



**CONSTRUCTION SPECIFICATION FOR
HOT MIX ASPHALT – END RESULT**

TABLE OF CONTENTS

313.01	SCOPE
313.02	REFERENCES
313.03	DEFINITIONS
313.04	DESIGN AND SUBMISSION REQUIREMENTS
313.05	MATERIALS
313.06	EQUIPMENT
313.07	CONSTRUCTION
313.08	QUALITY ASSURANCE
313.09	MEASUREMENT FOR PAYMENT
313.10	BASIS OF PAYMENT

313.01 SCOPE

This specification covers the requirements for the placement, compaction, and acceptance of hot mix asphalt (HMA).

This specification also covers the requirements for the placement, compaction, and acceptance of HMA produced using warm mix asphalt (WMA) technology when the tender item title includes “Warm Mix”.

313.02 REFERENCES

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

Ontario Provincial Standard Specifications, Construction

OPSS 308	Tack Coat
OPSS 914	Waterproofing Bridge Decks with Hot Applied Asphalt Membrane

Ontario Provincial Standard Specifications, Material

- OPSS 1101 Performance Graded Asphalt Cement
- OPSS 1151 Superpave and Stone Mastic Asphalt Mixtures

Ontario Ministry of Transportation Publications

MTO Laboratory Testing Manual

- LS-100 Rounding-Off of Test Data and Other Numbers
- LS-101 Calculation of Per Cent within Limits
- LS-262 Bulk Relative Density of Compacted Bituminous Mixtures
- LS-264 Theoretical Maximum Relative Density of Bituminous Paving Mixtures
- LS-265 Determination of Percent Air Voids in Compacted Dense Bituminous Pavement Mixtures
- LS-266 Determination of VMA in Compacted Bituminous Mixtures
- LS-282 Quantitative Extraction of Asphalt Cement and Analysis of Extracted Aggregate from Bituminous Paving Mixtures
- LS-292 Quantitative Determination of Asphalt Cement Content by Ignition and Analysis of Remaining Aggregate from Bituminous Paving Mixtures
- LS-294 Measuring Pavement Lift Thickness
- LS-306 Bulk Relative Density of Compacted Bituminous Mixtures Using Paraffin Coated Specimens
- LS-310 Determination of Draindown Characteristics in Uncompacted Asphalt Mixtures
- LS-317 Determination of the Severity of a Segregated Asphalt Pavement Surface
- LS-604 Relative Density and Absorption of Coarse Aggregate
- LS-605 Relative Density and Absorption of Fine Aggregate

ASTM International

- D6752 - 18 Standard Test Method for Bulk Specific Gravity and Density of Compacted Bituminous Mixtures Using Automatic Vacuum Sealing Method
- E178 - 16 Standard Practice for Dealing with Outlying Observations

American Association of State Highway and Transportation Officials (AASHTO)

- M 320-17 Standard Specification for Performance Graded Asphalt Binder
- R 35-17 Superpave Volumetric Design for Hot - Mix Asphalt
- T 166-16 Bulk Specific Gravity of Compacted Bituminous Mixtures Using Saturated Surface-Dry Specimens
- T 283-14 Standard Method of Test for Resistance of Compacted Asphalt Mixtures to Moisture-Induced Damage
- T 312-19 Standard Method of Test for Preparing and Determining the Density of Hot Mix Asphalt (HMA) Specimens by Means of the Superpave Gyrotory Compactor

313.03 DEFINITIONS

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

Ambient Air Temperature means the air temperature measured in the shade and away from the paving operations.

Anti-Stripping Treatment (AST) means as defined in OPSS 1151.

Asphalt Cement (AC) means asphalt binder as defined in OPSS 1101.

Attribute means one of the following properties: designated large sieve (DLS), 4.75 mm sieve, 75 µm sieve, AC content, air voids, lift thickness, VMA, draindown, 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.

Crack means a break in the pavement surface, a separation of the pavement or aggregates at the surface of the pavement, and separation of pavement joints, and includes breaks and separations previously repaired by sealing.

Design Lift Thickness (T_D) means the thickness in millimetres as specified in the Contract Documents of:

- a) A specified lift of asphalt mix measured by square metres, or
- b) For multiple binder course lifts of the same tender item, it means the combined specified thicknesses in millimetres of the successive binder course lifts of the same tender item, at the same location measured by square metres.

Designated Large Sieve (DLS) means a sieve size specifically designated for each mix type for gradation testing. The designated sieve for the following mix types is:

- a) 25.0 mm for Superpave 37.5;
- b) 19.0 mm for Superpave 25.0;
- c) 12.5 mm for SMA 19.0 and Superpave 19.0;
- d) 9.5 mm for SMA 12.5 and Superpave 12.5, 12.5FC 1 and 12.5FC 2; and
- e) 4.75 mm for SMA 9.5 and Superpave 9.5.

Draindown means that portion of SMA mixture, fines and AC, that separates and flows downwards through the mixture.

Fat Spot means an area of pavement where asphalt mastic has migrated to the surface creating a substantially blacker area than the surrounding pavement.

Field Adjustment to the Job Mix Formula means a change in the target gradation, AC content, or both of a mix, within limits as specified in the Contract Documents without a redesign of the HMA, resulting in an adjusted JMF.

Hot Mix Asphalt (HMA) means hot mixed, hot laid asphaltic concrete and includes mix produced using WMA technologies. 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.

Job Mix Formula (JMF) means the percentage passing on each designated sieve of the total mass of aggregate and the amount of AC as a percentage by mass of the mixture that are based on mix design procedures as specified in the Contract Documents.

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

Levelling Course means a HMA course of variable thickness used for correcting crossfall and profile deficiencies in the existing pavement prior to placing a HMA binder or surface course. Levelling course may also be referred to as a padding course.

Lift Thickness means the thickness in millimetres, measured according to LS-294, of:

- a) A single lift of asphalt mix measured by square metres, or
- b) For multiple binder course lifts of the same tender item, it means the combined thickness of all placed and compacted successive binder course lifts of the same tender item, at the same location measured by square metres.

Loose Mix means a representative sample of uncompacted HMA for testing mix properties.

Lot means a specific quantity of Material or a specific amount of construction.

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

Mid-Lane Segregation means a continuous or discontinuous longitudinal “streak” of segregation, typically no greater than 300 mm in width located anywhere across the width of the lane.

Mix Properties means the AC content, gradation, air voids, and VMA.

Other Segregation means discrete areas or patches of regular, irregular, or chevron shape segregation.

Outlier means a test result that for a specific significance level is determined by statistical analysis not to be part of the test result population.

Padding means a HMA layer used to eliminate transverse and longitudinal irregularities on an existing surface before placing the binder or surface course.

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

Payment Adjustment Sieves means the DLS, 4.75 mm, and 75 µm gradation sieves.

Percent within Limits (PWL) means an estimate of the percentage of the lot that is within specification limits, determined by using the mean and standard deviation of the lot.

Performance Graded Asphalt Cement (PGAC) means as defined in OPSS 1101.

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 requirements as specified in the Contract Documents.

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 requirements as specified in the Contract Documents.

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.

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

Segregation means a condition of the pavement characterized by areas with comparatively coarser or finer texture than that of the surrounding pavement, with severity levels:

- a) Slight Segregation - a pavement matrix is in place between the coarse aggregate particles; however, there are slightly more, coarse aggregate particles in comparison with the surrounding acceptable mix.
- b) Medium Segregation - the pavement has significantly more, coarse aggregate particles than the surrounding acceptable mat and usually exhibits some lack of surface matrix.

- c) **Severe Segregation** - the pavement appears very coarse, with coarse aggregate particle against coarse aggregate particle and the pavement has little or no matrix.

Small Quantity Lot means any lot with one or two sublots.

Standard Deviation means the square root of the value determined by summing the squares of the difference between each test result and the mean of the test results divided by the number of test results minus one.

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

SMA Mixes means SMA 9.5, SMA 12.5, and SMA 19.0.

Straight Edge means a straight edge made of metal with a level recessed in its upper surface parallel to the lower edge.

Superpave means a system for specifying material components and asphalt mix design using the Superpave gyratory compactor. It is an acronym for Superior Performing Asphalt Pavements.

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

Through Lane means a traffic lane not intended for entering or exiting the roadway and does not include shoulders. Where there is more than one roadway, through lane refers to the traffic lane for the higher-class roadway. Freeway to freeway ramps, HOV lanes, and truck climbing lanes are considered through lane.

Vertical Surface means all edges of concrete curbs, catch basins, appurtenances, longitudinal joints, and transverse joints for application of joint painting material.

Voids means air voids and voids in mineral aggregate (VMA).

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 HMA.

Waxed-based WMA Technology means a WMA technology that uses in whole or in part synthetic natural wax components.

313.04 DESIGN AND SUBMISSION REQUIREMENTS

313.04.01 Submission Requirements

Prior to the start of paving, the purchase price of the AC, in the form of a purchase order or other document signed by the Contractor's senior financial officer, shall be submitted to the Contract Administrator.

If there is intent to store HMA production in a silo, the planned times of HMA production shall be submitted to the Contract Administrator with one Business Day advance notice.

Prior to the start of paving on bridge decks, the mass of the rollers, except for Class V rollers, to be used on bridge decks shall be submitted to the Contract Administrator in writing. The minimum compaction temperature for HMA or WMA recommended by the AC supplier shall also be submitted to the Contract Administrator in writing.

A copy of the Technical Data Sheet and Safety Data Sheet of the release agent(s) shall be submitted to the Contract Administrator.

313.05 MATERIALS

313.05.01 Hot Mix Asphalt

The HMA shall be according to OPSS 1151. Asphalt cement, tack coat, anti-stripping treatments, release agents, and other additives shall be compatible with the other components of the HMA.

313.05.02 Tack Coat

Tack coat shall be according to OPSS 308.

313.05.03 Release Agents

No release agents shall be used that may adversely affect the quality or performance of the HMA. Release agents shall be used according to the proprietary requirements.

Petroleum based release agents, excess water, or excess release agents shall not be used.

313.05.04 Warm Mix Asphalt

The WMA shall be according to OPSS 1151 and the following:

The mix shall be produced at a facility capable of producing the mix according to the WMA technology supplier's instructions for the use of their WMA technology. All information required for the proper preparation, handling, storage, and use of the WMA materials shall be obtained from the WMA technology supplier.

The use of waxed-based or sulfur-based WMA technologies shall not be permitted.

313.05.05 Grit for Stone Mastic Asphalt

Grit for SMA shall be as specified in the Contract Documents.

313.06 EQUIPMENT

313.06.01 Rollers

A Class R Roller is a self-propelled pneumatic-tired roller.

A Class S Roller is self-propelled steel-drum, tandem, or three-wheel roller.

A Class V Roller is a self-propelled vibratory roller 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.

313.06.01.01 Rollers for Granular Grade Preparation

Finish rolling for granular grade shall be accomplished using, as a minimum:

- a) A Class S roller with a minimum mass of 7 tonnes and minimum mass of 3.5 kg per mm total roll width,
or

b) A Class V roller with a drum width of at least 1.2 m.

313.06.01.02 Rollers on Bridge Decks

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.

If Class V rollers are used, they shall be used in static mode.

At the Contract Administrator's request, rollers shall be weighed in the presence of the Contract Administrator or a representative.

313.06.02 Diamond Grinding

A diamond grinder shall be power-driven, self-propelled, and designed for grinding HMA. It shall be equipped with a grinding head with at least 50 diamond blades per 300 mm of shaft. The grinding head shall be at least 1.2 m wide. The grinder shall be equipped with the capability to adjust the depth, slope, and crossfall to remove HMA to the required profile and shall also include a slurry pick-up system.

313.07 CONSTRUCTION

313.07.01 Quality Control

The QC procedures shall be conducted to ensure HMA meets the requirements of the Contract Documents. Interpretation of QC inspections, test results, and measurements and the determination of any action to be taken shall be carried out to ensure that the work is according to the requirements of the Contract Documents.

A single sample for QC purposes may be obtained at the same time and location as QA acceptance samples. No additional loose mix samples shall be taken from the placed mix.

Up to three cores may be taken in each surface lot for additional samples for QC purposes. For binder courses, obtainment of one thickness core from each subplot for each binder lift shall be permitted prior to placement of the surface course. Cores shall not be spaced closer than one metre from any other core. If further additional samples are required, a written request shall be made to the Contract Administrator and samples shall only be taken upon written approval of the Contract Administrator. All sample locations shall be restored as specified in the Contract Documents.

313.07.02 Laboratory Correlations

On request, the Contract Administrator shall provide the opportunity to conduct a correlation of mix properties or compaction or both between the QA and QC laboratories prior to placement of HMA. The correlation may occur once for each mix type and shall be a maximum of three samples per mix type.

The Contract Administrator shall be provided with the samples and all information required to conduct the correlation testing. The Contract Administrator shall submit the QA test results on completion of the correlation testing.

313.07.03 Preparation of Foundation and Existing Pavement

Prior to placing any course of HMA on:

- a) A granular grade, a Class S roller or an equivalent Class V roller shall be used to finish roll the grade ahead of the paver. The granular grade after rolling shall be a compacted, smooth, float-free surface, free from contamination of foreign materials. Any distortion that will impact the specified thickness of the pavement to be placed shall be repaired.
- b) The HMA or concrete surfaces, the HMA and concrete surfaces shall be clean and free of all loose, broken, and foreign materials.
- c) Milled surfaces, the milled surface shall be clean of all loose, broken, and foreign materials and shall be swept with a power broom.

The existing surface being prepared by milling or padding or a combination, shall be prepared such that each lift can be placed and compacted to the thickness as specified in the Contract Documents, provided such corrections do not reduce the thickness of existing pavement materials or underlying materials by more than 5 mm below the general profile of the surrounding existing unground or unmilled pavement surface.

313.07.04 Correction of Pavement Beneath Surface Courses

Corrections may be made to any pavement course underlying the surface course by padding, milling, grinding, or a combination in order to meet the surface smoothness requirements. A plan shall be submitted to the Contract Administrator identifying the limits and types of corrections. The correction work shall be subject to approval of the Contract Administrator. Padding shall be completed using a mix type acceptable to the Owner. The thickness of those pavements after milling or grinding shall not be reduced by more than 5 mm below the general profile of the surrounding unground or unmilled pavement surface. The milled surface shall not exceed 25 mm from ridge to ridge, and the ridge to valley depth of the milled surface shall not exceed 10 mm.

313.07.05 Tack Coat

Tack coat shall be applied to surfaces according to OPSS 308 prior to placing HMA.

313.07.06 Transportation of Hot Mix Asphalt

Truck boxes used to transport HMA shall be clean and, if required, lightly coated with a uniform application of a release agent. Truck boxes shall be drained after each application and before loading.

313.07.07 Placing Hot Mix Asphalt

313.07.07.01 Operational Constraints

Paving shall not be carried out if the roadbed is frozen. When placing the mixture on a granular grade, the granular grade shall not be saturated and shall be free of standing water. The surface of a pavement upon which HMA is to be placed shall be clean and dry at the time of HMA placement.

For paving on bridge decks, a HMA course shall not be placed over the waterproofing membrane and protection board until a minimum 4 hours has elapsed following completion of the waterproofing system or until the waterproofing system has set sufficiently that the integrity of the waterproofing system is not jeopardized. After completion of the waterproofing system and prior to paving, a Request to Proceed shall be submitted to the Contract Administrator. Paving shall not proceed until a Notice to Proceed has been received from the Contract Administrator.

A HMA course shall not be placed upon a previously laid course until the temperature of the previous course is 50 °C or less. For a HMA lift thickness of 60 mm or less, this temperature shall be measured at the surface. For a HMA lift thickness greater than 60 mm, this temperature shall be measured internally.

The HMA binder courses shall be not placed unless the ambient air temperature is at least 2 °C. The HMA surface courses shall not be placed unless the ambient air temperature is at least 7 °C.

Public traffic shall not be permitted on freshly laid HMA until the temperature of the mat is 50 °C or less.

When WMA is used, the WMA technology supplier's recommendations for placing the WMA mix shall be followed. Placement and compaction temperatures of WMA shall be according to the WMA technology supplier's recommendations but shall also meet the operational constraints listed in this clause.

A lot shall be closed before paving begins on a different lot using the same tender item, the same mix design or both; unless otherwise allowed by the Contract Administrator.

313.07.07.02 Paving

313.07.07.02.01 General

Levelling, binder, and surface courses shall be laid by means of mechanical self-propelled pavers. Prior to roller compaction, obvious defects in the HMA placed shall be corrected. Irregularities in the alignment and grade along the outside edges shall be corrected. Excess HMA shall not be cast onto the surface of the freshly laid mat. After final compaction of each course the surface shall be smooth and true to the established crown and grade, uniform in texture and shall be free of any defects, including but not limited to, cracks, segregation, fat spots, oil spills, chatter, and roller marks.

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

All through lane paving courses shall be completed prior to the placement of adjacent sideroads, speed change lanes, and other paved areas.

The HMA shall be placed and compacted to the thickness as specified in the Contract Documents for each lift.

At the end of each completed portion of the lanes and prior to opening them to traffic, the ends of completed sections of HMA course shall be temporarily ramped down to the existing pavement according to the Temporary Ramp Downs clause.

If paving is being carried out under lane closures, paving shall be completed to the same station for the full pavement width, including paved shoulders, prior to the roadway being reopened to traffic except as noted in the Partial Paving of Full Pavement Width clause.

313.07.07.02.02 Paving in Echelon

For the purpose of laying levelling, binder and surface courses as specified in the Contract Documents, paving in echelon may be used as an option.

When paving in echelon, the pavers shall be operated at the same time within 60 m of the next paver so that a hot joint is obtained between the lanes of HMA being placed. Should one paver break down while placing levelling, binder, or surface course, the Contract Administrator may permit the Day's work to be completed with the remaining paver only.

313.07.07.02.03 Paving on Bridge Decks

The temperature of the HMA immediately after spreading shall be equal to or greater than the minimum temperature recommended by the AC supplier. When the HMA is produced using WMA technology, the temperature of the WMA immediately after spreading shall be equal to or greater than the minimum temperature recommended by the WMA technology supplier. Breakdown rolling shall commence immediately after spreading.

313.07.07.02.04 Paving Widening and Irregular Sections

The HMA shall be placed in widenings such that the top of the compacted HMA is placed 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 flush with the top of each step in separate operations. HMA shall be placed in the widening using equipment specially designed for this purpose.

In turnouts, driveways, and other irregular sections, other methods may be used to spread and finish the HMA, such methods shall be subject to the approval of the Contract Administrator.

313.07.07.02.05 Partial Paving of Full Pavement Width

Partial paving of the full pavement width is permitted except when one or more of the following conditions exist:

- a) When the ramping height would be greater than 50 mm,
- b) At the longitudinal edges that will form the hot joint of lanes to be paved in echelon when specified under the Paving in Echelon clause, or
- c) The pavement slope would cause water to accumulate at the edge of the ramping and extend onto an adjacent lane or shoulder that will be open to traffic.

When partial paving of the full pavement width is permitted, temporary longitudinal and transverse ramp downs shall be placed regardless of the difference in height elevations between adjacent pavement surfaces.

313.07.07.02.06 Temporary Ramp Downs

The HMA courses shall be temporarily ramped down to the existing pavement at a slope not steeper than 50H:1V transversely. Transverse ramp downs shall not form part of the permanent pavement and shall be removed prior to paving of the adjacent section.

Where longitudinal ramp downs are permitted or if, due to unforeseen circumstances such as equipment breakdown occurring during paving, paving cannot be completed to the same station across the full pavement width, the HMA course shall be temporarily ramped down to the existing pavement at a slope of 10H:1V. Only one temporary longitudinal ramp down shall be in place across the width of the pavement at any time. The temporary longitudinal ramp down shall not form part of the permanent pavement and shall be removed prior to paving the adjacent section. The adjacent paving shall be completed such that the ramping is not in place more than five Days, unless a written request is submitted to the Contract Administrator and a written approval is provided by the Contract Administrator allowing the ramp downs to remain in place for more than five Days.

Loose particles generated during construction of the longitudinal or transverse ramp downs or both shall be removed from the roadway surface prior to re-opening the roadway to traffic. Temporary ramp downs shall remain intact and in place until they are removed prior to paving the adjacent section.

Temporary ramp downs shall be removed to produce a straight clean vertical surface for the full depth of the course prior to paving the adjacent lane or shoulder. After removal of the temporary longitudinal ramp down, traffic shall not be permitted to cross over the vertical surface at the longitudinal edge before the adjacent paving is completed.

313.07.07.03 Longitudinal and Transverse Joints

313.07.07.03.01 General

All joints shall be made to obtain a complete bond between the two pavement edges and a smooth riding surface. The existing or previously placed pavement edge shall be a straight clean vertical surface for the full depth of the course. Where ramping or damage has occurred, trimming shall be required. All dirt or other foreign material and all loose material shall be removed from all vertical surfaces.

313.07.07.03.02 Longitudinal Joints

The longitudinal joints shall be parallel to the lane and visually uniform longitudinally. The width of subsequent courses shall be staggered to an offset of 150 to 300 mm so that longitudinal joints do not coincide. The longitudinal joints in the surface course shall be offset 50 mm from the edge of the demarcation between the lanes as specified in the Contract Documents.

313.07.07.03.03 Transverse Joints at Limits of Paving

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

- a) Where 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) Where a surface course is placed flush against an existing HMA 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 surface 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.
- c) Where a binder course and surface course are not placed flush against an existing HMA pavement, the binder course shall be feathered out removing the existing surface course to a minimum depth of not less than 40 mm to form a straight vertical surface 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.
- d) Where multiple courses are placed flush against an existing HMA pavement, the joint for each course shall be offset at least 150 mm from the joint on the course below.

At the limits of paving, the placement width of the HMA pavement shall match the width of the existing adjacent pavement.

313.07.07.04 Compaction

Compaction of the HMA shall be conducted using appropriate methods and equipment to provide a uniformly compacted mat as specified in the Contract Documents. Class R rollers shall not be used to compact SMA.

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

313.07.07.05 Gritting of Stone Mastic Asphalt

Hot grit shall be embedded in the SMA surface as specified in the Contract Documents.

313.07.08 Field Adjustments to the Job Mix Formula

Adjustment to the JMF to more closely reflect the mix being produced shall be permitted. The number of field adjustments to the JMF shall be limited to three for each mix design submitted, one prior to the start of production and a maximum of two during production. Field adjustments to the JMF shall be limited in scope such that the net impact of all field adjustments to the JMF does not exceed any of the maximum field adjustments to the JMF in Table 1 in comparison to the original JMF submitted under the current mix design.

JMF adjustments shall not be permitted once placement of the specific mix type has been completed. The adjusted JMF shall be submitted in writing on a form supplied by the Contract Administrator. Upon receipt of the JMF adjustment submission, the Contract Administrator shall give a written confirmation of receipt of the adjusted JMF. Within one Business Day of receipt of the JMF adjustment, the Contract Administrator shall give written notice confirming conformance to the Contract requirements or advising of any non-conformance. The revised JMF may be applied to the lot being placed at the time the confirmation of receipt of the revised JMF is issued and the previous lot, if requested by the Contractor as part of the written submission for a JMF change. If this request is not made, the revised JMF shall only apply to the lot placed after receipt of the revised JMF.

313.07.09 Sampling

313.07.09.01 Asphalt Cement

Samples of the AC shall be taken according to OPSS 1101.

When the selected WMA technology requires that additives be added to the AC, the samples for acceptance of the AC shall be taken after the additive has been added.

313.07.09.02 Hot Mix Asphalt Aggregates for Density Testing

Samples for RAP and the aggregates identified in the mix design for each mix type using methods as specified in the Contract Documents shall be procured. The first set of samples shall be taken no later than 10 Days prior to the start of production of the first lot of HMA. Subsequent samples shall be taken immediately following the completion of 15,000 tonnes \pm 1,000 tonnes of mix production and thereafter at further intervals of 20,000 tonnes as required. The aggregate and RAP sampling program shall be established in consultation with the Contract Administrator prior to paving. If the sampling interval needs to be reduced to reflect changes in the aggregate properties, the Contract Administrator shall be notified and samples shall be taken as warranted only when directed by the Contract Administrator.

A set of two samples shall be taken. One of these samples shall be for QA testing and the other shall be for referee testing. Samples for QA and referee testing shall be obtained concurrently.

Each sample shall be clearly identified as to the date of sampling, the lot number, and the tender item hot mix tonnage being produced when the sample was taken.

313.07.09.03 Hot Mix Asphalt Mix Properties

Samples shall be appropriately labelled with the Contract number, highway number, Region, lot number, subplot number, mix type, lift number, station, and date and time of sampling.

Each random sample location or the tonnage from which the sample is to be taken shall be as designated by the Contract Administrator. A set of two samples shall be taken as per Table 2. One of these samples shall be for QA testing and the other shall be for referee testing. Samples for QA and referee testing shall be obtained concurrently.

When the mass of the sample does not meet the requirements of Table 2, the sample shall be discarded and a new one taken immediately.

The SMA sample for draindown testing shall coincide with one of the other subplot samples as designated by the Contract Administrator. The samples shall be transferred to a clean stainless steel bowl or pan of suitable size, immediately after splitting, for delivery to the QA laboratory.

If the Owner's QA laboratory chooses LS-292 for each mix design, two sets of samples shall be provided consisting of:

- a) 2 one-litre cans of AC,
- b) 25 kilograms of each aggregate type, and
- c) 1 kilogram of baghouse fines, if used in the mix design.

One sample is for Owner's QA testing and the other for referee testing for the purpose of ignition oven calibration, including aggregate correction factors. The samples shall be submitted to the Owner's QA laboratory at least five Business Days prior to the start of paving with the applicable HMA type. If materials have changed from the mix design, an additional two sets of samples as detailed above shall be provided.

313.07.09.04 Compaction

Upon completion of each subplot, the Contract Administrator shall submit in writing notification of each random sample location. Pavement core samples shall be obtained in duplicate from each subplot no later than the next Business Day after the completion of the subplot. Each core shall meet the following requirements:

- a) Have a minimum nominal diameter of 150 mm and a maximum nominal diameter of 200 mm, and
- b) Consist of the full layer being sampled and at least one underlying layer, if one is present.

Cores shall not be taken within 250 mm of a longitudinal or transverse joint or the edge of pavement. Cores for compaction shall not be taken on bridge decks.

Each set of samples shall be taken from the same lane, same transverse offset, and at a spacing of 1.0 m \pm 0.1 m between each individual core edge.

Cores shall not be damaged during coring operations or in transit. If a core is damaged, a replacement core shall be extracted at a location adjacent to the original core.

Core samples shall also include design lift thickness on the label. The lot and subplot numbers shall be clearly marked with a permanent marker on all compaction cores.

HMA and compaction requirements for filling the sample holes shall be the same as the adjacent undisturbed pavement. 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.

A one litre sample of the release agent(s) shall be delivered to the Contract Administrator upon request.

313.07.09.05 Warm Mix Asphalt

Samples of WMA shall be obtained at the paver from sublots according to Table 2 for moisture sensitivity testing. The sublots are to be selected randomly from the sublots identified for mix properties by the Contract Administrator. These samples shall be designated for QA testing for moisture sensitivity according to AASHTO T 283. A complete sample data sheet shall accompany the samples. The data sheet shall also identify corresponding mix properties lot/sublot number and that the samples are for moisture sensitivity testing. Moisture sensitivity testing is required for information only.

313.07.09.06 Lift Thickness

For HMA tender items measured by square metres, single cores consisting of all lifts placed shall be used to evaluate the lift thickness of all lifts. Sample locations shall be determined based on the surface area of the upper most lift placed as specified in the Contract Documents.

All areas of hot mix paving as specified in the Contract Documents, including paved shoulders, shall be sampled for lift thickness with the following exceptions:

- a) Detours and other temporary pavement.
- b) Hot mix asphalt miscellaneous.
- c) Bridge decks.

Upon completion of each subplot of the upper most lift specified, the Contract Administrator shall submit in writing notification of the location to be used for sampling. After the completion of the subplot of the upper most lift specified, one pavement core sample shall be obtained from each subplot no later than the next Day. This one core shall be used for both QA and referee testing.

Each core shall have a nominal diameter of 50 mm and shall consist of all the specified hot mix lifts placed in the subplot and at least one underlying hot mix layer if one exists. Each core shall have its vertical side cored perpendicular to the upper surface of the core. Each sample shall be placed in a suitable container to protect the sample integrity during transport and until testing. The subplot number shall be clearly marked with a permanent marker on each core. In addition, the sample documentation as specified in the Contract Documents shall also note the number of lifts for which the thickness measurements are required and mix type for each.

No replacement thickness cores shall be obtained for QA or referee testing. When a core thickness is reported as "indeterminate", a new 150 mm core shall be taken centered over the subplot's previously taken 50 mm core.

Holes resulting from the removal of thickness core samples shall be cleaned, dried, and filled with a material acceptable to the Contract Administrator immediately after sampling.

313.07.10 Identification of Warm Mix Asphalt Paving Limits

When WMA is used, GPS coordinates for the WMA paving limits shall be submitted to the Contract Administrator no later than seven Days after completion of WMA paving.

313.07.11 Management of Excess Material

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

313.08 QUALITY ASSURANCE

313.08.01 Acceptance Criteria

Acceptance of HMA shall be based on the following criteria:

- a) AC Physical Requirements
- b) Mix Properties and Compaction
- c) Surface Tolerance
- d) Surface Appearance
- e) Surface Smoothness
- f) Lift Thickness
- g) Geometrics and Longitudinal Joint Location

313.08.01.01 Asphalt Cement Physical Requirements

The Contract Administrator shall determine the acceptability of the AC according to OPSS 1101 and requirements as specified in the Contract Documents.

When the selected WMA technology requires that additives be added to the AC, acceptance of the AC shall be based on the samples that contain the WMA additive subject to the conditions as specified in the Contract Documents. An allowance request may be made for the impact of the WMA and AST on a PGAC grade for QA or referee purposes provided that when production begins a complete AASHTO M 320 test results for the following is submitted to the Contract Administrator:

- a) AC with WMA and AST at the percentage identified in the mix design.
- b) AC without the additives.

The combined allowance shall be limited to a maximum 2 °C colder than the high temperature grade or a maximum of 2 °C warmer than the low temperature grade.

313.08.01.02 Mix Properties and Compaction

313.08.01.02.01 Lot Size

313.08.01.02.01.01 General

Before HMA production for the tender item starts, a discussion with the Contract Administrator shall happen regarding their determination of the size and location of the lots and sublots. Guidelines for the breakdown of the tender item quantity into lots are as listed in Table 3.

When only one or two sublots are completed at the end of paving for the tender item due to a change in the JMF or when a delay of more than 20 Business Days occurs in placing the complete lot, the test results obtained shall be considered as part of the previous lot and the previous lot shall then have 11 or 12 sublots. When only 3 to 9 sublots are completed due to the above circumstances, then the 3 to 9 sublots shall be considered as a lot.

When a delay of more than 20 Business Days occurs in placing the complete lot and this lot shall be completed during the same calendar year, a request in writing prior to the end of the 20 Business Days may be submitted to the Contract Administrator that the lot be continued upon the resumption of paving for that tender item. If the request is not made or is not accepted by the Contract Administrator, the lot shall be terminated and evaluated for acceptance.

313.08.01.02.01.02 Optional Surface Trial

When the surface hot mix tender item is 5,000 tonnes or more, an optional trial of one lot, not exceeding 500 tonnes, with one subplot shall be permitted. The trial shall be placed in a binder course, and the lift thickness shall not be greater than 60 mm. If this optional trial is chosen, the Contract Administrator shall be advised in writing prior to placing the trial lot. The optional trial shall not be placed in a critical location such as bridge decks. The optional trial lot will be treated as a small quantity lot for basis of acceptance and payment.

313.08.01.02.01.03 Lot Size for Bridge Decks

Hot mix placed on a bridge deck should be treated as a separate lot. Where hot mix is placed in multiple stages, each stage shall be treated as a separate lot.

The lot shall be either a single subplot or divided into three approximately equal sublots as determined by the Contract Administrator in consultation with the Contractor.

313.08.01.02.01.04 Lot Size for Tonnage Tender Items

Lot size is generally 5,000 tonnes. Sublots are generally 500 tonnes, however, subplot sizes may be adjusted to ensure a minimum of three sublots per lot.

When the tender item quantity is less than 1,000 tonnes, the lot(s) shall be divided into at least three sublots as determined by the Contract Administrator, unless such division is deemed impractical by mutual agreement.

313.08.01.02.01.05 Lot Size for Square Metre Tender Items

For lift thicknesses in the order of 40 to 55 mm, lot size is generally 40,000 m² with sublots of 4,000 m², however, subplot sizes may be adjusted to ensure a minimum of three sublots per lot. For lift thicknesses in the order of 60 to 100 mm, the lot size would generally be adjusted to 25,000 m² with sublots of 2,500 m².

When the tender item quantity is less than 4,000 m², the lot(s) shall be divided into at least three sublots as determined by the Contract Administrator, unless such division is deemed impractical by mutual agreement.

313.08.01.02.02 Acceptance Testing

The Owner shall conduct tests, carry out calculations, and provide values according to Table 4. The Contractor shall be provided with results from the completed tests.

The QA laboratory shall conduct density tests for RAP and aggregates identified in the mix design for each mix type using methods as specified in the Contract Documents.

When new aggregate samples are received, QA density testing on the new aggregate samples shall be conducted and the calculation of VMA for the subsequent lot(s) shall be based on the densities of the most recent QA samples submitted. When a change in aggregate density is noted, a request shall be made to the Contract Administrator that new samples be obtained between routine random samples. It shall also be stated in the sample request if the current lot will be closed or if the lot will be completed and the new density tests results will not be used for calculation of VMA until the next lot. The submitted request shall meet Contract Administrator's satisfaction prior to changes being made to sampling.

313.08.01.02.03 Basis of Acceptance

Acceptance for all mixes for mix properties and compaction is based on the lot PWL for each attribute, excluding VMA. PWL shall be determined using lot test results, LS-101, and lower and upper limits as specified in Table 5. The PWL of the lot for each criterion shall be used to determine the payment adjustment factor from Table 6. If the PWL is less than 50% for AC content, air voids or compaction, or less than 25% for any payment adjustment sieve, the lot is rejectable and shall be subject to repair or payment adjustment. VMA shall meet the minimum mix design requirements according to OPSS 1151 for each lot and payment shall be based on the lot mean as specified in the Payment Factor for Voids clause. If the VMA payment factor is less than 0.500, the lot shall be considered rejectable. SMA lots shall be considered rejectable if the draindown is more than 0.3%.

Small quantity lots shall not be subject to payment adjustment unless the mix is rejectable. Acceptance for these lots shall be on a subplot by subplot basis. The subplot shall be considered acceptable if the AC content, gradation, air voids, and compaction of each subplot comply with the limits specified in Table 5, and the VMA shall be no more than 0.50% below the design minimum. Mix that does not comply with the requirements shall be considered rejectable.

The Contract Administrator shall determine if a rejectable lot may remain in the work without repairs. When the Contract Administrator has determined that a rejectable lot may remain in the work without repair, the lot shall be subjected to an additional payment adjustment reflecting the extent of the non-conformance as determined by the Contract Administrator. If repair of the lot is chosen in lieu of a payment adjustment or if the Contract Administrator determines that a rejectable lot requires repair, the lot shall be repaired and re-evaluated as specified in the Repairs for Mix Properties and Compaction clause.

313.08.01.02.04 Referee Testing

A single request for referee testing for a given lot can only be invoked within five Business Days after the Contract Administrator's calculated QA payment factors for that lot have been received. Referee testing for aggregate density can only be invoked within five Business Days after the QA test results for aggregate density have been received.

For mix properties and compaction, a request may be made for testing by a referee laboratory for the entire lot or a maximum of two sublots from that lot. For all sublots in the referee request, referee testing shall fall into one of three categories:

- a) Mix properties only,
- b) Compaction only, or
- c) Mix properties and compaction.

A request may be made for referee testing for determining the draindown of a SMA sample.

The referee laboratory shall use the same test method as the QA laboratory except that when the QA laboratory chooses LS-292, the referee laboratory shall use that method provided the calibration requirements are met. If they are not met, the referee laboratory shall use LS-282.

When referee testing of mix properties is invoked, the referee laboratory shall conduct all necessary testing with the exception of the combined aggregate density which shall be supplied by the Contact Administrator.

When referee testing for compaction is invoked, the referee laboratory shall determine the MRD of the referee loose mix sample for the subplot and this value shall be used in the calculation of compaction for the referee core.

The results generated by the referee laboratory shall be used to re-evaluate the lot to determine the payment factors for the acceptance of the disputed properties for the disputed lots of HMA. The referee test results are binding on both the Owner and the Contractor.

313.08.01.02.05 Outliers in Referee Results

Where an entire lot of three or more sublots has been referee tested, an individual value for any attribute of a subplot's test result excluding VMA may be questioned. The request shall be made within three Business Days after receiving all the test results for the lot and only when the payment factor for the attribute with an outlier is less than 1.0. The validity of the questioned attribute shall be ascertained in accordance with ASTM E 178 using a T test at a 10% significance level.

If the T test procedure shows that the questioned value of the attribute is not an outlier then the test result shall be used in the calculations. If the T test procedure shows that the questioned value of the attribute is an outlier then the test result for the subplot shall be checked for mathematical errors. If there are no mathematical errors, the subplot with the outlier is treated as a lot with one subplot and the remaining sublots shall form a separate lot with no further consideration for outliers.

If only two sublots remain, the two sublots shall be treated as two separate lots each with one subplot.

313.08.01.03 Surface Tolerance

The surface tolerances of any pavement surface shall be such that when tested with a 3 m straight edge placed anywhere including the edge of the pavement and in any direction on the surface except across the crown or drainage gutters, there shall not be a gap between the bottom of the straight edge and the surface of the pavement:

- a) Greater than 6 mm for all binder courses, levelling courses, and padding, or
- b) Greater than 3 mm for all surface courses.

Traffic control shall be provided, as required, for the Owner to conduct surface tolerance measurements. All tolerance-related repairs shall be carried out according to the Repairs subsection.

Longitudinal joints shall be constructed such that the elevation difference across the longitudinal joints shall not exceed 5 mm when measured with a straight edge placed on the asphalt surface with the higher elevation and overhanging the joint by not more than 50 mm. All joints which exceed the 5 mm tolerance shall be repaired such that the tolerance is met.

313.08.01.04 Surface Appearance

The HMA deemed by visual appearance to have flushing, bleeding, segregation, fat spot, surface damage, cracking, chatter, or surface contamination but not limited to these, shall be considered deficient material or work. Traffic control shall be provided for all surface appearance assessments. Deficient material, mixture, and work shall be removed and replaced, or repaired, or assessed a payment reduction.

313.08.01.04.01 Segregation

The HMA exhibiting medium or severe mid-lane segregation shall be assessed a payment reduction or shall be repaired at the discretion of the Contract Administrator.

From the time the Contract Administrator provides notification of mid-lane segregation, a maximum of 500 tonnes of HMA may be placed to demonstrate the effectiveness of any repairs or adjustments or both made to a defective paver. The repairs or adjustments or both shall be demonstrated to the Contract Administrator. If the repairs or adjustments or both to the paver do not eliminate mid-lane segregation to the satisfaction of the Contract Administrator within the allowable 500 tonnes of HMA, then the use of that paver shall be discontinued.

Other segregation shall be addressed in accordance with the following:

- a) Slightly segregated mix shall be accepted into the work with no payment reduction.
- b) Medium segregation in levelling courses or padding with a thickness greater than 40 mm and binder courses shall normally be left in place with no payment reduction. Any areas of medium segregation that deteriorates prior to being overlaid by another pavement course shall be repaired at no cost to the Owner.
- c) Medium segregation in surface courses shall be assessed a payment reduction or repaired at the discretion of the Contract Administrator.
- d) Severely segregated mix shall be repaired by removal and replacement.

Levelling courses and padding with a total thickness less than 40 mm, bullnoses, and tapers that were not machine-laid and any areas of handwork shall not be assessed based on segregation but based on other workmanship-related problems. However, if they deteriorate prior to being overlaid by another pavement course, the Contract Administrator shall assess the causes of the deterioration before determining responsibility for the cost of repairs.

313.08.01.04.02 Challenging Severity of Segregation

A challenge in writing of the severity of any segregated area assessed as either medium or severe may be submitted within five Business Days of receiving the Owner's first visual assessment. The written challenge shall list the dimensions and assessment of the severity of each disputed segregated area.

For Contracts with up to 30,000 tonnes of HMA, a maximum of two separate written challenges for each tender item shall be permitted. For Contracts with more than 30,000 tonnes of HMA, a maximum of four separate written challenges for each tender item shall be permitted. Each written challenge may involve more than one disputed segregated area.

The Owner or a representative of the Owner, who did not carry out the original assessment and who is not the Contract Administrator, shall make a second visual assessment of the disputed areas. All necessary surface preparations and traffic control shall be provided so that this second visual assessment shall be carried out within five Business Days after the Contract Administrator has received the written challenge. The results of that second visual assessment shall be binding on both the Owner and Contractor.

A further challenge may be made to the Owner's second visual assessment of the segregation severity, if the segregation has occurred in any one of the mixes listed in Table 7. Such a challenge shall be made in writing within five Business Days of receiving the Owner's second visual assessment. Such a challenge shall be resolved by the Owner or a representative of the Owner determining the Macrotexture Ratio, according to LS-317. All necessary surface preparations and traffic control shall be provided during the field measurements for Macrotexture Ratio. Table 7 shall be used with the Macrotexture Ratio to determine the degree of severity and the disposition of the disputed area of segregation. The Macrotexture Ratio results shall be binding on both the Owner and the Contractor.

313.08.01.05 Acceptance Criteria for Surface Smoothness

The acceptability of surface smoothness shall be as specified in the Contract Documents.

313.08.01.06 Lift Thickness for Square Metre Tender Items

313.08.01.06.01 Lot Size

The Contract Administrator shall determine the size and location of the lots and sublots for thickness before hot mix production for the tender item starts.

There shall be one lot consisting of all square metre tender items when the entire Contract has the same number of lifts and tender items throughout. There shall be a separate lot for areas with:

- a) Different number of lifts,
- b) Different tender items, or
- c) Both.

Each lot shall be divided into sublots, corresponding to the area of the upper most lift, which generally is the surface course. Sublots shall normally be 2,000 m² in size. A minimum of three sublots are required for each lot.

313.08.01.06.02 Acceptance Testing

The Owner shall conduct tests, carry out calculations, and provide values according to Table 4. A copy of each lift thickness measurement for each lift placed at each sample location upon completion of the subplot measurement shall be provided by the Contract Administrator.

313.08.01.06.03 Basis of Acceptance

The acceptance of lift thickness is based on subplot lift thickness measurements and lot mean lift thickness of the tender item. The Contract Administrator shall calculate the thickness payment adjustment for the lot once all measurements for the lot have been completed.

Sublot lift thickness shall be acceptable if they are equal to or greater than the minimum subplot lift thickness as specified in Table 8 for the tender item's T_D .

The subplot shall be deemed rejectable and shall be repaired if:

- a) The lift thickness measurement is less than the minimum subplot lift thickness as specified in Table 8,
or
- b) For successive binder lifts of the same tender item, the combined lift thickness for these successive lifts is less than the minimum subplot lift thickness as specified in Table 8.

When a lift thickness lot contains any subplot that is deemed rejectable, the lot is rejectable until the subplot has been repaired and re-evaluated as acceptable. When the Contract Administrator allows a rejectable subplot to remain in place without repair, the subplot shall be subjected to a payment reduction according to the Payment Adjustment for Lift Thickness clause. A subplot lift thickness measurement for a rejectable subplot that receives a payment reduction shall not be used to assess the lot mean for the tender item.

The Contract Administrator shall calculate the lot mean lift thickness for each tender item to one decimal point and the lot thickness payment adjustment based on all the subplot lift thickness measurements in the lot, according to LS-100 and Table 9. If the lot mean lift thickness for the surface course tender item is less than 85% of the T_D the lot is rejectable.

The Owner shall determine if a rejectable lot may remain in the work without repairs. When the Owner has determined that a rejectable lot may remain in the work without repair, the lot shall be subjected to a payment reduction as determined by the Owner.

313.08.01.06.04 Referee Testing

An individual lift thickness measurement may be challenged by requesting referee testing in writing to the Contract Administrator within five Business Days after receiving the subplot lift thickness measurement. An opportunity shall be permitted to view the re-measurement of the QA designated pavement core for that subplot at an alternative Owner designated laboratory together with the Owner's representative. The re-measurement shall include the individual lift thickness that was challenged and shall also include any other lifts or combination of lifts in the core. The re-measured lift thickness measurements shall be considered binding and shall replace the original lift thickness measurements for assessment of all lifts measured for the core.

313.08.01.07 Geometrics and Longitudinal Joint Location

313.08.01.07.01 General

After final compaction, the HMA shall be smooth and true to the design profile and cross-section and constructed to the design width.

313.08.01.07.02 Pavement Width

The Contract Administrator shall conduct random spot checks of the width of each binder and surface course HMA lift for acceptance. Offset stakes shall be provided and maintained on both sides of the roadway, or other identifiers acceptable to the Contract Administrator, for use in checking the pavement width at 25 m maximum intervals until the Contract Administrator advises that the stakes or identifiers are no longer required.

The width of each lift shall be accepted provided:

- a) The outside edges of the lanes and the paved shoulders are parallel to the centreline and visually uniform.
- b) The width across all the adjacent lanes from the outside edge to outside edge is not less than the sum of the specified lane widths, and
- c) The width of the paved shoulders is not less than the paved shoulder width as specified in the Contract Documents.

If the width is not acceptable at any location, the Contract Administrator shall provide notification in writing that the pavement is rejectable. A written proposal for corrective action shall be submitted to the Contract Administrator within three Business Days of receiving the notification.

313.08.01.07.03 Longitudinal Joint Location

Longitudinal joints not meeting the Contract requirements shall be removed and replaced or assessed a payment reduction.

313.08.02 Repairs

313.08.02.01 General

All repairs shall be performed at no additional cost to the Owner. No repairs are permitted prior to completion of a lot.

All transverse joints in surface course repairs shall butt up to a full depth vertical surface. Repairs shall consist of the removal and replacement of the full thickness of the hot mix lift or the placement of an overlay when permitted by the Contract Administrator. A paver shall be used in carrying out the repair.

Repairs shall be full lane or full shoulder width except where localized repairs are allowed as specified in the Contract Documents.

The materials and the construction of repairs shall meet the acceptance criteria and other requirements as specified in the Contract Documents.

The limits and type of repairs shall be subject to the approval of the Contract Administrator and shall be approved prior to the repair being carried out.

Any damage to waterproofing system on bridge decks shall be repaired according to OPSS 914. The limits and type of waterproofing repair shall be subject to the approval of the Contract Administrator and shall be approved prior to the repair being carried out.

Repairs of an urgent nature, including moderate to very severe aggregate loss, moderate to very severe flushing, and wheel track rutting 16 mm in depth or greater shall be repaired within seven Days, unless extended by mutual agreement.

Except for urgent repairs, repairs shall be completed within 60 Days or prior to seasonal shutdown each year, whichever is the lesser, unless extended by mutual agreement.

313.08.02.02 Repairs for Mix Properties and Compaction

For a lot that is not rejected repairs may be chosen in lieu of accepting a payment adjustment, if the total payment factor for the lot is less than 0.940. When the Contract Administrator requires a rejectable lot to be repaired or repairs are chosen in lieu of accepting a payment adjustment, the areas of HMA in a lot that are to be repaired shall be determined subject to the minimum lengths and widths as specified in the Contract Documents. Each repair area shall include at least one of the loose mix or compaction core sample locations or both representing that subplot.

The minimum length of a single-repair to one lane shall be 250 m. The minimum length of a single-repair that extends over more than one lane shall be 250 lane-metres and no portion of the single-repair in a lane shall be less than 125 m in length.

The minimum limits of each repair shall be at least 125 lane-metres from the location of the loose mix or compaction core or both that represents the subplot; otherwise, a repair limit shall coincide with one end of the subplot when the sample location is less than 125 lane-metres from it. If the proposed limit of a single-repair falls within the proposed limit of another single-repair, the overlap shall count towards the 250 lane-metre minimum for both repairs. Repair areas within a single lane shall be separated by at least 100 m. If the delineation of repair areas results in patches less than 100 m apart, these repair areas shall be re-established to form a continuous repair.

A list and sketch identifying the proposed locations of the repairs shall be submitted to the Contract Administrator for review at least five Business Days prior to the intended start of the repair work. Each subplot and single-repair shall be uniquely labelled. Overlapping repair areas and discontinuous portions of a single-repair shall be labelled so that they are readily identified with their single-repair.

Prior to the repair, slab samples or cores shall be taken for testing of mix properties or compaction or both in the unrepaired area within 1 m of the limits of each end of the repair area. Additional samples or cores shall not be permitted to be taken beyond these locations until after QA or referee testing demonstrates that the remaining Material in the subplot proposed for repair is deemed to be rejectable. If the proposed repair limit coincides with the beginning of a subplot that is being left unrepaired, samples are not required at this location. Sufficient material shall be obtained for testing by the Owner's QA laboratory and for possible referee testing.

Testing shall demonstrate that the remaining Material in the subplot proposed for repair is not rejectable. To determine if the mix is rejectable, the mix properties and compaction shall comply with the basis of acceptance of a small quantity lot. If the Material is deemed to be rejectable, the proposed limit of the repair shall be extended by a minimum of 25 m, and the sampling and testing repeated. The repair area selected shall incorporate the location used for obtaining samples that shall be used to confirm that the remaining mix is not rejectable. If the repair proposal results in the removal of at least half the subplot tonnage, the Contract Administrator may waive testing demonstrating the suitability of the remainder of that subplot.

The unrepaired sublots combined with the unrepaired areas of any repaired sublots shall comprise one lot and shall be assessed based on the loose mix and core samples representing the unrepaired sublots. When a repaired subplot consists of two or more separate unrepaired areas, the Contract Administrator shall decide whether to combine these unrepaired areas as one subplot or to consider each unrepaired area as a separate subplot. If there are only one or two sublots in a lot that are not repaired, the Contract Administrator shall include those sublots as part of the previous or next lot.

The mix used for the repair shall comprise a separate lot or, prior to beginning any repair, the Contract Administrator in conjunction with the Contractor may decide to include it as part of the current lot being produced. The repaired area shall be tested for all criteria and re-evaluated for acceptance.

The two reconfigured lots shall be accepted at the full Contract price, subjected to a payment adjustment according to the Payment Adjustment for Mix Properties and Compaction clause, or rejected.

313.08.02.03 Repairs for Surface Tolerance

All areas not meeting the surface tolerance requirements shall be repaired by diamond grinding to a maximum of 5 mm or removed and replaced. Slurry produced from diamond grinding shall be removed from the site and managed as specified in the Contract Documents. The repaired areas shall be re-evaluated for surface tolerance acceptance by means of a 3 m straight edge as specified in Surface Tolerance clause.

313.08.02.04 Repairs for Segregation

Repairs for segregation shall meet the requirements of the General Repairs clause. In binder courses, localized repairs for mid-lane segregation less than 300 mm in width are permitted.

313.08.02.05 Repairs for Thickness

Any repairs solely to correct for excess lift thickness shall not be permitted.

The minimum length of a repair is the entire length of the subplot being repaired.

Acceptance for lift thickness of the repaired subplot shall be based on the individual subplot lift thickness measurement and the lot thickness payment adjustment shall be calculated based on the re-evaluated subplot measurement.

313.09	MEASUREMENT FOR PAYMENT
313.09.01	Actual Measurement
313.09.01.01	SMA 9.5 SMA 9.5 - ... mm Lift Thickness SMA 12.5 SMA 12.5 - ... mm Lift Thickness SMA 19.0 SMA 19.0 - ... mm Lift Thickness Superpave 4.75 Superpave 9.5 Superpave 9.5 - ... mm Lift Thickness Superpave 12.5 Superpave 12.5 - ... mm Lift Thickness Superpave 12.5 - Warm Mix Superpave 12.5 - Warm Mix - ... mm Lift Thickness Superpave 12.5FC 1 Superpave 12.5FC 1 - ... mm Lift Thickness Superpave 12.5FC 1 - Warm Mix Superpave 12.5FC 1 - Warm Mix - ... mm Lift Thickness Superpave 12.5FC 2 Superpave 12.5FC 2 - ... mm Lift Thickness Superpave 12.5FC 2 - Warm Mix Superpave 12.5FC 2 - Warm Mix - ... mm Lift Thickness Superpave 19.0 Superpave 19.0 - ... mm Lift Thickness Superpave 19.0 - Warm Mix Superpave 19.0 - Warm Mix - ... mm Lift Thickness Superpave 25.0 Superpave 25.0 - ... mm Lift Thickness Superpave 25.0 - Warm Mix Superpave 25.0 - Warm Mix - ... mm Lift Thickness Superpave 37.5 Hot Mix Asphalt Miscellaneous
313.09.01.01.01	By Area

Measurement of HMA by area shall be the horizontal area in square metres in place.

The quantities of HMA used for temporary ramp downs shall not be measured for payment. The removal of HMA used for temporary ramp downs shall not be measured for payment.

313.09.01.01.02 Tonne to Square Metre Conversion

When the unit of measure for a HMA tender item is square metres, and the Contract Documents refer to a quantity of mix for that tender item in tonnes and the Contract Documents do not already modify the quantity to relate to square metres, the Contract Administrator shall determine the theoretical HMA quantity in square metres (Q_A) that shall replace the non-payment tonnage quantity (Q_t) references as follows:

$$Q_A = Q_t / [0.975 \times BRD_{MD} \times (T_D/1000)] \quad \text{(Formula 1)}$$

Where:

- BRD_{MD} = the bulk relative density in t/m^3 , provided in the submitted HMA mix design, the Q_A is calculated for
- T_D = the design thickness, in millimetres, of the mix
- Q_t = non-payment tonnage quantity referred to elsewhere in the Contract Documents for the mix under the measurement by square metre tender item

313.09.01.01.03 By Mass

Measurement of HMA by mass shall be in tonnes according to the requirements of the Contract Documents.

The quantities of HMA used for temporary ramp downs shall not be measured for payment. The removal of HMA used for temporary ramp downs shall not be measured for payment.

313.09.01.02 Hot Mix Asphalt Miscellaneous

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

313.09.02 Plan Quantity Measurement

When measurement is by Plan Quantity, such measurement is based on the units shown in the clauses under Actual Measurement. The Plan Quantity shall not be adjusted due to any of the exceptions specified in the Lift Thickness clause under the Sampling clause.

313.10 BASIS OF PAYMENT

313.10.01 Hot Mix

- 313.10.01.01 SMA 9.5 - Item**
- SMA 9.5 - ... mm Lift Thickness - Item**
 - SMA 12.5 - Item**
 - SMA 12.5 - ... mm Lift Thickness - Item**
 - SMA 19.0 - Item**
 - SMA 19.0 - ... mm Lift Thickness - Item**
 - Superpave 4.75 - Item**
 - Superpave 9.5 - Item**
 - Superpave 9.5 - ... mm Lift Thickness - Item**
 - Superpave 12.5 - Item**
 - Superpave 12.5 - ... mm Lift Thickness - Item**
 - Superpave 12.5 - Warm Mix - Item**
 - Superpave 12.5 - Warm Mix - ... mm Lift Thickness - Item**
 - Superpave 12.5FC 1 - Item**
 - Superpave 12.5FC 1 - ... mm Lift Thickness - Item**
 - Superpave 12.5FC 1 - Warm Mix - Item**
 - Superpave 12.5FC 1 - Warm Mix - ... mm Lift Thickness - Item**
 - Superpave 12.5FC 2 - Item**
 - Superpave 12.5FC 2 - ... mm Lift Thickness - Item**
 - Superpave 12.5FC 2 - Warm Mix - Item**
 - Superpave 12.5FC 2 - Warm Mix - ... mm Lift Thickness - Item**
 - Superpave 19.0 - Item**
 - Superpave 19.0 - ... mm Lift Thickness - Item**
 - Superpave 19.0 - Warm Mix - Item**

Superpave 19.0 - Warm Mix - ... mm Lift Thickness - Item
Superpave 25.0 - Item
Superpave 25.0 - ... mm Lift Thickness - Item
Superpave 25.0 - Warm Mix - Item
Superpave 25.0 - Warm Mix - ... mm Lift Thickness - Item
Superpave 37.5 - Item
Hot Mix Asphalt Miscellaneous - Item

Payment at the Contract price for the above tender items shall include full compensation for all labour, Equipment, and Materials required to do the work (including the HMA used for temporary ramp downs), the removal of HMA used for temporary ramp downs, and the applicable payment adjustments.

When repairing HMA, all associated work and replace or restore all associated damage and removals shall be carried out at no additional cost to the Owner.

When the Contract Administrator instructs to cease paving due to continued medium or severe segregation regardless of cause, shall be at no additional cost to the Owner.

The preparation and correction of existing surfaces and pavement beneath surface courses carried out in order to meet the requirements of the Contract Documents, including milling, padding, and diamond grinding, shall be at no additional cost to the Owner.

313.10.01.02 Payment Adjustment for Mix Properties and Compaction

For all mixes, when repair is not required or repair is not chosen for a lot, the payment adjustment for that lot due to mix properties and compaction requirements shall be:

$$PA_{MC} = \text{lot quantity} \times \text{price} \times [PF_{MC} - 1.000] \quad (\text{Formula 2})$$

Where:

- PA_{MC} = payment adjustment for mix properties and compaction
- lot quantity = the quantity of the mix in the lot. For SMA 19.0, SMA 12.5, SMA 9.5, Superpave 12.5FC 1, and Superpave 12.5FC 2 tender items measured by tonnage, the lot quantity is the quantity of the mix in the lot multiplied by the applicable mass multiplier factor (MF) in the Payment Adjustment for Aggregate Density clause.
- price = the Contract price of the hot mix tender item
- PF_{MC} = payment factor for mix properties and compaction

For all mixes, when the PF_{MC} is:

- a) Less than 1.000, there shall be a reduction in payment, and
- b) Equal to 1.000 there shall be no adjustment.

313.10.01.02.01 Calculations

313.10.01.02.01.01 General

The PF_{MC} shall be based on the individual payment factors obtained from Table 6, based on PWL, determined for gradation, AC content, voids, and compaction using LS-101, Table 5, and the formulae in the Payment Factor for Gradation clause, the Payment Factor for Combined Gradation and Asphalt Cement Content clause, the Payment Factor for Voids clause, the Payment Factor for Combined Mix Properties clause, and the Payment Factor for Combined Mix Properties and Compaction clause. Rounding-off procedures for all calculations shall follow LS-100.

When there is no sampling or testing specified in the Contract Documents for an attribute or when the requirement for sampling or testing for an attribute is waived by the Owner, the payment factor for that attribute shall be equal to the payment factor it is added to in Formulae 5, 10, 11 or 12.

313.10.01.02.01.02 Payment Factor for Gradation

The payment factor for gradation shall be calculated using the following formulae:

For Superpave 37.5, Superpave 25.0, Superpave 19.0, Superpave 12.5, Superpave 12.5FC 1, Superpave 12.5FC 2, SMA 19.0, and SMA12.5:

$$PF_G = (PF_{DLS} + PF_{4.75} + PF_{75}) / 3 \quad \text{(Formula 3)}$$

For Superpave 9.5, Superpave 4.75, and SMA 9.5:

$$PF_G = (PF_{4.75} + PF_{75}) / 2 \quad \text{(Formula 4)}$$

Where:

- PF_G = payment factor for gradation
- PF_{DLS} = payment factor for designated large sieve
- PF_{4.75} = payment factor for the 4.75 mm sieve
- PF₇₅ = payment factor for the 75 µm sieve

313.10.01.02.01.03 Payment Factor for Combined Gradation and Asphalt Cement Content

The payment factor for combined gradation and AC content shall be calculated using the following formula:

$$PF_{GAC} = (PF_G + PF_{AC}) / 2 \quad \text{(Formula 5)}$$

Where:

- PF_{AC} = payment factor for AC content
- PF_{GAC} = payment factor for combined gradation and AC content

313.10.01.02.01.04 Payment Factor for Voids

For Superpave mixes, if the lot mean VMA is not more than 0.50 per cent below the minimum VMA as specified in the Contract Documents for mix design purposes, the payment factor for VMA is 1.000. For lot mean VMA results more than 0.50 per cent lower than the minimum specified for mix design purposes, a payment factor for the subject lot shall be calculated in accordance with the following:

$$\text{If } (VMA_{\min} - VMA_{\text{mean}}) \geq 2.5, \text{ then } PF_{VMA} = 0.0 \quad \text{(Formula 6)}$$

$$\text{If } (VMA_{\min} - VMA_{\text{mean}}) < 2.5 \text{ then, } PF_{VMA} = 0.8000 - 0.4 \times (VMA_{\min} - 0.5 - VMA_{\text{mean}}) \quad \text{(Formula 7)}$$

Where:

- PF_{VMA} = payment factor for VMA
- VMA_{mean} = lot mean VMA
- VMA_{min} = minimum VMA specified for mix design

For Superpave mixes, the payment factor for VMA shall be compared to the payment factor for air voids and the lesser of the two is the payment factor for voids (PF_{VOIDS}).

For SMA mixes, if the lot mean VMA is not more than 1.00 per cent below the minimum VMA as specified in the Contract Documents for mix design purposes, the payment factor for VMA is 1.000. For lot mean VMA results more than 1.00 per cent lower than the minimum specified for mix design purposes, a payment factor for the subject lot shall be calculated in accordance with the following:

If $(VMA_{min} - VMA_{mean}) \geq 3.0$, then $PF_{VMA} = 0.0$ (Formula 8)
If $(VMA_{min} - VMA_{mean}) < 3.0$ then, $PF_{VMA} = 0.8000 - 0.4 \times (VMA_{min} - 1.0 - VMA_{mean})$ (Formula 9)

Where:

PF_{VMA} = payment factor for VMA
 VMA_{mean} = lot mean VMA
 VMA_{min} = minimum VMA specified for mix design

For SMA mixes, the payment factor for VMA shall be compared to the payment factor for air voids and the lesser of the two is the payment factor for voids (PF_{VOIDS}).

313.10.01.02.01.05 Payment Factor for Combined Mix Properties

The payment factor for combined mix properties shall be calculated using the following formula:

$$PF_M = (PF_{GAC} + PF_{VOIDS}) / 2 \quad \text{(Formula 10)}$$

Where:

PF_M = payment factor for combined mix properties

313.10.01.02.01.06 Payment Factor for Combined Mix Properties and Compaction

The payment factor for combined mix properties and compaction shall be calculated using Formula 11.

$$PF_{MC} = (PF_C + PF_M) / 2 \quad \text{(Formula 11)}$$

Where:

PF_C = payment factor for compaction

The PF_{MC} shall be rounded and reported to four decimal places.

When the Contract Administrator decides that the unrepaired area of an original lot that has been partially repaired shall not be resampled, the PF_{MC} for the unrepaired area shall be 1.000.

313.10.01.02.01.07 Small Quantity Lots

For small quantity lots, each subplot shall be assigned a PF_{MC} of 1.000 if the subplot is not rejectable. If the subplot is determined to be rejectable, it shall be administered as described in the Repairs for Mix Properties and Compaction clause. When the Owner has determined that a rejectable subplot may remain in the work without repair, the lot shall be subjected to a payment adjustment reflecting the extent of the non-conformance as determined by the Owner.

313.10.01.03 Payment Adjustment for Surface Smoothness

Payment adjustment for surface smoothness shall be as specified in the Contract Documents.

313.10.01.04 Payment Adjustment for Segregated HMA

For all surface courses, where payment reduction for segregation is allowed in lieu of repairs, the payment reduction shall be calculated as follows:

- a) \$2,000 once for each applicable surface course tender item,
- b) An additional payment reduction of \$2.50/m for mid-lane segregation, and

- c) An additional payment reduction of \$5.00/m² for other segregation. The area of repair shall be computed by multiplying the full lane width by the length of the repair and rounded to the next whole square metre.

313.10.01.05 Payment Adjustment for Aggregate Density

For Superpave 12.5FC 1, Superpave 12.5FC 2, SMA 19.0, SMA 12.5, and SMA 9.5 tender items measured in tonnes, the tender quantity is based on reference densities according to Table 10. A payment adjustment for aggregate density for each lot for these tender items shall be calculated by the following formulae:

$$MF = D_R / (BRD_{mix}) \quad \text{(Formula 12)}$$

$$PA_{AD} = M_{mix} \times \text{Contract Price} \times [MF - 1.000] \quad \text{(Formula 13)}$$

Where:

- D_R = the reference bulk relative density of the mix in t/m³, as specified in Table 10
- BRD_{mix} = the lot average bulk relative density in t/m³, calculated from values obtained in the testing of bulk samples obtained during production. The values shall be the same as those used in calculating the final air voids payment factor for the lot.
- PA_{AD} = payment adjustment for aggregate density
- M_{mix} = the weighed mass of the mix in the lot incorporated into the work
- MF = the mass multiplier factor calculated to three decimal places
- Contract Price = the Contract price of the tender item for the mix

For all mixes, when the mass multiplier factor is:

- a) Less than 1.000 there shall be a reduction in payment,
- b) Equal to 1.000 there shall be no adjustment, and
- c) Greater than 1.000 there shall be an increase in payment for the lot.

There shall be no payment adjustment for aggregate density for HMA tender items measured by square metres.

313.10.01.06 Payment Adjustment for Asphalt Cement Content and Changes in the Price Index

313.10.01.06.01 Hot Mix Asphalt Quantity Calculation

The quantity of HMA for use in the calculations (T_{mix}) shall be the tonnage of HMA accepted into the work.

When the unit of measure is square metres, T_{mix} shall be determined using the theoretical tonnage. The theoretical tonnage shall be calculated for each lot by the Contract Administrator as follows and rounded to one decimal according to LS-100:

$$T_{mix} = [0.975 \times BRD_{mix} \times (T_D / 1000) \times A_{mix}] \quad \text{(Formula 14)}$$

Where:

- BRD_{mix} = the lot average bulk relative density in t/m³, calculated from values obtained in the testing of bulk samples obtained during production. The values shall be the same as those used in calculating the final air voids payment factor for the lot.

- T_D = the design thickness, in millimetres, of the HMA
- A_{mix} = area of hot mix placed in square metres in the lot

313.10.01.06.02 Payment Adjustment for Asphalt Cement Content

The payment adjustment for AC content for each lot shall be calculated using the following formula:

$$PA_{AC} = T_{mix} \times [Price_{AC} \times (AC_{ERS} - AC_{BID})/100] \quad (\text{Formula 15})$$

Where:

- PA_{AC} = payment adjustment for asphalt cement content
- T_{mix} = the quantity of the HMA accepted into the lot according to the Hot Mix Asphalt Quantity Calculation clause
- $Price_{AC}$ = the purchase price per tonne of the AC used in the mix according to the invoice submitted as per the Submission Requirements subsection
- AC_{ERS} = the average percentage by mass of AC in the lot
- AC_{BID} = the percentage by mass of AC specified for bidding purposes elsewhere in the Contract Documents. For SMA mixes select a minimum AC Content from Table 5 of OPSS 1151 based on combined aggregate bulk relative density from first set of QA samples

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

313.10.01.06.03 Payment Adjustment for Changes in the Asphalt Cement Price Index

A payment adjustment is applied based on changes to the Ministry's PGAC price index unless the Contract Administrator is notified in writing of the choice to opt out within five Business Days of receiving permission to start work. Once opted out of payment adjustments based on the price index, opt back in shall not be permitted. The price index is published monthly in the Contract Bulletin. The price index is used to calculate the amount of the payment adjustment per tonne of new AC accepted into the Work.

The price index is based on the price, excluding taxes, FOB the depots in the Toronto area, of AC grade PG 58-28 or equivalent. One index is used to establish and calculate the payment adjustment for all grades.

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

The payment adjustment for the month is calculated from the formulae in Table 11.

The payment adjustment per tonne applies to the quantity of new AC in the HMA accepted into the Work during the month for which it is established. The quantity of new AC includes all grades of AC supplied with and without polymer modifiers.

For each month in which a payment adjustment has been established, the quantity is calculated using the HMA quantity accepted into the Work and its corresponding AC content as required by the JMF except for mixes which contain reclaimed asphalt pavement.

For mixes which contain reclaimed asphalt pavement the percentage of new AC is determined from the difference between the AC content required by the JMF and the AC content of the reclaimed asphalt pavement incorporated into the HMA, as calculated by the Contract Administrator.

For mixes containing an AST-AC, the percentage of AST-AC is deducted from the percentage of new AC. No other deductions are made for any other additives.

For progress payment purposes, payment adjustments are made on the monthly progress payment certificate for the months in which HMA paving occurs.

313.10.01.07 Payment Adjustment for Lift Thickness

The payment adjustment for lift thickness shall apply to all placed and compacted HMA measured by square metre tender items using the horizontal area of the surface course in the lot. When the thickness payment adjustment is determined using a T_L calculated using a combination of tender items, the thickness payment adjustment shall apply to each binder course tender item included in T_L . The thickness payment adjustment shall be a reduction in payment. The formulae provided in Table 9 shall be used to calculate the thickness payment adjustment for each tender item. The lot payment adjustment shall be the sum of the payment adjustments calculated for each tender item.

When a rejectable subplot remains in the work without repair, the rejectable lifts in the subplot shall be subject to a payment reduction. The thickness payment adjustment for each rejectable lift shall be:

$$PA_T = 0.5 \times (\text{subplot quantity} \times \text{Contract price}) \quad (\text{Formula 16})$$

Where:

PA_T = subplot payment adjustment for each rejectable lift
subplot quantity = the area of the subplot
Contract price = the Contract price of the tender item for the lift

313.10.02 Anti-Stripping Treatments

When aggregates have been processed from commercial sources for use in hot mix surface course paving, payment at the Contract price for the applicable HMA tender item shall be full compensation for all labour, Equipment, and Materials required to test, supply, and incorporate, the AST.

When aggregates have been processed from MTO/Crown, Wayside, and/or Letter of Approval quarries for use in hot mix surface course paving and the use of an AST was required, payment at the Contract price for the applicable HMA tender item shall be full compensation for all labour, Equipment, and Materials required to test, supply, and incorporate the AST. When hydrated lime is used as the AST, payment includes full compensation for the amount up to 1.0% by mass of total dry aggregate. When an alternate AST-AGG is used as the AST, payment includes full compensation for the amount up to the listed minimum dosage from the DSM listing for Anti-Stripping Treatments by mass of aggregate. When an AST-AC is used as the AST, payment includes full compensation for the amount up to the listed minimum dosage from the DSM listing for Anti-Stripping Treatments by mass of AC. Payment for additional AST above the listed minimum dosages shall be administered as a Change in the Work.

313.10.03 Hot Mix Asphalt Miscellaneous

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 HMA Material shall be paid for under the appropriate HMA tender item.

313.10.04 Tack Coat

Where there is no separate tender item for tack coat, payment at the Contract price for the applicable HMA tender item to be placed on the tack coat shall be full compensation for all labour, Equipment, and Materials for the tack coating.

313.10.05 Repair

No payment shall be made for the:

- a) Quantity of HMA that is removed and replaced, overlaid, or otherwise repaired; or

- b) For additional shouldering, traffic control, and other work such as zone painting or bridge deck waterproofing.

When:

- a) In lieu of a reduction in payment, repairs to the lot, subplot, or visually defective HMA are completed; or
- b) The Contract Administrator has determined that a rejectable lot or subplot requires repair;

for all additional testing resulting from a repair to a lot a charge shall be applied at the rates established by the Owner for the year in which the testing was carried out.

No additional payment shall be made for the cost of tolerance measurements of the repaired areas that are required by the Contract Administrator.

313.10.06 Referee Testing and Segregation Challenge

313.10.06.01 Mix Properties and Compaction

If the referee test results show that the referee payment factor for compaction or mix properties is higher than the payment factor for compaction or mix properties based on the original QA test results by more than 0.025 and the referee results show that the lot is not rejectable, the Owner shall bear the cost of the referee testing for that attribute.

If the referee test results show that the lot is rejectable or the referee test results show that the referee payment factor for compaction or mix properties is not higher than the payment factor for compaction or mix properties based on the original QA test results by more than 0.025, the Contractor shall bear the cost of the referee testing for that attribute.

For density testing of aggregates, if referee testing is invoked, the cost of referee testing is assigned as follows:

- a) If the combined aggregate density as determined by the referee laboratory is within 0.010 of the result determined by the QA laboratory, the referee testing shall be at no additional cost to the Owner.
- b) If the referee result is between 0.011 and 0.020 of the QA result, the cost of referee testing shall be shared equally between the Contractor and Owner.
- c) If the difference in results is equal to or in excess of 0.020, the cost of referee testing shall be borne by the Owner.

When there is an outlier in the referee test results, the Owner shall charge 50% of the total cost for referee testing of all sublots in the original lot.

The cost of the referee testing shall be based on the referee testing rates as specified elsewhere in the Contract Documents.

313.10.06.02 Lift Thickness

If the referee test result is at least 3 mm greater than the original QA test result, the Owner shall bear the cost of the thickness measurement referee testing. Otherwise, the Contractor shall bear the cost of the thickness measurement referee testing.

313.10.06.03 Segregation Challenge

When a challenge is successful as described in the Challenging Severity of Segregation clause, the Owner shall pay for the cost of the traffic control, if the traffic control was not necessary for any other reason. The Owner shall not be responsible for any other costs associated with the second visual assessment including the cost of delays.

When a challenge is not successful as described in the Challenging Severity of Segregation clause, all costs associated with the second visual assessment, including the cost of traffic control and delays, shall be at no additional cost to the Owner.

TABLE 1
Maximum Field Adjustments for JMF

JMF Properties	Maximum Field Adjustment % (Notes 1 and 2)
AC content (all mixes except SMA mixes)	± 0.2
AC content (SMA mixes only)	± 0.4
Per cent Binder Replacement	- 5.0
Per cent passing 26.5 mm, 25.0 mm, 19.0 mm, and 16.0 mm sieves	± 5.0
Per cent passing 13.2 mm, 12.5 mm, and 9.5 mm sieves	± 4.0
Per cent passing 4.75 mm, 2.36 mm, and 1.18 mm sieves	± 3.0
Per cent passing 300, and 150 µm sieves	No limits
Per cent passing 75 µm sieve (all mixes except SMA mixes)	± 1.0
Per cent passing 75 µm sieve (SMA mixes only)	± 2.0
<p>Notes:</p> <ol style="list-style-type: none"> 1. The maximum field adjustment is applied against the original JMF submitted with the mix design. 2. The adjusted JMF shall meet the requirements of the Contract, including AC content and gradation on all sieves. 	

**TABLE 2
Sample Size and Frequency**

Material	Sample Size	Frequency of Sampling
SMA mixes, Superpave 9.5, 12.5, 12.5FC 1, 12.5FC 2, and 19.0 (Note 1)	20 to 30 kg or 30 to 40 kg (Note 2)	Every subplot
Superpave 25.0 and 37.5 (Note 1)	25 to 35 kg or 35 to 45 kg (Note 2)	Every subplot
HMA Compaction Cores	150 to 200 mm diameter	Every mix properties subplot
HMA Thickness Cores	50 mm diameter	Every thickness subplot
HMA Aggregates for Density Testing	Coarse aggregate 10 kg Fine aggregate 5 kg RAP 5 kg	First sample to be taken at least 10 Days prior to producing first HMA lot; second sample at 15,000 tonnes; thereafter every 20,000 tonnes or when new samples requested
SMA mixes for draindown testing	3 to 5 kg	Once per lot
WMA for moisture sensitivity testing (Note 1)	50 kg	3 sublots per mix type

Notes:

- Each material sample receptacle shall have a maximum mass of 30 kg. For ease of handling, especially when the larger sample size is required, splitting of material at the paving site is permitted such that a sample is contained in a maximum of two receptacles whose total mass does not exceed the maximum specified above. Once delivered to testing laboratories, combining of the material from the two receptacles is only mandatory if a single receptacle contains insufficient material to carry out the full suite of tests required.
- The larger sample size shall be applicable when samples are designated for testing to the maximum number of gyrations. The frequency of the larger samples shall be one per lot, as designated by the Contract Administrator.

**TABLE 3
Breakdown of the Tender Item Quantity into Lots for Mix Properties and Compaction**

Number of Tonnes	Quantity of Square Metres		Number of Lots
	40 to 55 mm Lift Thickness	60 to 100 mm Lift Thickness	
< 5,000	40,000	25,000	1
5,000 to 10,000	40,000 to 80,000	25,000 to 50,000	2
10,000 to 12,000	80,000 to 100,000	50,000 to 60,000	2 or 3 (Note 1)
> 12,000	> 100,000	> 60,000	3 +

Notes:

- As determined by the Contract Administrator in consultation with the Contractor.

**TABLE 4
Testing Requirements**

Properties and Attributes	Testing Method	Calculations, Values, and Results Required
Mix Properties		
AC Content and Aggregate Gradation for mix samples	LS-282 or LS-292	% AC, % passing DLS sieve, 4.75 mm sieve, 75 µm sieve
Volumetric Properties		
Laboratory Compaction to: i. Design number of gyrations (N_{des}) ii. Maximum number of gyrations (N_{max}) Maximum Theoretical Specific Gravity (G_{mm})	AASHTO T 166 using the same laboratory compaction protocol as was used in mix design. (Note 1) AASHTO T 312, LS-264 Superpave Mixes only: in addition to compacting all samples to the design number of gyrations, one sample from each lot of HMA shall be compacted to the maximum number of gyrations. Bulk Relative Density for mix samples, BRD_m	BRD_m BRD at N_{des} BRD at N_{ini} BRD at N_{max} G_{mm} % G_{mm} @ N_{ini} % G_{mm} @ N_{des} % G_{mm} @ N_{max}
Voids in Mineral Aggregate (VMA)	LS-604, LS-605, LS-266 (Note 2) G_{sb} = combined bulk relative density of blended coarse and blended fine aggregates	G_{sb} VMA
Voids Filled with Asphalt (VFA)	AASHTO R 35	VFA
Air voids for mix (V_a)	LS-265	V_a
Dust to Binder Ratio (D_P) for Superpave mixes	AASHTO R 35	D_P
Compaction		
Compaction and Thickness of Cores	BRD_c = Bulk Relative Density for core samples, LS-262 (Note 1) MRD_m = G_{mm} (Maximum Relative Density for loose mix samples, LS-264) % Compaction = $(100 \times BRD_c / MRD_m)$	Thickness of Core % Compaction
Lift Thickness		
Thickness of Cores	LS-294	Lift Thickness
SMA Mix Properties		
Draindown for mix	LS 310	% Draindown
WMA Moisture Sensitivity		
WMA Moisture Sensitivity	AASHTO T 283 including Table 1	TSR Visual Stripping Rating
Notes:		
1. For all gyratory-compacted specimens and cores of SMA mixes and Superpave mixes, if the per cent water absorbed by the specimen is found to exceed 2% by volume, as described in AASHTO T 166, then the bulk relative density shall be determined using either LS-306 or ASTM D 6752		
2. Calculate to two decimal places for each subplot using the BRD_m for the subplot, and the G_{sb} of the most recent QA samples, as specified in the Contract Documents, to provide a lot mean VMA to two decimal places.		
3. The rounding-off procedure, for all values, shall be according to LS-100.		

TABLE 5
Specification Limits for HMA Acceptance Attributes

Attributes	HMA Type	Lower Limit (LL) %	Upper Limit (UL) %
AC Content	All HMA types	JMF - 0.40 (Note 1)	JMF + 0.50
Designated Large Sieve	All HMA types	JMF - 5.0	JMF + 5.0
4.75 mm Sieve	All HMA types	JMF - 5.0	JMF + 5.0
75 µm Sieve	All HMA types	JMF - 2.0	JMF + 2.0
Air Voids	All HMA types	2.5	5.5
Pavement Compaction	Superpave 37.5, 25.0, 19.0,12.5, 9.5 and 12.5FC 1	92.0	97.0
	Superpave 12.5FC 2	92.0	98.0
	SMA	93.0	98.0
Notes:			
1. When a JMF change results in a decrease in the design AC content, the lower limit (LL) shall be set at the revised JMF minus 0.3% for all lots to which the JMF change applies.			

TABLE 6
Payment Factors Based on Per Cent Within Limits

PWL	Designated Large Sieve	4.75 mm Sieve	75 µm Sieve	AC Content	Air Voids	Compaction
100	1.000	1.000	1.000	1.000	1.000	1.000
99	1.000	1.000	1.000	1.000	1.000	1.000
98	1.000	1.000	1.000	1.000	1.000	1.000
97	1.000	1.000	1.000	1.000	1.000	1.000
96	1.000	1.000	1.000	1.000	1.000	1.000
95	1.000	1.000	1.000	1.000	1.000	1.000
94	1.000	1.000	1.000	1.000	1.000	1.000
93	1.000	1.000	1.000	1.000	1.000	1.000
92	1.000	1.000	1.000	1.000	1.000	1.000
91	1.000	1.000	1.000	1.000	1.000	1.000
90	1.000	1.000	1.000	1.000	1.000	1.000
89	1.000	1.000	1.000	1.000	1.000	0.991
88	1.000	1.000	1.000	1.000	1.000	0.983
87	1.000	1.000	1.000	1.000	1.000	0.974
86	1.000	1.000	1.000	1.000	1.000	0.965
85	1.000	1.000	1.000	1.000	1.000	0.956
84	0.997	0.997	0.997	0.992	1.000	0.948
83	0.994	0.994	0.994	0.984	1.000	0.939
82	0.992	0.992	0.992	0.976	1.000	0.930
81	0.989	0.989	0.989	0.968	1.000	0.921
80	0.986	0.986	0.986	0.960	1.000	0.913
79	0.983	0.983	0.983	0.952	0.999	0.904
78	0.980	0.980	0.980	0.944	0.998	0.895
77	0.977	0.977	0.977	0.936	0.995	0.886
76	0.974	0.974	0.974	0.928	0.991	0.878
75	0.972	0.972	0.972	0.920	0.986	0.869
74	0.969	0.969	0.969	0.912	0.980	0.860
73	0.966	0.966	0.966	0.904	0.973	0.851
72	0.963	0.963	0.963	0.896	0.964	0.843
71	0.960	0.960	0.960	0.888	0.955	0.834
70	0.957	0.957	0.957	0.880	0.944	0.825
69	0.954	0.954	0.954	0.872	0.933	0.816
68	0.951	0.951	0.951	0.864	0.920	0.808
67	0.949	0.949	0.949	0.856	0.906	0.799
66	0.946	0.946	0.946	0.848	0.891	0.790
65	0.943	0.943	0.943	0.840	0.875	0.781
64	0.940	0.940	0.940	0.832	0.858	0.773
63	0.937	0.937	0.937	0.824	0.839	0.764
62	0.934	0.934	0.934	0.816	0.820	0.755
61	0.931	0.931	0.931	0.808	0.799	0.746

PWL	Designated Large Sieve	4.75 mm Sieve	75 µm Sieve	AC Content	Air Voids	Compaction
60	0.929	0.929	0.929	0.800	0.778	0.738
59	0.926	0.926	0.926	0.790	0.755	0.729
58	0.923	0.923	0.923	0.780	0.731	0.720
57	0.920	0.920	0.920	0.770	0.706	0.711
56	0.917	0.917	0.917	0.760	0.680	0.703
55	0.914	0.914	0.914	0.750	0.653	0.694
54	0.911	0.911	0.911	0.740	0.624	0.685
53	0.909	0.909	0.909	0.730	0.595	0.676
52	0.906	0.906	0.906	0.720	0.564	0.668
51	0.903	0.903	0.903	0.710	0.533	0.659
50	0.900	0.900	0.900	0.700	0.500	0.650
49	0.882	0.882	0.882	0.686	0.490	0.637
48	0.864	0.864	0.864	0.672	0.480	0.624
47	0.846	0.846	0.846	0.658	0.470	0.611
46	0.828	0.828	0.828	0.644	0.460	0.598
45	0.810	0.810	0.810	0.630	0.450	0.585
44	0.792	0.792	0.792	0.616	0.440	0.572
43	0.774	0.774	0.774	0.602	0.430	0.559
42	0.756	0.756	0.756	0.588	0.420	0.546
41	0.738	0.738	0.738	0.574	0.410	0.533
40	0.720	0.720	0.720	0.560	0.400	0.520
39	0.702	0.702	0.702	0.546	0.390	0.507
38	0.684	0.684	0.684	0.532	0.380	0.494
37	0.666	0.666	0.666	0.518	0.370	0.481
36	0.648	0.648	0.648	0.504	0.360	0.468
35	0.630	0.630	0.630	0.490	0.350	0.455
34	0.612	0.612	0.612	0.476	0.340	0.442
33	0.594	0.594	0.594	0.462	0.330	0.429
32	0.576	0.576	0.576	0.448	0.320	0.416
31	0.558	0.558	0.558	0.434	0.310	0.403
30	0.540	0.540	0.540	0.420	0.300	0.390
29	0.522	0.522	0.522	0.406	0.290	0.377
28	0.504	0.504	0.504	0.392	0.280	0.364
27	0.486	0.486	0.486	0.378	0.270	0.351
26	0.468	0.468	0.468	0.364	0.260	0.338
25	0.450	0.450	0.450	0.350	0.250	0.325
24	0.432	0.432	0.432	0.336	0.240	0.312
23	0.414	0.414	0.414	0.322	0.230	0.299
22	0.396	0.396	0.396	0.308	0.220	0.286
21	0.378	0.378	0.378	0.294	0.210	0.273
20	0.360	0.360	0.360	0.280	0.200	0.260

PWL	Designated Large Sieve	4.75 mm Sieve	75 µm Sieve	AC Content	Air Voids	Compaction
19	0.342	0.342	0.342	0.266	0.190	0.247
18	0.324	0.324	0.324	0.252	0.180	0.234
17	0.306	0.306	0.306	0.238	0.170	0.221
16	0.288	0.288	0.288	0.224	0.160	0.208
15	0.270	0.270	0.270	0.210	0.150	0.195
14	0.252	0.252	0.252	0.196	0.140	0.182
13	0.234	0.234	0.234	0.182	0.130	0.169
12	0.216	0.216	0.216	0.168	0.120	0.156
11	0.198	0.198	0.198	0.154	0.110	0.143
10	0.180	0.180	0.180	0.140	0.100	0.130
9	0.162	0.162	0.162	0.126	0.090	0.117
8	0.144	0.144	0.144	0.112	0.080	0.104
7	0.126	0.126	0.126	0.098	0.070	0.091
6	0.108	0.108	0.108	0.084	0.060	0.078
5	0.090	0.090	0.090	0.070	0.050	0.065
4	0.072	0.072	0.072	0.056	0.040	0.052
3	0.054	0.054	0.054	0.042	0.030	0.039
2	0.036	0.036	0.036	0.028	0.020	0.026
1	0.018	0.018	0.018	0.014	0.010	0.013
0	0.000	0.000	0.000	0.000	0.000	0.000

TABLE 7
Allowable Macrotexture Ratios for Various Mixes

Mix Type	Macrotexture Ratio (M_R)		
	Degree of Segregation		
	Slight	Medium	Severe
Superpave 9.5	< 1.5	1.5 to 2.0	> 2.0
Superpave 12.5, 12.5FC 1, 12.5FC 2	< 1.6	1.6 to 2.2	> 2.2
Superpave 19.0	< 1.8	1.8 to 2.6	> 2.6
Superpave 25.0	< 2.0	2.0 to 3.5	> 3.5

TABLE 8
Minimum Sublot Lift Thickness

Mix Course	Design Lift Thickness (T_D) mm	Minimum Sublot Lift Thickness mm
All Courses	25 to 39	$T_D - 7$
	40 to 59	$T_D - 10$
Surface Course	60 and greater	$T_D - 15$
Binder Courses	60 and greater	$0.70 \times T_D$

TABLE 9
Lot Thickness Payment Adjustment

Course	T_L	Thickness Payment Adjustment, PA_T
Surface Course (Note 1)	$T_L \geq [0.85 \times T_D]$	$PA_T = \text{lot quantity} \times \text{price} \times \{[1.000 - (T_L / T_D)] \times 2.0\}$
Binder Course	$T_L \geq [0.95 \times T_D]$	$PA_T = \text{lot quantity} \times \text{price} \times \{[1.000 - (T_L / T_D)]\}$
	$[0.95 \times T_D] > T_L \geq [0.85 \times T_D]$	$PA_T = \text{lot quantity} \times \text{price} \times \{[1.000 - (T_L / T_D)] \times 2.0\}$
	$T_L < [0.85 \times T_D]$	$PA_T = \text{lot quantity} \times \text{price} \times \{[1.000 - (T_L / T_D)] \times 3.0\}$
Where:		
T_L = lot mean lift thickness for the tender item, if lot mean lift thickness is less than or equal to T_D (see definition), or		
$T_L = T_D$, if lot mean lift thickness is greater than T_D		
lot quantity = the horizontal area of the upper most lift of hot mix in the lot (normally surface course)		
price = the Contract price of the hot mix tender item		
Notes:		
1. A lot is rejectable when the surface course $T_L < [0.85 \times T_D]$.		

TABLE 10
Reference Densities, D_R

Region	Reference Densities, D _R tonnes/m ³
West Region	2.530
Central Region Northeastern Region Northwestern Region	2.520
Eastern Region	2.390

TABLE 11
AC Price Adjustment

I _P	AC Price Adjustment, PA
I _P > 1.05 I _{TO}	PA = (I _P - 1.05 I _{TO}) x T _{AC}
I _P < 0.95 I _{TO}	PA = (0.95 I _{TO} - I _P) x T _{AC}
<p>Note:</p> <p>If I_P > 1.05 I_{TO} the Contractor receives compensation; however, if I_P < 0.95 I_{TO} the Owner receives a rebate.</p> <p>Where:</p> <p>PA = payment adjustment for new AC, in dollars</p> <p>I_{TO} = PGAC price index for the month prior to Tender Opening</p> <p>I_P = PGAC price index for the month in which paving occurs</p> <p>T_{AC} = quantity of new AC in tonnes</p> <p>T_{AC}, shall be calculated as follows:</p> $T_{AC} = [AC_{new} / 100] \times T_{mix_mnth}$ <p>Where:</p> <p>AC_{new} = the percentage of new AC in the mix as required by the JMF.</p> <p>T_{mix_mnth} = the tonnage of HMA, as calculated in the Hot Mix Asphalt Quantity Calculation clause, accepted into the work during the month for which the payment adjustment was calculated.</p>	