum Roll Width M</th>
<th>Minimum Static Mass Per mm Total Roll/Tire Width kg</th>
</tr>
</thead>
<tbody>
<tr>
<td>V 1</td>
<td>1.00</td>
<td>1.40</td>
<td>2.0</td>
</tr>
<tr>
<td>V 2</td>
<td>1.20</td>
<td>1.60</td>
<td>2.6</td>
</tr>
<tr>
<td>V 3</td>
<td>1.40</td>
<td>1.90</td>
<td>2.9</td>
</tr>
</tbody>
</table>
313.07 CONSTRUCTION

313.07.01 Hot Mix HL 1, 2, 3, 3A, 4 or 8
   Hot Mix HL 1, 2, 3, 4, or 8
   Patching
   Recycled Hot Mix (ratio)
   Recycled Hot Mix (ratio) Patching
   Heavy Duty Binder Course Mix
   Medium Duty Binder Course Mix
   Dense Friction Course Mix
   Open Friction Course Mix
   Electrically Conductive Mix

The work required for the above items is detailed in this subsection.

The work required for all hot mix items shall include the application of tack coat, where specified in the Contract, except when the tender item “Tack Coat” is included in the Contract and some or all of the tack coat application is designated in the Contract as being required under that item.

313.07.01.01 Process Control

The Contractor shall conduct such process control procedures, including sampling and testing, as is necessary to ensure that all hot mix aggregates and all hot mix to be used in the work conform to the requirements of the Contract. The Contractor shall determine the type and amount of process control sampling and testing to be completed.

The Contractor shall be responsible for the interpretation of the test results and the determination of any action to be taken to ensure that all materials and work conform to the requirements of the Contract.

Reclaimed asphalt pavement shall be considered as an aggregate for the purposes of process control.

313.07.01.02 Preparation of Foundation and Existing Pavement

a. Prior to placing any course of hot mix on a granular grade, a class S1 roller, or an equivalent vibratory 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. This roller shall operate continuously within 300 m of the paver.

b. Prior to placing any course of hot mix, all asphalt and concrete surfaces shall be cleaned of all loose, broken and foreign materials.

c. Prior to placing mix on milled surfaces, the milled surfaces shall be cleaned of all loose, broken and foreign materials, and shall be swept with a power broom.

313.07.01.03 Application of Tack Coat

All Portland cement concrete pavement surfaces, except surfaces where Electrically Conductive Mix is to be placed, which are to be covered with hot mix and specified asphaltic concrete pavement surfaces which are to be covered with hot mix shall be tack coated with SS-1 emulsified asphalt diluted with an equal volume of water.

The diluted emulsified asphalt shall be applied to the surface immediately following the cleaning of the surface, at a rate of 0.35 kg/m². The emulsified asphalt shall be applied evenly by means of a pressure distributor.
Tack coat shall be applied ahead of the paver to accommodate not more than 2 hours of production of hot mix. Traffic shall be prevented from travelling upon the tack coat. Hot mix shall not be placed on tack coated areas until the tack coat has dried to a proper condition of tackiness.

313.07.01.03.01 Tack Coating of Milled Surfaces

When only one course of hot mix pavement is to be placed upon pavement milled under this Contract and it is placed after September 1 of the current calendar year, then the surface of the milled pavement shall be tack coated. The tack coat shall consist of either SS-1 or SS-1H emulsified asphalt diluted with an equal volume of water. The tack coat shall be applied at a rate of 0.35 kg/m².

313.07.01.04 Transportation of the Mixture

The mixture shall be transported from the asphalt plant to the work in vehicles with smooth metal boxes in good and leak-proof condition, previously cleaned of all foreign materials.

Delivery of hot mix to the site shall be scheduled such that spreading and compaction of the hot mix is completed by one-half hour after sunset, except when night work is permitted by the Contract.

313.07.01.05 Sampling of Asphalt Cement for Acceptance Testing

313.07.01.05.01 General

Asphalt cement samples shall be obtained, packaged appropriately, labelled and delivered as specified. The samples shall not be split prior to delivery.

Samples of the asphalt cement shall be a minimum size of one litre and shall be taken in accordance with ASTM D 140 at the frequencies and locations in clause 313.07.01.05.02.

Containers for the samples will be supplied by the Owner when the Owner supplies the asphalt cement.

313.07.01.05.02 Frequency and Location

The asphalt cement sampling frequencies and locations shall be as follows:

a. When the Contractor supplies the asphalt cement, random samples shall be obtained on a daily basis for each grade of asphalt cement which is used to produce greater than 100 t of hot mix on that day. One sample shall be obtained for each 2000 t or fraction thereof of hot mix produced on that day with each grade of asphalt cement. The Contractor shall use random numbers to determine when each random sample is to be obtained. The samples shall be obtained during the working time when the mix is being produced and shall be taken from the working storage tank or from a sampling valve located between the working storage tank and the mixer.

b. When the Owner supplies the asphalt cement and the Contractor is producing mix exclusively for Owner work, one sample shall be obtained from each truck tank of asphalt cement delivered.

c. When the Owner supplies the asphalt cement and the Contractor is not producing mix exclusively for Owner work, or when the Owner supplies a polymer modified or premium grade of asphalt cement, then samples shall be taken as follows:

1. one sample shall be obtained from each truck tank of Owner supplied asphalt cement delivered, and

2. random samples shall be obtained on a daily basis for each grade of asphalt cement which is used to produce greater than 100 t of hot mix on that day. One sample shall be obtained for each 2000 t or fraction thereof of hot mix produced on that day with each grade of asphalt cement. The Contractor
shall use random numbers to determine when each random sample is to be obtained. The samples shall be obtained during the working time when the mix is being produced and shall be taken from the working storage tank or from a sampling valve located between the working storage tank and the mixer. Unscheduled visits by the Owner's inspector may be made periodically to request and have the Contractor supply random duplicate samples of the asphalt cement from the locations mentioned above.

313.07.01.05.03 Labelling

Samples shall be labelled, as appropriate, with the contract number, date, time, grade and type of asphalt cement, supplier, refinery, weigh bill number, tanker number (when appropriate), whether the sample was taken from a delivery tanker or from a tank of the plant, and name and proportions of any additives added to the asphalt cement.

Labels for the samples will be supplied by the Owner.

313.07.01.05.04 Delivery

Samples shall be delivered to the Owner within 24 hours of sampling to a designated site within the contract limits.

313.07.01.06 Sampling of Mix for Acceptance Testing

313.07.01.06.01 General

Random samples of the mix shall be obtained, packaged appropriately, labelled and delivered as specified. The samples shall not be split prior to delivery.

Individual random samples of mix shall be:

a. a sample minimum mass of 10 kg, to be tested to determine compliance for asphalt cement content, gradation of extracted aggregates, Air Voids, Marshall Flow, Voids in Mineral Aggregate and Marshall Stability, and

b. a sample minimum mass of 5 kg, to be tested to determine compliance for the penetration of asphalt cement recovered from the mixture.

On a mix specific basis the Contract Administrator may reduce the required minimum mass of the mix samples.

313.07.01.06.02 Frequency

The sampling frequency is based on standard lots as directed by the Contract Administrator.

a. 10 kg samples: Sampling frequency shall be based on one random sample per 500 t of any one type of mix produced.

b. 5 kg samples: Sampling frequency shall be based on one random sample per 1000 t of any one type of mix produced.

However, at the discretion of the Contract Administrator, the standard lot/sublot size may be reduced and the above sampling frequencies may be increased when it is necessary because of the sequence of paving operations or when the tendered item quantity is less than a standard lot size.
313.07.01.06.03 Method

The 10 kg samples shall be obtained by any of the following methods:

a. plate samples (this method will not be permitted for Open Friction Course Mix and HL 2),

b. truck box samples (this method will be allowed at the hot mix plant when the Owner is conducting testing with Owner employees at the hot mix plant location), or

c. from the screed auger chamber (this method will be allowed only for Open Friction Course Mix and HL 2).

The 5 kg samples shall be obtained by any of the methods for 10 kg samples or by coring, except that coring shall not be permitted on bridge decks.

313.07.01.06.04 Location, Packaging and Labelling

The Contract Administrator will determine the location of each random sample and inform the Contractor just prior to the sample being taken by the Contractor.

Samples shall be placed into a suitable container which will protect the sample characteristics during transport and until testing. Samples shall be labelled, as appropriate, with the contract number, Region, date, lot number, subplot number, mix type, station location, offset from the centreline of the highway and time of sampling.

When the mass of a plate sample is less than the desired quantity, the sample shall be discarded and a new one taken immediately. The transverse location of the new sample shall be the same as that of the discarded one.

When more than one core is required to obtain the required sample mass, all cores for the sample shall be taken adjacent to each other.

Holes resulting from the removal of pavement samples shall be repaired in accordance with clause 313.07.02.18.

Truck box samples shall be random samples obtained from a random quarter in the truck box.

313.07.01.06.05 Delivery and Records

Samples shall be delivered as specified in the Contract.

When samples are delivered to a laboratory which is not owned by the Owner, the Contractor shall maintain records which contain the date, time of delivery, and the printed name and signature of the authorized receiving individual. At the time of delivery of each sample to such a laboratory, the Contractor shall sign records of the testing laboratory to confirm the date and time of delivery.

313.07.01.07 Hot Mix Padding

When and where specified in the Contract, padding shall be carried out.

313.07.01.08 Patching Items - Special Requirements

Prior to hot mix patching, cold mix patching material shall be removed from the locations designated for such removal in the Contract. The resulting cavities shall be filled with the specified hot mix and compacted.
Prior to placing hot mix patching material, the areas of the existing pavement designated to be tack coated shall be treated with undiluted SS-1 emulsified asphalt at the rate of 0.35 kg/m². The hot mix patching material shall be machine laid to the required thickness, grade and crossfall.

The ends of the patch and along the centre line when only one lane is to be patched shall be feathered down to provide a smooth transition between the existing pavement and the patch.

The transverse joint between the existing pavement and the patch shall be either diagonal or fishtailed as determined by the Contract Administrator at the time of construction.

313.07.01.09 Placing Mixes

Paving shall not be carried out if, in the opinion of the Contract Administrator, the roadbed is frozen. In case of disagreement, the Contractor has the option of demonstrating, at the Contractor's own expense and to the satisfaction of the Contract Administrator, that the roadbed is frost-free.

Hot mix surface courses shall not be placed unless the air temperature at the surface of the road is at least 7°C except as follows:

a. When single course pavement is laid on granular grade when the air temperature shall be at least 2°C.

b. When single course pavement is laid on HL 2 which is laid on a granular grade the minimum air temperature shall be at least 2°C.

c. For Open Friction Course Mix and Dense Friction Course Mix when the air temperature shall be at least 12°C.

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

When placing the mixture on a granular grade, the granular grade shall be free of standing water. Not less than 300 m of prepared grade shall be maintained ahead of the paver. This requirement shall be waived at the end of the lane, or at the end of the paving operation for that day.

The surface of an existing pavement or previously laid course, upon which hot mix is to be placed, shall be clean and dry at the time of placing the hot mix.

A course shall not be placed upon a previously laid course within the 12 hours following final compaction of the latter, or until the temperature of the previous course is 50°C or less, whichever occurs first.

When HL 2 is placed directly upon a granular base, the Contractor shall be responsible for the removal and replacement of any HL 2 course which is broken up, distorted or otherwise damaged by traffic.

The temperature of the mixture immediately after spreading and prior to initial rolling shall not be less than 115°C.

Immediately after each course is laid and before compaction using rollers is started, deficiencies in the surface and material texture shall be corrected. Irregularities in alignment and grade along the outside edges shall be corrected.

A course on the through lane shall be placed beyond the junction where sideroad tapers, acceleration lanes, etc. end, before the corresponding course is placed on such adjacent pavements.

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, prior to opening of the lanes to traffic, the completed sections of bituminous course shall be ramped down to the existing pavement at a slope of 25 mm to 3 m. The hot mix to be used for construction of the ramps shall be determined by the Contractor and approved by the Contract Administrator. In all cases, the ramp shall not form part of the permanent pavement and shall be removed before the paving of the adjacent section.

313.07.01.09.01 Open Friction Course Mix

Open Friction Course Mix shall be placed within one hour of discharge from the asphalt plant.

The mass shown in the tender is based on a combination of steel slag coarse and fine aggregates. If traprock, dolomitic sandstone or gravel aggregates are used, the mass of actual mix placed shall be adjusted for density difference so that the specified course thickness is maintained by dividing the mass of actual mix placed by the appropriate multiplier factor in Table VI.

313.07.01.09.02 Dense Friction Course Mix

For Dense Friction Course Mix, the mass shown in the tender is based on the combination, by volume, of 55 percent traprock coarse and 45 percent traprock fine aggregates. If any of the other specified types and combinations are used, the mass of actual mix placed shall be adjusted for density difference so that the specified course thickness is maintained, by dividing the mass of actual mix placed by the appropriate multiplier factor in Table VII.

313.07.01.09.03 Heavy Duty Binder Course Mix

For Heavy Duty Binder Course Mix, the mass shown in the tender is based on bedrock material coarse and fine aggregate mixes. If any of the other specified aggregate combinations are used, the mass of actual mix placed shall be adjusted for density difference so that the specified course thickness shall be maintained, by dividing the mass of actual mix placed by the appropriate multiplier factor in Table VIII.

313.07.01.09.04 Electrically Conductive Mix

Mix shall be placed on concrete surfaces which are dry, free of debris and not tack coated.

Just prior to paving, the adhesive tape on any cathodic protection anodes and voltage probes shall be removed. The anode top surfaces shall be thoroughly cleaned using a stiff wire brush.

Electrically Conductive Mix shall not be placed within 150 mm ± 25 mm of any metal appurtenance, i.e. deck drains, expansion joints, etc; this space shall be filled with any other type of hot mix which does not contain conductive aggregates. (Examples of conductive aggregates are coke breeze and steel slag.)

Tarpaulins shall be used to cover Electrically Conductive Mix in the truck boxes during transportation and placing.

Electrically Conductive Mix shall be laid to a 40 mm compacted depth and covered by the surface course within the same day.

Prior to the initial placement of Electrically Conductive Mix in the work, the Contractor shall demonstrate the capability to produce the required mix. This shall be done at the plant by producing and sampling a trial mix for testing by the Owner. The trial mix shall be a minimum of 2 production batches of the size which will be used during paving. The Owner's testing will take approximately six hours and tests for aggregate gradation, asphalt cement content and resistivity will be completed. Mix shall not be placed in the work until permission is given by the Owner. If the test mix is unsatisfactory, corrections shall be made and the process repeated until the required mix is produced. Material from the trial mix shall not be incorporated into the work.
313.07.01.10 Use of Paving Equipment

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

The longitudinal alignment of the spreader shall be controlled by following a stringline which is set from the alignment stakes. This means of control shall be placed at each outer edge of the pavement so that the spreader is directed at all times by the alignment stakes and not by the edge of the preceding course, except for the trailing paver when pavers are operated in echelon.

The automatic screed controls and all compaction aids on the paver shall be in operation while the mixture is being placed, except that the automatic screed controls shall not be used when placing HL 2 or a single course on granular grade.

Except for HL 2, when laying the first course adjacent to concrete gutters and similar structures, a short ski not less than 3 m in length shall be used and shall ride on the structure.

Single pavers, or the lead paver when pavers are operated 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 as necessary to match the output of the plant: however, in no case shall the speed of the paver exceed 18 m/min.

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

313.07.01.11 Widenings and Irregular Sections

a. Widenings

When widening existing pavements, asphaltic concrete shall be placed in the widening such that when compacted the top of the widening portion is flush with the top of the existing pavement. When stepped joints are specified, the layers placed in the widening shall be placed to the top of each step in separate operations.

The mixture shall be placed in the widening using special equipment designed or adapted for this purpose.

b. Irregular Sections

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

When laying surface courses, the use of feed augers for placing mix in these areas, etc. is permitted only when supplying materials to a hydraulic strike-off device.

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

313.07.01.12 Longitudinal and Transverse Joints

a. Requirements for all Joints

All joints shall be made to ensure a thorough and continuous bond between jointed materials and to provide a smooth riding surface.
All dirt or other foreign material and all loose material shall be removed from faces at which a joint is to be made.

When matching existing surfaces the depth of the uncompacted mat shall be set to allow for compaction and the paver screed shall overlap the adjacent surface by at least 50 mm.

b. Painting of Joints

Faces at which joints are made shall be painted with a thin uniform and continuous coating of joint painting material with the exception of the joint between pavement lanes laid in echelon and joints between adjacent lanes of HL 2.

c. Requirements for Longitudinal Joints

Longitudinal joints shall be properly “set up” with the back of a rake or lute at proper height and grade prior to rolling.

With the exception of HL 2 courses, the width of subsequent courses shall be adjusted to an offset of 150 - 300 mm so that longitudinal joints do not coincide vertically. 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 driving lanes, speed change lanes, tapers, etc as indicated in the Contract.

For surface courses, the method of making joints shall be such that the excess material is not scattered on the surface of the freshly laid mat. Such excess material shall be removed.

At widenings, longitudinal joints between bituminous pavement laid under this Contract and existing bituminous pavement shall be treated as follows:

1. Where a butt joint is to be constructed, the existing pavement edge shall be trimmed to a straight, clean, vertical face.

2. Where a stepped joint is to be constructed, the existing pavement edge shall be trimmed to a straight, clean, vertical face and the asphalt pavement shall be removed to the depth and width indicated in the Contract to form the stepped joint.

Where a resurfacing course placed flush against a rigid object, a butt joint shall be constructed by removing the existing pavement to provide an exposed face of at least 25 mm at the face of the rigid object and feathered out to zero along a line 1.25 m from and parallel to the exposed face of the rigid object to provide a depth of at least 25 mm of resurfacing material over the area of removal.

d. Requirements for Transverse Joints

Except for end joints with hot mix patching, transverse joints between bituminous pavement laid under this Contract and bituminous courses previously laid under this Contract shall be constructed by trimming the end of the previously laid course back to its full depth, to expose a fresh straight vertical surface.

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

1. Where a binder course is placed flush against an existing bituminous pavement and a butt joint is to be made, the existing pavement shall be trimmed back to form a straight vertical face.

2. Where a surface course is placed flush against an existing bituminous pavement, a butt joint shall be prepared by removing the existing pavement to the full depth of the existing surface course, to form a
straight vertical face, and for a longitudinal distance not less than 5 m so that the surface course placed has a thickness equal to the full depth of the existing surface course over the 5 m section.

3. Where a binder course and surface course are not placed flush against an existing bituminous pavement, the binder course shall be feathered out and the surface course shall be butt jointed by removing the existing pavement to a minimum depth of not less than 40 mm, to form a straight vertical face, and for a longitudinal distance not less than 5 m so that the surface course placed has a minimum thickness of 40 mm over the 5 m section.

313.07.01.13 Option to Place a Trial Quantity of Surface Course Hot Mix as Binder Course

This option is not applicable where the surface course is HL 2, HL 3A or Open Friction Course Mix, or where the binder course is either HL 4 Modified or HL 8 Modified.

The Contractor shall inform the Contract Administrator, in writing, if this option is to be used and the intended location and date of the trial quantity placement.

Where this option is applicable, the Contractor has the option of placing a trial quantity of each applicable surface course mix, subject to the following:

a. The trial quantity shall be a maximum of 1000 t for each applicable surface course mix, unless the Contract Administrator approves the placement of additional surface course material in the trial location.

b. The location of the trial quantity shall be subject to the approval of the Contract Administrator.

c. The trial quantity shall be placed as part of the upper binder course.

d. The trial quantity shall not be placed on a bridge deck.

e. Where the thickness of the upper binder course is less than or equal to 65 mm, the trial quantity shall be laid to the same thickness as the upper binder course but not less than 40 mm.

f. Where the upper binder course is greater than 65 mm in thickness, the binder course shall be laid in two lifts for the trial so that the upper lift of 40 mm thickness (minimum) may be constructed using surface course mix.

g. The surface course mixture and all construction methods used in the trial shall comply with the construction requirements for surface course.

h. When applying the Owner’s acceptance requirements for mix composition tolerances and for segregation, and the resulting disposition of unacceptable work, the trial quantity of surface course shall be decisioned under binder course acceptance criteria.

i. If the Contractor exhibits the capability of producing a non-rejectable pavement before the entire trial quantity is completed, the Contract Administrator may direct that the remainder of the location be paved with binder course material.

313.07.01.14 Option to Use Reclaimed Asphalt Pavement in HL 4 and HL 8 Binder Course Mix

This clause only applies to binder course mix produced for the tender items HL 4 and HL 8.

The Contractor may modify the composition of HL 4 and HL 8 binder course mixes with reclaimed asphalt pavement provided that the resultant mixture which is produced conforms to all requirements for the type of hot mix specified in the Contract, and as follows:
Reclaimed asphalt pavement that is contaminated with other material shall not be used.

Reclaimed asphalt pavement which is to be used in asphaltic concrete on this Contract shall be stockpiled in conformance with the stockpiling requirements for coarse aggregates in subsection 1001.07.05 Stockpiling of OPSS 1001, except that when the material is stockpiled on a compacted granular pad the top 75 mm of the pad shall be the coarse aggregate which is required for a new (virgin) mixture of the tendered hot mix item.

The use of reclaimed asphalt pavement which is obtained from existing stockpiles which do not have a foundation conforming to the above will be permitted provided that the bottom 0.5 m of the stockpile is not incorporated into the work.

Process control sampling and testing of the reclaimed asphalt pavement shall be as specified elsewhere in the Contract.

The Contractor shall determine the composition of the mix in accordance with the mix design procedures for a mix which contains reclaimed asphalt pavement, the percentage of reclaimed asphalt pavement in the mix and the grade of the new asphalt cement to be used in the mix. A calculation shall be completed to show that the proposed mix proportions will produce a mix which complies with recovered penetration requirements and this calculation shall be submitted to the Contract Administrator with the mix design documentation.

The Contractor shall conduct tests to determine the average penetration of the asphalt cement recovered from the reclaimed asphalt pavement. The test results shall be provided to the Contract Administrator with the mix design documentation. The testing for recovered penetration will conform to LS-284 and LS-200.

When the Contract requires the Owner to supply the asphalt cement for the tender item and the tender quantity of hot mix is greater than 3000 t, the Contractor shall provide a mix design and related documents for a mix using only new (virgin) materials and this mix design will be used to determine the compensation for the asphalt cement component of the reclaimed asphalt pavement in the actual mix produced. The mix design using only new (virgin) materials shall meet all Contract requirements.

When reclaimed asphalt pavement is incorporated into the mix, and the penetration grade of asphalt cement as specified in the Contract will not provide a mix that conforms to the Contract requirements, the Contractor shall supply an alternative penetration grade of asphalt cement. The penetration grade supplied shall be 85/100, 120/150, 150/200, 200/300, 300/400 or 500+. The use of 120/150, 200/300 and the 500+ penetration grades of asphalt cement shall be subject to approval by the Owner.

When the Contract requires the Owner to supply the asphalt cement for the tender item and the Contractor supplies an alternative penetration grade of asphalt cement, the Recovered Penetration Requirements specified elsewhere in the Contract are replaced by the following:

<table>
<thead>
<tr>
<th>Penetration Grade of Asphalt Cement Which the Owner Was to Supply</th>
<th>Mix Recovered Penetration Limits</th>
</tr>
</thead>
<tbody>
<tr>
<td>85/100</td>
<td>50 - 80</td>
</tr>
<tr>
<td>150/200</td>
<td>80 - 140</td>
</tr>
<tr>
<td>300/400</td>
<td>135 - 200</td>
</tr>
</tbody>
</table>
The use of additive(s), exclusive of new asphalt cement, to increase the penetration value of the asphalt cement in the reclaimed asphalt pavement or the mix is not permitted.

The use of additive(s), used to increase the penetration value of the new asphalt cement after the manufacture of the asphalt cement, is not permitted.

313.07.01.15 Compaction

313.07.01.15.01 Core Testing

Each completed course of pavement shall be compacted to the percentage of the recompacted Marshall density indicated in Table IV as determined from individual cored or sawn samples

<table>
<thead>
<tr>
<th>Thickness of Sample mm</th>
<th>Minimum % Compaction</th>
</tr>
</thead>
<tbody>
<tr>
<td>Equal to or greater than 40</td>
<td>96</td>
</tr>
<tr>
<td>Equal to or greater than 30 to less than 40</td>
<td>95</td>
</tr>
<tr>
<td>Equal to or greater than 25 to less than 30</td>
<td>94</td>
</tr>
<tr>
<td>Less than 25</td>
<td>93</td>
</tr>
</tbody>
</table>

313.07.01.15.02 Rolling

Rolling shall be completed to provide uniform compaction of the mixture.

All rolling shall be completed prior to one half hour after sunset, except when night work is permitted by the Contract.

Rolling and compaction for Open Friction Course Mix shall be carried out immediately after the mixture is placed and shall be completed with steel-tired rollers only.

The Contractor shall supply and use at least the minimum number of roller compaction units in the sequence specified in Table V.

When vibratory rollers are used, one shall be supplied for each paver.

The operating speed of steel-tired rollers shall not exceed 5 km/h and shall be slow enough to avoid undue displacement of the mix. Rollers shall operate with the drive wheel forward in the direction of paving.

At all places not accessible to rollers, the mixture shall be compacted by means of other suitable means.

Rolling procedures shall be as follows:

a. Breakdown Rolling

The mixture shall be thoroughly and uniformly compacted as soon after placing as it will bear 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 trips. Alternate trips of the roller shall be staggered.

b. Intermediate Rolling

The intermediate roller shall follow the breakdown rolling as closely as possible. Passes shall be so arranged as to ensure overlapping successive tire paths. The rolling operation shall be such as to prevent pick-up of the mixture on the tires.

c. Finish Rolling

Finish rolling shall be accomplished with the minimum number of passes required to produce a satisfactory surface. Finish rolling shall start longitudinally at the higher edge and proceed towards the lower edge of the course.

<table>
<thead>
<tr>
<th>MAXIMUM PRODUCTION</th>
<th>ROLLER SEQUENCE</th>
<th>ROLLER SEQUENCE</th>
</tr>
</thead>
<tbody>
<tr>
<td>t/h</td>
<td>Southern Ontario</td>
<td>All Ontario</td>
</tr>
<tr>
<td>120</td>
<td>S2 + R1 + S1</td>
<td>S2 + R2 + S1</td>
</tr>
<tr>
<td></td>
<td>V1 + R1</td>
<td>V1 + R2</td>
</tr>
<tr>
<td>135</td>
<td>V2 + R1</td>
<td>V1 + R3</td>
</tr>
<tr>
<td></td>
<td>V1 + R2</td>
<td>V2 + R2</td>
</tr>
<tr>
<td>150</td>
<td>S2 + 2xR1 + S1</td>
<td>S2 + 2xR2 + S1</td>
</tr>
<tr>
<td></td>
<td>S2 + R2 + S1</td>
<td>S2 + R3 + S1</td>
</tr>
<tr>
<td></td>
<td>V2 + R2</td>
<td>V2 + R3</td>
</tr>
<tr>
<td>200</td>
<td></td>
<td>V3 + R2</td>
</tr>
<tr>
<td>220</td>
<td></td>
<td>V3 + R3</td>
</tr>
</tbody>
</table>

Note: For Open Friction Course mix two class S2 rollers shall be used with each paver irrespective of the production rate.

313.07.01.16 Tolerances

Each course after final compaction shall be smooth and true to the established crown and grade and the surface of each course shall be free from deviations exceeding 3 mm as measured in any direction with a 3 m straight edge.

313.07.01.17 Surface Appearance

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

313.07.01.18 Repair of Sampling Locations

Holes resulting from the removal of pavement samples shall be filled with hot mix and compacted to conform to the adjoining undisturbed pavement immediately after sampling. In addition, when cores or sawn samples have been taken the hole shall be immediately cleaned, dried, filled and compacted using a manual hammer which has a drop weight or a mechanical compactor which is gas, electric or air powered.
313.07.01.19 Seal Coat for Salt/Sand Storage Pads

After the salt/sand storage pad has cooled to ambient temperature, the surface course of the storage pad shall be sprayed with undiluted SS-1 emulsified asphalt at a rate of 0.50 kg/m$^2$.

313.07.01.20 Disposal of Materials

All excess materials, including any surplus of reclaimed asphalt pavement created by revising the recycling ratio specified for Recycled Hot Mix (ratio) or by supplying conventional hot mix in place of Recycled Hot Mix (ratio), shall be managed as specified elsewhere in the Contract.

313.07.02 Crack Repair

The work required for this item shall be carried out in advance of paving operations.

Cracks which are to be repaired shall be cleaned and all loose and broken material shall be removed.

Hot mix of the type designated shall be placed in the crack, feathered to 0.3 m on each side of the crack and rolled with a steel-tired roller having a mass of at least 3 t.

313.07.03 Tack Coat

The work required for this item shall be carried out where such applications are designated in the Contract for tack coating under this item. Tack coating of pavements shall conform to clause 313.07.01.03.

313.08 QUALITY ASSURANCE

313.08.01 General

Acceptance testing will be conducted by the Owner or the Owner's agent.

All visually defective material, mixture, or work will be rejected by the Contract Administrator irrespective of any test results. Such defective material, mixture and work shall not be incorporated into the finished work.

The Contractor may have a representative present during testing. During the testing, the representative shall comment on anything about the testing which the representative does not consider valid and the Owner will respond to the comments to resolve them. Prior to leaving the laboratory any unresolved comments regarding the testing procedures are to be given to the Owner in writing. Any comments, on the testing procedures, which are made subsequent to the Contractor's representative leaving the laboratory will not be considered.

The Contract Administrator may obtain samples for testing from the pavement during the paving operation. Holes made by removal of such samples shall be filled by the Contractor. These samples are in addition to the samples taken by the Contractor under clause 313.07.01.06.

313.08.02 Acceptance of Asphalt Cement Content and Aggregate Gradation

The Owner will determine the acceptability of the hot mix for conformance with the asphalt cement content and aggregate gradation requirements on a lot-by-lot basis by testing samples to determine the asphalt cement content and aggregate percent passing on each designated sieve and comparing the results to the job-mix formula.

Acceptance testing will be conducted in accordance with test procedure LS-282.
313.08.03 Acceptance of Penetration of Asphalt Cement Recovered from Hot Mix

313.08.03.01 General

The Owner will determine the acceptability of the hot mix for conformance with the recovered penetration requirements on a lot-by-lot basis by testing samples to determine the penetration of the asphalt cement recovered from the hot mix and comparing the results to the requirements.

Acceptance testing will be conducted in accordance with test procedures LS-284 and LS-200. The laboratory completing the testing will have a current Canadian Testing Association (Ontario Chapter) certification for the required testing.

The Owner will inform the Contractor of the test result for each sample in writing within seven business days commencing the day after the day of delivery of the samples being received at the testing laboratory.

313.08.03.02 Lot Size

The lot size for acceptance will normally be 1000 t; however, the lot size may be reduced, at the discretion of the Contract Administrator, when it is necessary to reduce the lot sizes because of paving operations.

When either the process of hot mix production or the source of a material is changed or terminated, the lot shall be considered to be terminated and the Contractor shall notify the Contract Administrator of this change in writing. Minor plant adjustments shall not be considered a change in the process.

313.08.03.03 Requirements, Conformance and Repair

Acceptance will be determined on one test result per lot.

When the recovered penetration of a lot does not conform to the requirements specified and the test result is 25 penetration units or greater, the hot mix will be considered as borderline. When the recovered penetration of a lot is less than 25 penetration units the hot mix in the lot will be rejected.

The Contractor shall repair the hot mix in rejected lots by using the options detailed below, except when rejected material is located beneath a structure, on a structure, adjacent to curb and gutter, or when for any other reason the pavement elevation cannot be raised, in which case the repair method for the rejected hot mix shall be as directed by the Owner.

The repair options for the first hot mix layer placed on the Contract, except for a first layer placed on granular grade, shall be:

a. Remove and replace the hot mix, or

b. Overlay with hot mix with the same thickness as that of the rejected layer.

For hot mix placed on granular grade and hot mix which is the second or subsequent layer placed on a Contract, rejected mix shall be removed and replaced with mix conforming to the Contract requirements.

The repaired lot shall be re-sampled during repair and treated as a subsequent lot for purposes of acceptance.

313.08.03.04 Re-testing of Recovered Penetration

The Owner will reconsider rejected lots if the Contractor presents test data from random samples, which were obtained through a comprehensive coring and testing program on the rejected lot of material, and the samples were tested by an agency which has a current Canadian Testing Association (Ontario Chapter) certification for the required testing. The rejected lot may be divided into a maximum of 10 equal portions for...
the above coring and testing program. The Contractor shall supply the Contract Administrator with replicate cores of 2.5 kg each and the cores shall be taken in the presence of the Contract Administrator. Based on test results more favourable to the Contractor, the Owner will discard the original test data and re-test the rejected lot for compliance to specified requirements. The rejected lot will be re-tested in the same equal portions as used in the Contractor's coring and testing program and only those portions found to be rejectable by the Owner's re-testing shall be repaired.

313.09 MEASUREMENT FOR PAYMENT

313.09.01 Hot Mix HL (Type)
Hot Mix HL (Type) Patching
Recycled Hot Mix (Ratio)
Recycled Hot Mix (Ratio) Patching
Heavy Duty Binder Course Mix
Medium Duty Binder Course Mix
Dense Friction Course Mix
Open Friction Course Mix
Electrically Conductive Mix

313.09.01.01 Measurement by Area
Measurement will be of the horizontal area in square metres in place.

313.09.01.02 Measurement by Mass
Measurement will be in tonnes conforming to OPSS 502.

313.09.01.03 Trial Mix Quantities
Trial mix quantities will not be measured for payment.

313.09.01.04 Temporary Transverse Ramp Down Quantities
When the hot mix type used in a temporary transverse ramp down is different from the hot mix type used for the bituminous course for which the ramp down is required, the hot mix quantity used in the ramp down will not be measured for payment.

313.09.01.05 Open Friction Course Mix
The payment quantities indicated in the tender are based on mixes consisting of steel slag aggregates only. The quantity for payment for traprock, dolomitic sandstone, and gravel mix incorporated into the work will be determined by multiplying the total measured mass of mix with the appropriate multiplier factor given in Table VI.

| TABLE VI |
| OPEN FRICTION COURSE MIX - MASS MULTIPLIER FACTORS |

<table>
<thead>
<tr>
<th>Origin of Raw Material for Aggregates</th>
<th>Multiplier Factor</th>
</tr>
</thead>
<tbody>
<tr>
<td>Steel Slag</td>
<td>1.000</td>
</tr>
<tr>
<td>Traprock</td>
<td>1.222</td>
</tr>
<tr>
<td>Gravel</td>
<td>1.325</td>
</tr>
<tr>
<td>Dolomitic Sandstone</td>
<td>1.227</td>
</tr>
</tbody>
</table>
313.09.01.06 Dense Friction Course Mix

The payment quantities indicated in the tender are based on the mixes consisting of traprock aggregates only. The quantity for payment will be determined by multiplying the total measured mass of the mix incorporated into the work by the appropriate multiplier factor given in Table VII, depending on the aggregate combination supplied.

### TABLE VII

<table>
<thead>
<tr>
<th>Coarse Aggregate</th>
<th>Fine Aggregate</th>
<th>Multiplier Factor</th>
</tr>
</thead>
<tbody>
<tr>
<td>Traprock</td>
<td>Traprock</td>
<td>1.000</td>
</tr>
<tr>
<td>Traprock</td>
<td>Blast Furnace Slag</td>
<td>1.111</td>
</tr>
<tr>
<td>Traprock</td>
<td>Dolomitic Sandstone</td>
<td>1.047</td>
</tr>
<tr>
<td>Steel Slag</td>
<td>Traprock</td>
<td>0.964</td>
</tr>
<tr>
<td>Steel Slag</td>
<td>Steel Slag</td>
<td>0.947</td>
</tr>
<tr>
<td>Steel Slag</td>
<td>Blast Furnace Slag</td>
<td>1.038</td>
</tr>
<tr>
<td>Steel Slag</td>
<td>Dolomitic Sandstone</td>
<td>1.007</td>
</tr>
<tr>
<td>Blast Furnace Slag</td>
<td>Traprock</td>
<td>1.164</td>
</tr>
<tr>
<td>Blast Furnace Slag</td>
<td>Steel Slag</td>
<td>1.107</td>
</tr>
<tr>
<td>Blast Furnace Slag</td>
<td>Blast Furnace Slag</td>
<td>1.268</td>
</tr>
<tr>
<td>Blast Furnace Slag</td>
<td>Dolomitic Sandstone</td>
<td>1.164</td>
</tr>
<tr>
<td>Dolomitic Sandstone</td>
<td>Traprock</td>
<td>1.055</td>
</tr>
<tr>
<td>Dolomitic Sandstone</td>
<td>Steel Slag</td>
<td>1.023</td>
</tr>
<tr>
<td>Dolomitic Sandstone</td>
<td>Blast Furnace Slag</td>
<td>1.149</td>
</tr>
<tr>
<td>Dolomitic Sandstone</td>
<td>Dolomitic Sandstone</td>
<td>1.098</td>
</tr>
</tbody>
</table>

13.09.01.07 Heavy Duty Binder Course Mix

The payment quantities indicated in the tender are based on bedrock material coarse and fine aggregate mixes. The quantity for payment will be determined by multiplying the total measured mass of the mix incorporated into the work by the appropriate multiplier factor given in Table VIII, depending upon the aggregate combination supplied.

### TABLE VIII

<table>
<thead>
<tr>
<th>Coarse Aggregate</th>
<th>Fine Aggregate</th>
<th>Multiplier Factor</th>
</tr>
</thead>
<tbody>
<tr>
<td>Crushed Bedrock</td>
<td>Crushed Bedrock</td>
<td>1.000</td>
</tr>
<tr>
<td>Crushed Bedrock</td>
<td>Steel Slag</td>
<td>0.910</td>
</tr>
<tr>
<td>Steel Slag</td>
<td>Crushed Bedrock</td>
<td>0.910</td>
</tr>
<tr>
<td>Steel Slag</td>
<td>Steel Slag</td>
<td>0.877</td>
</tr>
</tbody>
</table>
313.09.02  Crack Repair
313.09.02.01  Actual Measurement
Measurement will be by the metre along the crack.
313.09.02.02  Plan Quantity Measurement
Measurement is by Plan Quantity, as may be revised by Adjusted Plan Quantity, of the length in metres along the crack.

313.09.03  Tack Coat
313.09.03.01  Actual Measurement
Measurement will be of the area tack coated in square metres.
313.09.03.02  Plan Quantity Measurement
Measurement is by Plan Quantity, as may be revised by Adjusted Plan Quantity, of the horizontal area in square metres.

313.09.04  Hot Mix Miscellaneous
313.09.04.01  Actual Measurement
Measurement will be of the area in square metres, regardless of the number of lifts placed.
313.09.04.02  Plan Quantity Measurement
Measurement is by Plan Quantity, as may be revised by Adjusted Plan Quantity, of the horizontal area in square metres, regardless of the number of lifts placed.

313.10  BASIS OF PAYMENT
313.10.01  Hot Mix
313.10.01.01  Hot Mix HL (Type) - Item
Hot Mix HL (Type) Patching - Item
Recycled Hot Mix (Ratio) - Item
Recycled Hot Mix (ratio) Patching - Item
Heavy Duty Binder Course Mix - Item
Medium Duty Binder Course Mix - Item
Dense Friction Course Mix - Item
Open Friction Course Mix - Item
Electrically Conductive Mix - Item

Payment at the contract price for the above tender item(s) shall be full compensation for all labour, equipment and materials to do the work except as otherwise provided for in subsection 313.10.01.

When repairing hot mix, the Contractor shall be responsible for and shall carry out all associated work and replace or restore all associated damage and removals, at no cost to the Owner. Where the Owner supplies the asphalt cement in the Contract, the cost of asphalt cement used in repairing the work will be recovered from the Contractor.
When the Contractor is responsible for the supply and cost of all of the hot mix aggregates, and/or the reclaimed asphalt pavement, the Contractor shall be responsible for any additional costs (except the additional cost of an increase in asphalt cement content when the asphalt cement is supplied by the Owner or when provision is made elsewhere in the Contract to compensate the Contractor for an increase in asphalt cement content) incurred due to a change in the material proportions after the original mix design and job-mix formula have been accepted.

When the Owner supplies hot mix aggregate(s), reclaimed asphalt pavement for use in the item - Recycled Hot Mix (ratio), and/or is responsible for a portion or all of the cost of the blending material, the Owner may be responsible for some or all additional costs incurred due to a change in the material proportions after the original mix design and job-mix formula have been accepted. A written request for additional compensation shall be made while the materials for this Contract are available for sampling by the Owner. The Owner will judge each case on its own merits, based on the Contractor's written support for the request and on Owner test results and information.

313.10.01.01.01 Recycled Hot Mix (Ratio)

When a lower recycling ratio than that which is specified has been used at the Contractor's request, all additional costs, including any additional asphalt cement and appropriate grade or grades of asphalt cement required, extra labour, equipment and material costs arising from lowering the recycling ratio shall be the responsibility of the Contractor, unless it has been established to the satisfaction of the Contract Administrator that a job-mix formula could not be obtained at the specified recycling ratio or unless the recycling ratio has been reduced to 50/50 to comply with air quality standards.

When the Contractor has to reduce the recycling ratio in order to comply with air quality standards, the Owner will only assume responsibility for the costs arising from reducing the recycling ratio to 50/50. Any additional costs, including any additional asphalt cement and appropriate grade or grades of asphalt cement required, extra labour, equipment and material costs arising from providing a recycling ratio of less than 50/50 shall remain the responsibility of the Contractor.

When the Contractor selects the option to supply conventional mix, the Contractor shall be responsible for all additional costs incurred, including all additional asphalt cement and all blending of aggregates which is required.

313.10.01.01.02 Medium Duty Binder Course Mix

For Contracts which require the Owner to supply the asphalt cement and when the Contractor elects to use polymer modified asphalt cement, the supply shall be at the Contractor's cost. The Owner will compensate the Contractor for the quantity of polymer modified asphalt cement used, based on the job-mix formula by either of the following two methods as specified in writing by the Contractor at the pre-work meeting:

a. Payment will be made for an equal quantity of standard asphalt cement at the Owner's purchase order price for asphalt cement (excluding the Ontario Retail Sales Tax), which is current at the time of placing the hot mix.

b. The Contractor shall take delivery of the asphalt cement penetration grade, as ordered on the Owner's purchase order, from the Owner's supplier in a quantity equal to the quantity of polymer modified asphalt cement required by the job-mix formula for the quantity of mix incorporated into the work.

313.10.01.01.03 Dense Friction Course Mix

When the Owner supplies the asphalt cement, the Owner will supply up to 4.5 percent asphalt cement (by mass) for the mix based on traprock aggregates.

The Contractor shall be responsible for the cost of any additional asphalt cement required, depending on the aggregates selected by the Contractor, for the aggregate combination utilized.
Regardless of the type of aggregates used, the quantity of asphalt cement required in the mix will be determined by multiplying the asphalt cement content specified in the job-mix formula by the actual mass of hot mix placed.

313.10.01.01.04 Open Friction Course Mix

a. When the Owner Supplies the Asphalt Cement

The Owner will supply up to 5.2 percent asphalt cement (by mass) for the mix based on steel slag aggregates.

The Contractor shall be responsible for the cost of any additional asphalt cement required, depending on the aggregates selected by the Contractor up to the percentage shown in the table below for the aggregate combination utilized. The Owner will provide any asphalt cement required beyond the percentage shown for the combination utilized.

Regardless of the type of aggregates used, the quantity of asphalt cement required in the mix will be determined by multiplying the asphalt cement content specified in the job-mix formula by the actual mass of hot mix placed.

<table>
<thead>
<tr>
<th>Origin of Raw Material for Aggregates</th>
<th>% A.C. By Mass</th>
</tr>
</thead>
<tbody>
<tr>
<td>Steel Slag</td>
<td>5.2</td>
</tr>
<tr>
<td>Traprock</td>
<td>5.0</td>
</tr>
<tr>
<td>Gravel</td>
<td>5.3</td>
</tr>
<tr>
<td>Dolomitic Sandstone</td>
<td>4.6</td>
</tr>
</tbody>
</table>

b. When the Contractor Supplies the Asphalt Cement

When the mix is constructed with steel slag coarse and steel slag fine aggregate, there will be an adjustment to the unit bid price per tonne of hot mix if the percentage by mass of asphalt cement required for the work as required by the job-mix formula is not 5.2 percent. The price adjustment will apply to the mass of hot mix placed using the job-mix formula.

The unit bid price will be adjusted upwards or downwards by an amount of 0.1 percent of the price of the asphalt cement used in the mix for every 0.1 percent increase or decrease respectively between the percentage of asphalt cement for the job-mix formula and 5.2 percent. The Contractor shall inform the Owner in writing of the purchase price of the asphalt cement when there is to be a price adjustment of the asphalt cement based on the asphalt cement required by the job-mix formula.

There will be no adjustment when any other aggregate type is selected.

313.10.01.01.05 Option to Place a Trial Quantity of Surface Course Hot Mix as Binder Course

When the Contractor has performed work in conformance with clause 313.07.01.13, Option to Place a Trial Quantity of Surface Course Hot Mix as Binder Course, the following shall apply:

a. Payment for surface course mix placed in the binder course as a trial quantity, to a maximum of 1000 t for each applicable surface course item, will be made at the contract price for the surface course; however, with the approval of the Contract Administrator, the Contractor may place additional surface course material in the trial location at the appropriate contract price for the binder course replaced.

b. When the Contract specifies that asphalt cement is supplied by the Owner and is not included in the contract price for the mix, asphalt cement will be supplied in the quantity appropriate to the surface course mix for the trial quantity not exceeding 1000 t of mix.
c. The quantity of surface course mix placed as binder course under this option shall be considered as binder course quantity in considering unit price revision in accordance with the Contract.

d. The Contractor shall be responsible for changes in the required quantities of materials, excluding asphalt cement as provided for above but including reclaimed asphalt pavement, resulting from his decision to place the trial quantity of surface course, and the Contractor shall bear all resulting costs.

e. All other costs arising from the Contractor's decision to take advantage of this option shall be borne by the Contractor.

313.10.01.01.06  Option to Use Reclaimed Asphalt Pavement in HL 4 and HL 8 Binder Course Mix

Payment at the contract price shall include all labour, equipment and materials to do the work required by the Contractor's optional use of reclaimed asphalt pavement as provided under clause 313.07.01.14, Option to Use Reclaimed Asphalt Pavement in HL 4 and HL 8 Binder Course Mix, as all costs, including those costs associated with supplying all materials including any blending materials, shall be deemed to be included in the contract price for the appropriate tender item. However, when the Contract requires the Owner to supply a specific grade of asphalt cement for the tender item, the Owner will compensate the Contractor for an alternative grade of asphalt cement when supplied by the Contractor and for the recycled asphalt cement in the mix by one of the following methods as specified in writing by the Contractor at the pre-work meeting:

a. When the Contractor supplies an alternative grade of asphalt cement, the Contractor will be compensated for the total quantity of asphalt cement that would have been required using only new (virgin) material in the mix design. Payment will be made at the Owner's purchase order price (excluding Ontario Retail Sales Tax) for the grade of asphalt cement specified for the mix using only new (virgin) material that is current at the time of placing hot mix incorporating the alternative grade of asphalt cement and reclaimed asphalt pavement material in the mix.

b. When the Contractor does not supply an alternative grade of asphalt cement, the Contractor shall make appropriate downward adjustments to the amount of asphalt cement ordered, to allow for the asphalt cement provided from the reclaimed asphalt pavement material. The Owner will reimburse the Contractor for the quantity of recycled asphalt cement, as determined by the difference between the amount of asphalt cement that would have been required using only new (virgin) material in the design mix and the amount of asphalt cement ordered from the Owner's supplier. Payment for the asphalt cement component of the reclaimed asphalt pavement will be made at the Owner's purchase order price (excluding Ontario Retail Sales Tax), for new asphalt cement that is current at the time of placing the hot mix incorporating the reclaimed asphalt pavement material in the mix.

c. The Contractor shall take delivery of such asphalt cement of the penetration grade specified in the Contract for Owner supply in an amount equal to the amount of asphalt cement that would have been required using only new (virgin) material in the mix design.

When the tender quantity for the item is less than or equal to 3000 t and a mix design using only new (virgin) materials has not been completed for the item, the asphalt cement content designated by the job-mix formula of the mix will be used for the calculations in place of the asphalt cement content of the mix using only new (virgin) materials.

313.10.01.01.07  Re-testing of Recovered Penetration

The Contractor will bear all costs of coring and laboratory testing conducted by the Contractor under clause 313.08.03.04, Re-testing of Recovered Penetration, except that when no rejected hot mix is located, the Owner will pay the Contractor's laboratory testing cost to a maximum cost per test equal to the Canadian Testing Association recommended rates in effect when the testing was completed plus applicable taxes, and $35.00 per core to a maximum of twenty cores per lot.
313.10.01.01.08  New Mix Designs Resulting From Owner Changes

Where a new mix design and job-mix formula are required because of a change for which the Owner bears responsibility, the Contractor shall have the work completed as Extra Work in conformance with the Contract.

313.10.01.01.09  Anti-Stripping Additives and Hydrated Lime

This clause shall apply only when specified elsewhere as being applicable to the Contract.

When an anti-stripping additive is required it shall be supplied and used at the Contractor's cost when:

a. an aggregate is used which is not on the Owner's Aggregate Sources List in the Contract,

b. an aggregate is used which is on the Owner's Aggregate Sources List in the Contract and anti-stripping additive is indicated as being required,

c. an aggregate is used which is on the Owner's Designated Sources Manual/List and an anti-stripping additive is indicated as being required,

d. an anti-stripping additive is stated as being required for the mix, or

e. an Aggregate Sources List is not provided in the Contract and an aggregate source is selected which has a history of requiring an anti-stripping additive.

When determining the quantity of asphalt cement used, a deduction will be made for the amount of anti-stripping additive used in the mix.

When hydrated lime is used in place of an anti-stripping additive, all costs shall be the Contractor's.

313.10.01.01.10  Blending Materials

This clause shall apply only when specified elsewhere as being applicable to the Contract.

All materials produced during hot mix aggregate processing operations shall be available to the Owner at no extra cost, in order to produce hot mix which conforms to Contract requirements.

When the Owner pays for blending sand, payment will be for the additional cost incurred by the Contractor for supplying blending sand in stockpile at the asphalt plant site. Such payment will be made at a negotiated price per tonne of hot mix in which blending sand is actually used. This price shall be considered as being the additional cost over and above the cost of supplying an equal amount of primary fine aggregate through normal operations. The Contractor shall provide blending sand which results in the least cost to the Owner.

The responsibility for the cost of blending sand shall be determined in accordance with the following conditions:

a. Where the Aggregate Sources List in the Contract shows "X" (Acceptable) for the source of primary fine aggregate and if blending sand is required to produce hot mix which conforms to Contract requirements, the Owner will bear the negotiated cost of blending sand, unless the Owner has notified the Contractor in writing during the progress of the aggregate production that the primary fine aggregate has been contaminated through unacceptable stripping, processing or handling operations, in which case the Contractor shall bear the cost for blending sand.

b. Where the Aggregate Sources List in the Contract shows "R" (Conditionally Acceptable) for the source of primary fine aggregate and the suitability condition states "Requires Blending" and the Contractor can
provide a primary fine aggregate in a single stockpile which meets the gradation specification limits and a blending sand is still required to produce hot mix which conforms to Contract requirements, the Owner will be responsible for the negotiated cost of blending sand.

c. Where the Aggregate Sources List in the Contract shows "R" (Conditionally Acceptable) for the source of the primary fine aggregate and the suitability condition states "Requires Blending", and the gradation of the primary fine aggregate as produced is outside the gradation specification limits, and a blending sand is required to produce hot mix which conforms to Contract requirements, the Contractor shall be responsible for the cost of that portion of the blending sand required to bring the blended combination inside the gradation specification limits for every sieve and not less than five percent inside the gradation specification limits based on the total fine aggregate dry mass on the 1.18 mm, 600 μm and 300 μm sieves. The Owner will bear the negotiated cost of the remaining portion of the blending sand. The negotiated cost will not include mobilization.

Further, where a blending ratio of less than one part of blending sand to five parts of primary fine aggregate will satisfy the preceding gradation requirements, the Contractor shall be responsible for the cost of supplying one part of blending sand to five parts of primary fine aggregate.

d. Where the Aggregate Sources List in the Contract shows "R" (Conditionally Acceptable) for the source of primary fine aggregate and the suitability condition states that "Blending Required in Order to Produce Hot Mix Which Conforms to Contract Requirements" and historical information on the use of this source in the production of hot mix(es) is available, the Contractor shall be responsible for the cost of all blending sand. This situation does not apply to quarry screenings produced from processing quarried bedrock rock.

e. Where the Aggregate Sources List in the Contract shows "N" (Not Acceptable) or "I" (Requires Investigation), the Contractor shall be responsible for the cost of all blending sand required to produce hot mix which conforms to Contract requirements.

f. Where the Contractor uses quarry screenings produced from processing quarried rock for the source of primary fine aggregate, the Contractor shall be responsible for the cost of all blending sand required to produce hot mix which conforms to Contract requirements.

g. Where the source is not listed in the Aggregate Sources List in the Contract or an Aggregate Sources List is not supplied, the Contractor shall provide hot mix which conforms to Contract requirements and shall be responsible for the cost of all blending sand regardless of the gradation of the primary fine aggregate.

h. When the optional use of reclaimed asphalt pavement in hot mix is permitted in the Contract and the Contractor exercises the option, the Contractor shall be responsible for the cost of all blending sand required to produce hot mix which conforms to Contract requirements.

313.10.01.01.11 Handling of Filler

This clause shall apply only when specified elsewhere as being applicable to the Contract.

Payment for the handling of filler and providing the mineral filler attachment shall be made as Extra Work in conformance with the Contract, and shall cover all costs arising from adding the filler, including unloading, handling, stockpiling and arranging for delivery.

The Owner will supply filler F.O.B. the Contractor's hot mix plant.
313.10.02  Hot Mix Miscellaneous - Item

Payment at the contract price for the above tender item shall be full compensation for all labour, equipment and materials to do the work except that the hot mix material shall be paid for under the appropriate hot mix tender item.

313.10.03  Crack Repair - Item

Payment at the contract price for the above tender item shall be full compensation for all labour, equipment and materials to do the work except that the hot mix material shall be paid for under the appropriate hot mix tender item.

313.10.04  Tack Coat - Item

Payment at the contract price for the above tender item shall be full compensation for all labour, equipment and materials to do the work.

Where there is no separate tender item for "Tack Coat", payment at the contract price for the appropriate tender item for hot mix to be placed on the tack coat shall include full compensation for all labour, equipment and materials for the tack coating.

Payment for tack coating completed in association with bridge deck waterproofing shall be deemed to be included in the bridge deck waterproofing item.