INDEX TO CLAUSES

6.7 Price Adjustment Phasing

PART 7 – PRICE ESCALATION/DE-ESCALATION – PERFORMANCE GRADEDA ASPHALT BINDER

7.1 General

PART 8 – WARM MIX ASPHALT

8.1 General

PART 9 – WARRANTY

9.1 General

PART 10 – MEASUREMENT FOR PAYMENT

10.1 General

PART 1 - GENERAL

This specification covers the preparation of Superpave Hot Mix Asphalt (HMA) materials and paving utilised during HRM construction, HRM maintenance activities and development projects relating to pavement works.

The HMA shall comprise a mixture of mineral aggregate, filler and asphaltic binder combined and be placed in accordance with this specification.

This standard does not address any safety concerns related to the use of its contents. It is the responsibility of the user of this specification to establish appropriate safe work practices applicable to the work detailed within.

1.1 Work Included

This section specifies requirements for constructing asphalt concrete pavement. Work includes fine grading, supply and placing of tack coat, and HMA materials and paving.

1.2 Related Sections

The latest editions of the following shall apply to this specification.

.1	Concrete	Section 03 30 00
.2	Earthwork	Section 31 20 00
.3	Walks, Curbs and Gutters	Section 32 16 00
.4	Reinstatement	Section 32 98 00
.5	Precast Manholes, Catch-Basins and Structures	Section 33 39 00
.6	Standard Details	Section 39 00 00
.7	Specification for Performance Graded Asphalt Binder	S-2
.8	Pavement Markings	S-4C
.9	Concrete	S-11 Part A
.10	Walks, Curbs and Gutters	S-11 Part B
.11	Precast Concrete	S-11 Part C

1.3 Reference Standards

The latest editions of all the following references shall apply to this specification.

.1 Canadian General Standards Board (CGSB) 1-GP-74M Paint, Traffic, Alkyd

.2 Nova Scotia Department of Public Works Standard Specification - Highway Construction and Maintenance

.3 Transportation Association of Canada; Manual of Uniform Traffic Control Devices for Canada

.4 AASHTO M 156, Standard Specification for Requirements for Mixing Plants for Hot-Mixed, Hot-Laid Bituminous Paving Mixtures

.5 AASHTO T 283, Standard Method of Test for Resistance of Compacted Asphalt Mixtures to Moisture-Induced Damage

.6 AASHTO T 304, Standard Test Method for Uncompacted Void Content of Fine Aggregate

.7 Asphalt Institute MS-2, Asphalt Mix Design Methods

.8 ASTM C88, Standard Test Method for Soundness of Aggregates by Use of Sodium Sulfate or Magnesium Sulfate

.9 ASTM C117, Standard Test Method for Materials Finer than 75-µm (No. 200) Sieve in Mineral Aggregates by Washing

.10 ASTM C127, Standard Test Method for Relative Density (Specific Gravity) and Absorption of Coarse Aggregate

.11 ASTM C128, Standard Test Method for Relative Density (Specific Gravity) and Absorption of Fine Aggregate

.12 ASTM C136, Standard Test Method for Sieve Analysis of Fine and Coarse Aggregates

.13 ASTM C1097, Standard Specification For Hydrated Lime For Use In Asphalt Cement Or Bituminous Paving Mixtures

.14 ASTM D75, Standard Practice for Sampling Aggregates

.15 ASTM D140, Standard Practice for Sampling Asphalt Materials

.16 ASTM D242, Standard Specification for Mineral Filler For Bituminous Paving Mixtures

.17 ASTM D546, Standard Test Method for Sieve Analysis of Mineral Filler for Asphalt Paving Mixtures

.18 ASTM D2041, Standard Test Method for Theoretical Maximum Specific Gravity and Density of Bituminous Paving Mixtures

.19 ASTM D2172, Standard Test Methods for Quantitative Extraction of Bitumen From Bituminous Paving Mixtures

.20 ASTM D2419, Standard Test Method for Sand Equivalent Value of Soils and Fine Aggregate

.21 ASTM D2726, Standard Test Method for Bulk Specific Gravity and Density of Non-Absorptive Compacted Bituminous Mixtures

.22 ASTM D2950, Standard Test Method for Density of Bituminous Concrete in Place by Nuclear Methods

.23 ASTM D3203, Standard Test Method for Percent Air Voids in Compacted Asphalt Mixtures

.24 ASTM D3665, Standard Practice for Random Sampling of Construction Materials

.25 ASTM D4318, Standard Test Methods for Liquid Limit, Plastic Limit, and Plasticity Index of Soils

.26 ASTM D4791, Standard Test Method for Flat Particles, Elongated Particles, or Flat and Elongated Particles in Coarse Aggregate

.27 ASTM D5361, Standard Practice for Sampling Compacted Asphalt Mixtures for Laboratory Testing

.28 ASTM D5444, Standard Test Method for Mechanical Size Analysis of Extracted Aggregate

.29 ASTM D6307, Standard Test Method for Asphalt Content of Asphalt Mixture by Ignition Method

.30 ASTM D6928, Standard Test Method for Resistance of Coarse Aggregate to Degradation by Abrasion in the Micro-Deval Apparatus

.31 ASTM D7113, Standard Test Method for Density of Bituminous Paving Mixtures in Place by the Electromagnetic Surface Contact Methods

.32 ASTM D7428, Standard Test Method for Resistance of Fine Aggregate to Degradation by Abrasion in the Micro-Deval Apparatus

.33 NSTIR TM-2, The Petrographic Analysis of Coarse Aggregate

.34 NSTIR TM-3, Determination of Percent Fractured Particles in Processed Coarse Aggregates

PART 2 - EXECUTION

2.1 Fine Grading

.1 Fine grade gravel surface to within 10 mm of elevations and cross sections indicated immediately prior to placement of asphalt materials. Add or remove gravel as required. Compact to 100% Standard Proctor Maximum Dry Density or as directed by the Engineer.

2.2 Adjusting Tops of Castings

Prior to placing HMA surface course:

.1 Prior to installing catchment devices, the contractor shall provide all testing equipment, labour, incidentals, traffic control, etc. required to undertake an inspection of the system to document conditions prior to commencing work. This inspection must be done in the presence of the Engineer.

.2 Install catchment devices in all manholes prior to work commencing on the manhole. Such catchment devices shall be constructed and installed in a manner so as not to impede the flows through the manhole.

.3 Adjust manhole covers and catch basin frames to match asphalt surface, using manufactured grade rings or cast in place concrete.

.4 For streets where full depth asphalt removal is not occurring (i.e. mill and repave) the adjustment area of the manhole is to be filled with temporary hot/cold mix asphalt so that after milling a minimum of 40 mm of asphalt will remain.

.5 Manhole frame to be installed (reset) after base asphalt has been placed and just before finish asphalt layer is placed unless otherwise approved by Engineer. Note: after setting Utility or other fixed (non-adjustable) manholes, the vertical edges of the structure need to be clearly marked with caution paint.

.6 Adjust valve boxes to finished asphalt surface. Raise or lower top sections of the valve boxes.

.7 Upon manhole adjustment, removal of catchment device and all works associated with restoration around the manhole, the contractor shall provide all testing equipment, labour, incidentals, traffic control, etc. required to undertake an inspection of the system to verify its cleanliness. This inspection must be done in the presence of the Engineer.

2.3 Water Main Leakage Testing

.1 After placement of the asphaltic concrete base course and prior to the placement of the asphaltic concrete surface course, contractor to provide 24 hours notice to Halifax Water for leakage testing. Allow access to and coordinate with Halifax Water for leakage testing.

2.4 Pavement Markings

.1 Arterials shall have the pre-markings (tabs on milled surface, temporary tape on micro and pavement) applied immediately after the placement of each lift of asphaltic concrete and permanent markings shall be applied within 48 hours. All other streets shall have the permanent markings applied within one week after the placement of the final lift of asphaltic concrete.

.2 Surface to be dry and clean prior to the application of pavement markings. Apply paint at application rate indicated with spray gun to lines and at locations indicated. Dimensions and colour to HRM's Pavement Markings, Section S-4 specification.

2.5 Quality Management Plan

.1 The Contractor shall submit to the Engineer, a Quality Management Plan (QMP) for review a minimum of 15 working days prior to commencement of any asphalt work as part of the project(s). The Engineer will provide written approval of the Contractor's QMP (Contractor QMP Approval Letter) in a timely manner, prior to commencement of this work.

The Contractor has the option to submit a comprehensive QMP to the Engineer for review, prior to the construction season and commencement of any asphalt work as part of the project(s). This QMP shall be applicable for the entire construction season (ends December 30th of the calendar year) and pertains to all asphalt work expected for that season, by the Contractor.

The QMP is required to include the following as a minimum.

.1 A Paving Plan

.2 A Quality Control Inspection and Testing Plan (QC ITP).

.3 A Cold Weather Paving Plan

.2 The Engineer will provide written approval of the Contractor's QMP (QMP Approval Letter). This letter shall be submitted to the Engineer for each project succeeding project award and prior to construction. Specifically, the Contractor's QMP Approval Letter shall be submitted for each project as part of the preconstruction documents identified in HRM Construction's Contractor Required Pre

Construction Information list, for which they intend to use the plan, and shall include a revision number, project name and submission date.

.3 If the Engineer deems the Contractor's QMP submission unacceptable, the Contractor shall provide iterations in a timely manner until the QMP is considered adequate by the Engineer. Construction shall not commence without submission of the Contractor's QMP Approval Letter for the project.

.4 At the Engineer's discretion, a project specific QMP may be requested at any time to fit the criteria of a unique project. This request will be identified in contract specifications during the tendering process.

.5 If deemed necessary by the Contractor, an amended QMP can be submitted to the Engineer for review and approval throughout the construction season.

.6 The Paving Plan shall include the following:

.1 Identification of quality and quantity of equipment and personnel to be used for achieving quality end product as outlined in this specification.

.2 Identification of conditions where paving will be ceased including asphalt concrete not being placed during rain or snow or on asphalt surfaces which are wet and/or unclean, and on any surface which has ponded water.

.3 Confirmation that conventional HMA per the regular paving plan shall not be permitted when the ambient air temperature is below 5°C.

.4 The paving sequence.

.5 The procedure that will be implemented to establish the compaction rolling pattern.

.7 The QC ITP shall include the following:

.1 The type and amount of testing to be carried out by the Contractor.

.2 The methods of testing to be used.

.3 The equipment (field and laboratory), location of laboratory, staff to be used for QC testing.

.4 Confirmation that a laboratory that has current CCIL Type B Certification or AMRL equivalent certification or other equivalent certified laboratory acceptable to the Engineer shall be used for all QC testing. Testing of the samples shall be conducted under the direction and constant supervision of at least one technician certified to perform the QC tests according to CCIL or equivalent certification.

.5 Typical remedies to be implemented if the QC testing results indicate that the project requirements are not being met.

.6 The Contractor shall be required to update and resubmit the QC ITP to the Engineer for approval, as conditions or changes warrant.

.7 Confirmation that all QC testing results and interpretation of testing results will be provided to the Engineer within 24 hours of completion of testing.

.8 The Cold Weather Paving Plan shall include the following:

.1 Identify the condition under which the cold weather paving plan will be implemented including when paving operations are to take place between 0 - 5°C ambient air temperature. The wind chill temperature (if any) will also be considered by the Engineer when determining whether the cold weather paving plan shall apply or if paving shall be permitted.

.2 Confirmation that Warm Mix Asphalt (WMA) shall be used for all cold weather paving (0 to 5 °C ambient air temperature) and identification of the WMA technology proposed to be used.

.3 Confirmation that a joint heater or echelon paving will be used.

.4 Identification of the increased temperature testing frequency at the job site to ensure that the asphalt meets HRM specification.

.5 Details regarding how compaction will be achieved per the requirements of the specification.

.6 Details regarding how compaction of granular layers will be checked and confirmed prior to paving commencing.

.9 The submitted QMP is required to be reviewed and approved by the Engineer prior to the start of paving. Once accepted by the Engineer the QMP becomes a part of the Contract and shall be enforced accordingly. Any changes to the QMP shall be communicated to the Engineer in advance of the change and shall include information regarding mobile laboratories location, laboratory equipment, and staff changes.

PART 3 - MATERIALS

3.1 General

The Contractor shall be responsible for the supply, storage and handling of all material utilised to produce the HMA described in this specification.

3.2 Aggregates

Aggregates shall be crushed pit run, quarried stone or sand conforming to the quality requirements of this specification. All aggregates shall be free from coatings of clay, silt, or other deleterious organic matter.

The Contractor shall submit to the Engineer the location of all proposed aggregate sources at the commencement of each construction season. Any subsequent aggregate source changes must be requested in writing to the Engineer prior to material acceptance.

.1 Fine Aggregates

Fine Aggregate shall consist of clean, hard, durable, rough-surfaced grains, free from clay, loam and other foreign matter. The portion of the material passing the 4,750 µm sieve shall be known as fine aggregate.

Fine aggregate shall conform to the physical requirements as stipulated in Table 1 for the mix type.

Table 1 - Fine Aggregate Physical Requirements[1]

Material Property	Test Method[2]	Specified Value
		A-HF, BHF, C-HF, D-HF and E-HF
Absorption	ASTM C128	< 2.0
Angularity[3]	ASTM C125 2AASHTO	≥ 45.0
Sand Equivalent	ASTM D2419	≥ 50
Soundness[4]	ASTM C88	<10
Micro Deval	ASTM D7428	< 20
Plasticity Index[5]	ASTM D4318	0 (Non-Plastic)

(1) Applies to each individual aggregate component in the asphalt mixture

(2) Latest Edition
(3) Does not apply to Natural Blend Sand Component
(4) Test to be conducted utilizing Sodium Sulphate ($NaSO_4$)
(5) Test required for fine aggregate from pit run sources or natural fines only.

.2 Coarse Aggregates

Coarse Aggregate shall consist of hard, durable crushed stone or crushed gravel particles, reasonably uniform in quality and free from soft or disintegrated pieces. The portion of material retained on the 4,750 µm sieve shall be known as coarse aggregate.

Coarse Aggregates shall conform to the physical requirements as stipulated in Table 2 for the mix type.

Table 2 - Coarse Aggregate Physical Requirements(1)

Material Property	Test Method(2)	Specified Value	
		Base Course (A-HF and B-HF)	Surface Course (C-HF, D-HF and E-HF)
Absorption	ASTM C127	< 1.75	< 1.75
Petrographic Number(3)	NSTIR TM2	≤ 135	≤ 135
% Fractured Particles - Two Face	NSTIR TM3	> 85	> 95
Flat or Elongated Particles 5:1	ASTM D4791	< 10	< 10
Micro Deval	ASTM D6928	< 20	< 15
Aggregate Soundness(4)	ASTM C88	< 15	< 15

(1) Applies to each individual aggregate component in the asphalt mixture
(2) Latest edition
(3) Coarse Aggregate Sources may be blended to meet Petrographic Number
(4) Test to be conducted utilizing Sodium Sulphate ($NaSO_4$)

.3 Gradation of Combined Aggregates

The gradation of the combined processed aggregate for the asphalt concrete shall conform to the values shown in Table 3 for the mix type specified in the contract documents when tested by washed sieve analysis according to ASTM C117, C136 and D546.

Table 3 - Combined Processed Aggregate Gradations for Each Mix Type(1)

Sieve Size (µm)	Cumulative Percent Passing				
	A-HF	B-HF	C-HF	D-HF	E-HF
37,500	100	-	-	-	-
25,000	90 – 100	100	-	-	-
19,000	70 – 90	90 – 100	100	-	-
12,500	60 – 80	70 – 90	90 – 100	100	100
9,500	-	60 – 75	70 – 90	90 – 100	95 – 100
4,750	25 – 60	35 – 58	45 – 68	52 – 75	90 – 100
2,360	15 – 45	25 – 45	25 – 55	25 – 55	45 – 90
1,180	-	-	-	-	30 – 60
600	-	-	-	-	-
300	-	3 – 20	6 – 20	5 – 20	15 – 30
150	-	-	-	-	-
75	1 – 7	2 – 8	2 – 10	2 - 10	6 – 12

(1) A maximum of 15% natural sand will be permitted to achieve required gradation

.4 Mineral Filler

Mineral filler, when required, shall comprise finely divided mineral matter such as rock dust, hydrated lime, hydraulic cement, pozzolanic material, fly ash or other suitable mineral matter. All mineral fillers must conform to the requirements of ASTM D242, Standard Specification for Mineral Filler for Bituminous Paving Mixtures. All mineral fillers utilised must have a plasticity of zero.

.5 Reclaimed Asphalt Pavement (RAP)

No RAP shall be permitted in C-HF, D-HF, and E-HF asphalt mixes for Traffic Category C mixes. For Traffic Category A and B mixes the proportion of RAP in C-HF, D-HF, and E-HF mixes shall be limited to a maximum of 15%. Up to 30% RAP by mass of mix is allowed in A-HF and B-HF mix types for all Traffic Categories.

When 16% to 30% RAP is used in asphalt mixtures placed as intermediate or base courses the selected binder grade used in the new asphalt shall be one grade lower for both high and low temperature stiffness than the binder grade

requirement for virgin asphalt. For example, if the specified binder grade is 58S-28, the required binder grade for mixtures using 16% to 30% RAP shall be 52S-34S.

Suitable RAP shall not contain any other additives including, but not limited to, Sulphur, crumb rubber, asphalt rubber, asbestos, produced sand, paving fabrics and reinforcement grids.

3.3 Asphalt Binder

The Performance Graded Asphalt Binder (PGAB) shall be prepared by the refining of petroleum. The Contractor will be responsible for the supply and transportation of the PGAB. Material storage, transportation and material properties will comply with HRM's Performance Graded Asphalt Binder Specification, Section S-2, for the PGAB specified in the Contract Documents.

3.4 Anti-Stripping Agents

An anti-stripping additive may be required in the Hot Mix Asphalt Concrete. Resistance of Compacted Hot Mix Asphalt to Moisture-Induced Damage tests in accordance with AASHTO T283 shall be completed following the mix design procedure, to determine the required amount of anti-stripping additive. All asphalt mixes are required to have a minimum Tensile Strength Ratio (TSR) of 80%, as determined by AASHTO T283.

Additionally, the tested specimens are to be inspected by the laboratory developing the mix design for any visual evidence of moisture damage as demonstrated by the loss of asphalt coating on the aggregate matrix. If coating loss is evident, even if TSR values are 80% or greater, the test procedure is to be repeated incorporating an approved anti-stripping agent. The testing procedure is repeated at increments of 0.2% Liquid Anti-Stripping (LAS), or as recommended by the Manufacturer; or 0.5% hydrated lime, until such time that the moisture damage is not evident.

Either hydrated lime ($Ca(OH)_2$) or LAS additives approved by the Engineer can be utilised.

The TSR test report must contain, as a minimum, the following:

- The source and percentage of aggregates used within the proposed asphalt concrete mix.
- The type and percentage of asphalt binder used.
- The percentage of air voids.
- The Tensile Strength Ratio (TSR); and
- Visual inspections of the mix.

Where LAS agents are required as an additive to the PGAB, the dosage added will be the minimum dosage required to satisfy the above criteria.

Contractors electing to utilize LAS agents in their PGAB are required to ensure all appropriate safety precautions are taken in the handling, use and blending of this material. All workers are to be formally trained with respect to working with PGAB containing LAS additives.

In addition to anti-stripping additives herein, an additional minimum of 0.5% hydrated lime may be required to be added to the mix as requested by the Engineer per the Contract.

Hydrated lime shall be added to the aggregates by the dry method or the wet method.

For the dry method, hydrated lime shall be taken from the lime storage facility and combined with aggregate with an appropriate mixing device. Prior to the addition of the hydrated lime, the aggregate source must be dampened to improve aggregate coating.

For the wet method, a slurry containing one-part hydrated lime to three parts water by mass shall be used. The slurry shall be prepared in a central mixing tank. When the wet method of lime addition is utilised, no addition of water to the aggregate prior to the mixing of the slurry mix and aggregate will be required.

Both the coarse and fine aggregate components must be treated with hydrated lime.

Regardless of the process or mixing equipment used, the process shall result in the production of aggregates that are uniformly and homogeneously coated with the hydrated lime, and that are free of clumps and balls prior to entering the dryer at the HMA plant.

3.5 Tack Coat

On Local roads the Contractor is required to use non-tracking emulsion based tack, except when paving at temperatures below 5°C, in which case conventional RS-1 tack shall be used. The requirements of the non-tracking emulsion tack coat prior to dilution, are shown in Table 4.

Table 4 - Local Roads Tack Coat Requirements Non-Tracking Emulsion Requirements (Prior to Dilution)		
Test Type	**Specification Range**	
	Minimum	**Maximum**
Test on Emulsion		
SF Viscosity, 25°C, SFs	20	
Sieve Test		0.1
Dist. Residue	55	
Oil Portion of Dist., %		Trace
Settlement, 5 days, %	-	3
Demulsibility, 35 ml, 0.02 N $CaCl_2$, %	60	
Particle Charge	(-) or (+)	
Test on Residue		
Penetration, 25°C, dmm	20	55
Ash Content, %		1.0

*Non-tracking tack can be used on all other road classifications

Rapid Setting Emulsified Asphalt (RS-1) may be used as tack coat on Minor/Major Collectors and Arterials. The requirements for RS-1 are shown in Table 5.

Table 5 - Minor/Major Collectors and Arterials Tack Coat Requirements Rapid Setting Emulsified Asphalt (RS-1) Requirements		
Test Type	**Specification Range**	
	Minimum	**Maximum**
Test on Emulsion		
SF Viscosity, 25°C, SFs	20	100
Dist. Residue	55	
Settlement, 5 days, %		3.0
Storage Stability, %		1.5
Sieve Test, %		0.1
Demulsibility, %	60	
Particle Charge	Negative	
Test on Residue		
Penetration, 0.1 mm	100	200
Ductility, cm	60	
Solubility, %	97.5	

PART 4 - MIX DESIGN REQUIREMENTS

4.1 Mix Requirements

The Contractor shall undertake a laboratory-based mix design using current aggregate stockpiles and once completed the mix design will be designated as the Design Mix Formula (DMF). The Contractor shall use professional engineering services and a qualified testing laboratory, to assess the aggregate materials proposed for use and to carry out the design of the asphalt concrete

mix. The qualified testing laboratory shall be certified by Canadian Council of Independent Laboratories (CCIL) to a minimum of Superpave Mix Design Testing - Type A, Aggregate Testing - Type D, and retain a minimum of one CCIL certified laboratory asphalt technician and one CCIL certified laboratory aggregate technician on staff. A single technician may hold both asphalt and aggregate certifications and satisfy the requirements.

The asphalt mix design shall follow the Superpave method of the DMF as outlined in the latest edition of the Asphalt Institute Manual Series No. 2 (MS-2). The DMF shall meet the requirements of Table 6 for the mix type specified. The mix design, in all instances, must be current and reflective of the aggregate that is to be utilised in the HMA. The Contractor shall submit the DMF to the Engineer at least 14 days prior to the initial start of asphalt mix plant production and resubmit for each subsequent change in supplier or source of materials.

Table 6 - Mix Properties Requirements

HRM Traffic Category	Design Traffic in Equivalent Single Axle Loads	Number of Gyrations		
		N_{ini}	N_{des}	N_{max}
A	0.3 to 3 Million	7	75	115
B	3 to 10 Million	7	75	115
C	> 10 Million	8	100	160

HRM Traffic Category	Mix Type	Property	Requirement
A, B and C	A-HF	Design PGAB Content - %	≥ 4.6
	B-HF		≥ 4.8
	C-HF		≥ 5.1
	D-HF		≥ 5.6
	E-HF		-(1)
A	All Mixes	Density(2) at N_{ini} - %	≤ 90.5
B and C			≤ 89.5
A, B and C	All Mixes	Density(2) at N_{des} - %	96.5
A, B and C	All Mixes	Density(2) at N_{max} - %	≤ 98.0

HRM Traffic Category	Mix Type	Property	Requirement
A, B, and C	A-HF	Voids in Mineral Aggregate (VMA) - %	≥ 12.0
	B-HF		≥ 13.0
	C-HF		≥ 14.0
	D-HF		≥ 15.0
	E-HF		≥ 16.0
A, B and C	All Mixes	Voids Filled with Asphalt (VFA) - %	65 – 78
A, B and C	A-HF, B-HF, C-HF and D-HF	Dust to Binder Ratio	0.6 – 1.2
	E-HF		0.9 – 2.0
A, B and C	All Mixes	Modified Lottman Test, TSR - %	≥ 80

(1) There is no minimum asphalt cement content requirement; however, the mix shall meet all other mix property requirements.
(2) Density expressed as a percentage of Theoretical Maximum Specific Gravity (G_{mm}) of mix.
(3) All mixes shall be designed to 3.5% air voids.

The DMF submission to the Engineer shall include, but not be limited to, the following information:

- Mix type for which the DMF was completed and a description of the probable usage of the mix in projects.
- All test results, mix design worksheets, and graphs.
- Material proportions and sources.
- The amount of RAP in percent by mass and volumetric data.
- Designation of the fine aggregate and the coarse aggregate.
- PGAB grade, source and percent by mass of the new PGAB and RAP sourced binder (if applicable).
- A graph of the temperature-viscosity relationship for the PGAB that is to be used in the mix.
- Information on additives, including source, type, percent by mass of asphalt cement, and test results according to Asphalt Institute MS-2.
- Information regarding fines that are returned to the mix, aggregate breakdown during production, and the resultant change in the aggregate gradations.
- Complete gradations for all coarse and fine aggregates.
- The volumetric properties for the mix selected in accordance with Table 6. Graphs shall be submitted for the air voids, voids in mineral aggregate, voids filled with asphalt, dust-to-asphalt ratio, bulk relative density, maximum relative density, and the

gyratory curves of the mix plotted against asphalt cement content.
- Aggregate absorptions.
- Bulk specific gravity and saturated surface dry density for each aggregate.
- Mix bulk specific gravity according to ASTM D2726.
- Theoretical maximum specific gravity.
- When RAP is permitted for use, extracted bulk relative density, percentage of asphalt binder sourced from the RAP, and gradation for the RAP used in the mix.
- All visual observations made during the design process with particular attention and comments regarding stripping and coating for both the coarse and fine aggregates.
- The mixing and compaction temperature used in the mix design and the compaction temperature of the reheated mix to be employed in the testing of the production mix.
- The typical mix weight to produce a gyratory specimen with a height of 115 mm ± 5 mm.

The final DMF, once reviewed and approved by the Engineer, will be implemented as the initial trial for plant mix start up with any necessary adjustments immediately being made by the Contractor. These adjustments, if any, will result in the Job Mix Formula (JMF). Any additional adjustments will result in an additional documented JMF. Copies of all JMF reports will be provided to the Engineer for their review and approval. JMF reports shall be provided to the Engineer for review and prior to asphalt paving per the new JMF A maximum of three (3) JMF reports will permitted for a DMF for each project.

Adjustments to DMF for each JMF shall be within the limits shown in Table 7.

Table 7 – Permitted Limits for DMF Adjustment

Property	Maximum Allowable Adjustment(1)
Percent PGAB content	± 0.3%
Percent Passing the 37,500 µm, 25,000 µm and 19,000 µm sieves	± 5.0%
Percent Passing the 12,500 µm and 9,500 µm sieves	± 4.0%
Percent Passing the 4,750 µm, 2,360 µm and 1,180 µm sieves	± 5.0%
Percent Passing the 600 µm, 300 µm and 150 µm sieves	No limits
Percent Passing the 75 µm sieve	± 1.0%

(1) The field adjustment is applied against the actual DMF property value.

All JMF's shall meet the requirements of Tables 3 & 6, and Subsection 4.1 of this specification. All quality control tests will be measured against the documented JMF.

PART 5 - TRANSPORTATION, PLACEMENT AND CONSTRUCTION

5.1 Transportation of Hot Mix Asphalt

The HMA shall be transported from the mixing plant to the work site in tight vehicles with the bottoms cleaned of all foreign materials. Vehicles shall be equipped with tarps of water-repellent material with a maximum mesh size of 0.5 mm when stretched, a minimum melting point of 200°C and of sufficient size to completely cover truck bodies from edge of box to edge of box and abut the tailgate.

Tarps shall be in good condition and shall have no holes or tears. The tarps shall be securely tied down so there is no visible opening between the truck box and tarp. Vehicles shall also be equipped with wind deflectors at the front of the truck box. Tarps must always be used during the transportation of HMA to the respective job site unless otherwise stated by the Engineer.

The use of hydrocarbon-based fuels or solvents to lubricate the truck bodies or to clean tools or equipment is not permitted. A biodegradable release agent shall be supplied by the Contractor to clean or lubricate tools, equipment, and truck bodies.

The maximum temperature of the HMA/WMA as it is discharged from the mixing chamber shall not exceed the maximum mixing temperature from the DMF/JMF by more than 20°C, up to a maximum of 170°C for HMA, 165°C for WMA. The temperature of HMA immediately prior to initial rolling shall not be less than 120°C. The temperature of WMA immediately prior to initial rolling shall not be less than 100ºC.

5.2 Placing of Hot Mix Asphalt

The mixing and compaction temperature ranges for the HMA shall be determined from the supplier temperature-viscosity charts current for the calendar year as supplied with the approved DMF. Laboratory asphalt mixing shall occur within temperature ranges such that the viscosity of the PGAB is 170 ± 20 centistokes. Asphalt compaction shall occur within temperature ranges such that the viscosity of the PGAB is 280 ± 30 centistokes.

Asphalt concrete shall be placed upon a prepared gravel surface that has been approved by the Engineer, which is free from standing water, and cleaned of all loose or foreign material including fine dust.

The placing of asphalt concrete shall be at a constant and even rate of speed compatible with the rate of compaction rolling and plant output.

Asphalt concrete shall be placed upon a milled and/or existing asphalt surface, which is free of standing water, and cleaned of all loose or foreign material including fine dust. Hand sweeping, power sweeping, power blowers, vacuum sweepers, and/or pressure washers may be required between successive lifts of asphalt or on

milled surfaces when deemed necessary by the Engineer, prior to placement of tack coat.

Placement shall not take place during rain. Placement shall not take place at temperatures below 5°C, without an approved Cold Weather Paving Plan (included as part of an approved Quality Management Plan), and prior to approval by the Engineer. A course shall not be placed upon a previously laid course within 12 hours following final compaction of the prior course, or until the temperature of the previous course is 50°C or less, whichever occurs first.

Asphalt concrete ramps shall be installed at all limits including side streets and pedestrian ramps using HMA (or approved equivalent) and a bond separator. Asphalt ramps are to be installed before work is completed for the day, and before the area is opened to live traffic. Asphalt ramps to be constructed to at least a 20 to 1 horizontal to vertical ratio.

5.3 Use of Paving Equipment

Base and surface course asphalt mixes shall be laid by means of mechanical self-propelled pavers and a Material Transfer Vehicle (MTV) as requested by the Engineer per the Contract. The MTV is defined as a self-propelled transfer unit and insert hopper. The MTV shall transfer asphalt concrete mixtures from an unloading truck and re-mix the material prior to transferring the mix to the paver, without direct contact with the paver.

The hot mix shall be dumped in the centre of the paver hopper or MTV and care shall be exercised to avoid overloading and spillage of the hot mix and segregation.

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

The automatic screed controls and all compaction aids on the paver shall be in operation while the hot mix is being placed, however the automatic screed controls shall not be used when placing a single course on granular grade.

The paver(s) shall operate continuously at a uniform speed as necessary to match the output of the plant; however, in no case shall the speed of a paver exceed 18 m/min.

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

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

5.4 Placement by Hand

Where areas are not accessible by paving equipment, hand placement will be permitted. Care must be taken during hand placement to avoid segregation of the coarse and fine aggregate. Lutes and rakes must be utilised during hand placement to thoroughly loosen and uniformly distribute the mix. Any lumps that do not readily break down must be removed.

All hand tools must be heated prior to hand placement operations to keep them free from sticking asphalt. Care must be taken when heating the tools to ensure the mix is not overheated.

Prior to rolling, the surface must be checked with a 3 m straightedge for level, and any irregularities must be corrected at the expense of the Contractor.

5.5 Tack Coat Application

Where a HMA is to be placed as an overlay to an existing asphalt wearing or milled surface, a tack coat must be applied to the surface prior to the placement of the HMA. The tack coat material shall be as per Section 3.5 of this specification. The method of application shall be as recommended by the manufacturer and shall be subject to the approval of the Engineer. The tack coat utilised must be appropriate for the prevailing weather conditions.

Where tack coat is required by the Engineer, an application rate of 0.25 L/m² ± 0.05 L/m^2 for non-tracking and 0.15 L/m² ± 0.05 L/m^2 for RS-1 shall be utilized. On milled surfaces the application rate shall be increased to 0.30 ± 0.05 L/m^2 L/m² for non-tracking and 0.20 L/m² ± 0.05 L/m^2 for RS-1. Regardless of the rate of application, tack coat application shall be uniform and to the visual satisfaction of the Engineer.

New HMA may be applied directly over a freshly placed mat without applying a tack coat when multiple lifts are being placed and the fresh mat is free of any type of contamination or debris. However, a tack coat must be applied if more than 24 hours expires between consecutive lifts.

5.6 Compaction

Compaction of the asphalt concrete shall be with any combination of rollers that can achieve the specified smoothness, grade and density. However, the Contractor is required to utilise a fully functional pneumatic tire roller on all paving projects. A ‘paving’ project shall be defined as a contract which involves full-width replacement or overlay of new HMA.

Trench reinstatement or partial-width road paving will be considered ‘patching’ projects.

The Contractor shall demonstrate a rolling pattern for achieving compaction at the start of paving operations, and the degree of compaction will be verified by the Engineer.

Rollers shall be in good condition, capable of reversing direction without backlash, and they shall be operated by competent and trained operators. The speed of steel-wheeled rollers and pneumatic rollers shall not exceed 5 km/h. The speed shall be slow enough to avoid displacement of the asphalt concrete. Any displacement occurring as a result of reversing the direction of the roller, or from any other cause, shall be corrected.

Rolling shall proceed continuously until all roller marks are removed and the specified compaction is achieved.

Water or a biodegradable release agent shall be used on the roller wheels or tires to prevent adhesion of asphalt concrete. Hydrocarbon fuels or solvents shall not be permitted.

Breakdown rolling shall take place as closely behind the paver as the temperature and condition of the mat will allow.

Secondary rolling shall follow the breakdown rolling as closely as possible while the asphalt concrete is still viscous enough to achieve the specified compaction. Secondary rolling shall be by means of a pneumatic rubber tire roller.

Final rolling shall be performed while the asphalt concrete is still viscous enough to permit the removal of roller marks.

Sufficient rollers must be maintained on the job site to ensure full compaction of the asphalt mix before the temperature of the mix falls below 80°C.

The surface, after final rolling, shall be smooth and true to the established crown and grade.

All defective areas identified or agreed to by the Engineer shall immediately be repaired by removing the asphalt concrete and replacing it with the same type of HMA used in that particular lift as per the specifications, and to the satisfaction of the Engineer.

The surface shall be free from roller marks or any depressions exceeding 5 mm when measured with a 3 m straight edge held parallel to the centerline.
The surface shall have a cross slope of 20 mm/m to 35 mm/m or as specified by the Engineer (in areas of normal crown).

5.7 Joints

Joints shall be constructed in a careful and skillful manner by experienced and competent personnel. Joints shall be smooth, well-bonded and tightly sealed.

.1 Transverse Joints

Transverse joints shall be formed by butt joints. When forming butt joints, the edge of the previously placed asphalt concrete shall be cut back to its full depth to expose a fresh surface. The exposed fresh surface shall be coated with tack coat or heated before asphalt concrete is placed in contact with it. Heat shall be applied to the joint using a method approved by The Engineer, with care taken not to overheat the existing asphalt concrete. The freshly placed asphalt concrete shall be raked to the proper depth and grade and then the transverse joints shall be rolled transversely (perpendicular to the travel lanes) and the compacted joint shall be inspected with a 3 m straightedge. If there is more than a 6 mm depression, the joint shall be reconstructed.

Should any separation of the construction joint be present on or before 2 years after 100 percent completion of the project section, the Contractor will be required to undertake corrective action as outlined in Table 8, at their own cost, prior to the end of the current construction year:

Table 8 - Joint Rehabilitation under Warranty Period

Gap in Construction Joint	Required Corrective Action
3 - 20 mm	The affected joint must be cleaned, hot-air lanced, and filled with appropriate sealant
> 20 mm	Milled, tacked and replaced with equivalent HMA at a minimum width of 300 mm

.2 Keyed Joints

When overlaying existing asphalt concrete pavement, keyed joints shall be constructed at both ends of the Project repaved area, at all intersecting roads, ramps, and at all bridge decks in the repaved area, to avoid a feather joint. Keys will only be required between the final lift of pavement and the existing pavement, unless otherwise directed by the Engineer.

The existing asphalt concrete pavement shall be removed to expose a vertical surface of a depth equal to the thickness of the final lift against which new asphalt concrete may be placed. The minimum slope measured parallel to the centerline of the milled area shall be 200 horizontal to 1 vertical (200H:1V). The angle that the joint makes with the centerline shall not exceed forty-five degrees (45°) or as otherwise directed by the Engineer.

When existing pavement has been removed in advance of paving the joint area, the Contractor shall construct a smooth asphalt taper at the joint area to a slope of at least 20 horizontal to 1 vertical (20H:1V). The taper may be placed on tar paper and shall be removed just prior to paving the keyed area or as directed by the Engineer. The transverse joint shall be straight and have a vertical face when the taper is removed.

The associated cost of providing all keys shall be included in the price per tonne of asphalt concrete.

The paver shall not move more than 20 m from any keyed joint until that joint has been rolled and checked with a straight edge. If the joint is not satisfactory to the Engineer, it shall be immediately corrected before the paver may proceed.

.3 Longitudinal Joints

Longitudinal joints in successive asphalt lifts shall be offset by 150 mm. Longitudinal joints in the top lift shall not be constructed within a travel lane except when paving in echelon or when paving tapers. Base course mats may have joints located within the lane, but not in the wheel path.

Where practical, pavers shall be used in echelon to lay full-width pavement sections, when traffic can be diverted and when production of the mixture can be maintained. Echelon paving may require a road closure permit if traffic cannot be maintained. During echelon paving successive pavers shall be within 60 m of the leading paver. The pavers shall follow one behind the other close enough that cooling of the longitudinal joints between the mats is minimized and in no case is less than 125°C. Adjacent mats must be completed to provide for exposed joint edges of maximum length of 100 m at the end of each day.

Longitudinal Joints with temperatures less than 80°C must be tacked prior to placement of the successive mat. Adjacent mats must be completed to provide for exposed joint edges of maximum length of 100 m at the end of each day. When paving is conducted on multi-lane roads, the maximum length of permissible edge mat at the end of each day may be increased should the Engineer deem it safe to do so. The Contractor will not be permitted to leave exposed joints longer than 24 hours should conditions permit paving the following working day. Multi-lane roads are defined as roads with widths requiring more than two mat widths to traverse the full width of pavement.

Should any separation of the construction joint be present on or before 2 years after 100 percent completion of the project section, the Contractor will be required to undertake corrective action as outlined in Table 9, at their own cost, prior to the end of the current construction year:

Table 9 - Joint Rehabilitation under Warranty Period

Gap in Construction Joint	Required Corrective Action
3 - 20 mm	The affected joint must be cleaned, hot-air lanced, and filled with appropriate sealant
> 20 mm	Milled, tacked and replaced with equivalent HMA at a minimum width of 300 mm

PART 6 - QUALITY CONTROL and QUALITY ASSURANCE

6.1 General

All work and materials supplied under this specification are subject to close and systematic inspection by the Engineer, at any time throughout construction. The Engineer shall be afforded full access both at the Site and any production plant to determine whether the material being supplied is in accordance with this specification.

All materials supplied and works carried out under this specification shall be approved based on the results of QA testing and inspection by the Engineer.

Conversion of in-place pay volume (pay area times thickness) to unit tonnage for asphalt shall be at the rate of 2.3 tonnes per cubic metre.

6.2 Quality Control

The Contractor shall be responsible for carrying out all QC testing per their approved QMP. The Contractor shall conduct QC procedures, including sampling and testing, as is necessary to ensure that all hot mix aggregates, all PGAB and all HMA/WMA to be used in the work is according to the requirements of this specification.

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

All QC results shall be promptly communicated to the Engineer, no later than 24 hours after completion of testing.

6.3 Quality Assurance

Quality Assurance (QA) will be the responsibility of the Engineer. Acceptance of materials and work performed, and determination of payment adjustments will be based on QA testing. In addition to QA testing used to determine payment adjustments, the Engineer may, at its sole discretion, examine, inspect, or test any aspect of the

Contractor's work as deemed appropriate. Such inspections and testing shall not relieve the Contractor of their responsibilities for QC inspection and testing.

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

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

When the HMA fails to consistently meet the requirements of this specification, the Engineer may refuse further material until the mix properties are verified for compliance.

6.4 Sampling

.1 Samples of asphalt cement, aggregate, asphalt loose mix and cores shall be taken by the Contractor in the presence of the Engineer. Sample locations and timing will be determined by the Engineer. All core samples to be taken from the roadway following paving shall be reviewed and approved by the Engineer prior to the coring taking place.

Core specimens shall not be sampled within 600 mm of longitudinal joints and edge of pavements, 10 m from transverse joints, or 1.5 m from ironworks. HRM reserves the right to request cores on patching and reinstatement for hardware adjustments and curb placement.

.2 The Contractor shall have representatives available on site to obtain loose mix within 30 minutes of being notified that a loose sample will be required and within two hours of being notified that core samples will be required. The Engineer is responsible for sample labelling, storage, and transportation to the QA testing laboratory.

.3 All sampling shall be done in triplicate, with one sample being for QA testing, one for QC testing, and the third sample being held for testing in case of appeals to the QA testing results. Samples to be held in case of disputes arising, will be labelled as appeal samples and stored by the Engineer.

.4 Sampling Frequency

For each mix type, a Lot is defined as a portion of the paving being considered for acceptance or unit price adjustment. The total quantity of plant produced asphalt will be categorized into Lots based on three Work Categories. Each

of the Work Categories is defined in Table 10, including the loose asphalt mix and core sampling required for each.

Table 10 - Work Categories for Sampling

Work Category	Typical Lot Definition	Loose Mix Samples	Core Sample
1	1000 tonnes	Lot to be divided into 3 approximately equal segments with 1 loose mix sample per segment	Lot to be divided into 5 approximately equal segments with 1 core per segment
2	One days production, and less than 1000 tonnes, and greater than 200 tonnes	Lot to be divided into 2 approximately equal segments with 1 loose mix sample per segment	Lot to be divided into 3 approximately equal segments with 1 core per segment
3	Less than 200 tonnes	1 loose mix sample	1 core

For Work Category 1 if it is the last time that the mix is produced and the criterion of 1,000 tonnes for a Lot cannot be met (i.e. less than 1,000 tonne of mix remain) then the following shall apply:

- If the remaining plant production is 500 tonne or less, it will be added to the previous lot. One additional loose sample will be obtained from the remaining plant production. The total new lot tonnage (i.e. greater than 1,000 tonnes) will be divided into 5 approximately equal segments, with one core sample being obtained per segment.
- If the remaining plant production is greater than 500 tonne but less than 1,000 tonne, the remaining production will be categorized as a new Lot. The Lot will be divided into two approximately equal segments and one loose sample will be obtained per segment. For coring, the lot will be divided into 3 approximately equal segments, and one core sample being obtained per segment.

For Work Category 3 core sampling will be at the discretion of the Engineer based on project and site conditions.

For Work Category 3 sampling and testing may be waived at the discretion of the Engineer based on project and site conditions.

In all cases, additional number and frequency of testing may be determined by the Engineer.

Sample locations will be selected on a stratified random basis. A stratified random sample is defined as a representative sample taken in an unbiased manner, by dividing a Lot into approximately equal segments. A random sample is taken from each area or segment.

Reinstatement of the sample core holes shall be the responsibility of the Contractor. Compaction requirements for filling all sample core holes shall be the same as the adjacent undisturbed pavement. All sample core holes shall be cleaned, dried, and filled and then compacted using a Marshall Hand Compaction Hammer, a mechanical, self-powered gas, electric, or air powered compactor immediately after sampling.

Regardless of the Work Category, the Engineer reserves the right to collect and test a minimum of one sample of virgin PGAB from the plant for each asphalt mix type. The Engineer will advise the Contractor when a PGAB sample is required. The sample will be obtained by the Contractor in the presence of the Engineer.

6.5 Asphalt Mix Properties Properties and Compaction

.1 Acceptance for all mix properties and compaction shall be based on Quality Assurance results for each attribute.

.2 The Engineer shall determine if a rejectable Lot may remain in the work without repairs. When the Engineer 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 Engineer. If repair of the lot is chosen in lieu of a payment adjustment or if the Engineer determines that a rejectable lot requires repair, the lot shall be repaired at the Contractor’s expense.

.3 Appeals of the QA testing results shall be sent in writing to the Engineer within five (5) business days of receiving test results. The results of all appeals testing, and the payment adjustment calculated from such testing will be binding. Should the payment adjustment remain the same or increase, based on the new results, the Contractor will be responsible for the cost of the additional testing. Should the payment adjustment be eliminated or be reduced based on the results of appeals testing, the cost of the appeal testing will be borne by HRM.

.4 Loose mix samples shall not be taken from the first or last loads of the day. On projects where less than 200 tonnes of

asphalt is placed, payment adjustments shall not apply, however criteria will be reviewed for acceptance/rejection.

.5 Unit Price Adjustments will be applied to each Lot as per the formula below. The Price Adjustment for compacted density will be applied independently of Price Adjustments determined for mixture properties. The Unit Price Adjustment for mixture properties will be the largest negative Unit Price Adjustment of the following: Air Void Content, Voids in Mineral Aggregate (VMA) or the mixture constituents (475mm, 0.075mm sieve, AC content).

$$\mathbf{PA_{LOT} = PA_{DEN} + PA_{MIX}}$$

Where:
PA_{MIX} = the largest applicable negative PAs as follows:

1. PA_{AV}; or
2. PA_{VMA}; or
3. $PA_{GRAD} + PA_{ABC}$; or
4. If $PA_{AV} + PA_{GRAD} + PA_{ABC} = 0$, and $PAM_{VA} > 0$, then PA_{VMA} is applied.

.6 Price Adjustment for Density (PA_{DEN})

Table – 11 PA_{DEN}	
% of Maximum Theoretical Density	**Price Adjustment ($ per Tonne)**
≥93.0	$ 1.50
92.5-92.9	$ 0
92.4	- $ 1.00
92.3	- $ 1.20
92.2	- $ 1.40
92.1	- $ 1.60
92.0	- $ 1.70
91.9	- $ 2.10
91.8	- $ 2.40
91.7	- $ 2.80
91.6	- $ 3.10
91.5	- $ 3.50
91.4	- $ 4.20
91.3	- $ 4.90
91.2	- $ 5.60
91.1	- $ 6.30
91	- $ 7.00
90.9	- $ 7.70
90.8	- $ 8.40
90.7	- $ 9.10
90.6	- $ 9.80
90.5	- $ 10.50
90.4	- $ 11.40
90.3	- $ 12.20
90.2	- $ 14.00
90.1	- $ 15.70
90	- $ 17.50
<90	Reject

(1) All projects shall have payment based on the price adjustment determined by the mean density of the lot.
(2) $1.50 per metric tonne bonus will be extended should the average of all cores in the project area of consideration meet or exceed 93.0% with no individual core below 92.0%.
(3) Lots with any individual core below 89.5% will be rejected.
(4) Additional cores will be taken by HRM to delineate poorly compacted area(s) to be removed, irrespective to percentage of cores applicable.

.7 Price Adjustment for Voids (PA_{AV})

Table 12 - PA_{AV}	
Mean of the Deviations of Actual Air Void Content from the Target (3.5%)	**Price Adjustment For Asphalt Air Void Content ($ per Tonne)**
0.00 to 1.00	0
1.01 to 1.10	-0.5
1.11 to 1.20	-1
1.21 to 1.30	-2
1.31 to 1.40	-4
1.41 to 1.50	-6
1.51 to 1.60	-8
1.61 to 1.70	-10
1.71 to 1.80	-12
1.81 to 1.90	-14
1.91 to 2.00	-16
> 2.00	Reject

.8 Price Adjustment for Voids in Mineral Aggregate (PA_{VMA})

Table 13 - PA_{VMA}	
Average Deviation of Actual VMA Content from the Mix Type Specified Value	**Price Adjustment For VMA Content ($ per Tonne)**
- 0.50 to ≥1.00	0
-0.51 to -0.60	-0.5
-0.61 to -0.70	-0.60
-0.71 to -0.80	-0.70
-0.81 to -0.90	-0.80
-0.91 to -1.00	-0.90
-1.01 to -1.10	-1.00
-1.11 to -1.20	-2.00
-1.21 to -1.30	-3.00
-1.31 to -1.40	-4.00
-1.41 to -1.50	-5.00
>-1.51	Reject

.9 Price Adjustment for Gradation (PA_{GRAD})

Table 14 - PA_{GRAD}

Sieve Size (µm)	Mean of the Deviations of the Gradation from the JMF			Price Adjustment for Gradation
	A-HF, B-HF	C-HF	D-HF, E-HF	$ per Tonne
4,750	0.00 to 6.00	0.00 to 5.00	0.00 to 5.00	0.0
	6.01 to 6.20	5.01 to 5.20	5.01 to 5.20	-0.5
	6.21 to 6.40	5.21 to 5.40	5.21 to 5.40	-1.0
	6.41 to 6.60	5.41 to 5.60	5.41 to 5.60	-1.5
	6.61 to 6.80	5.61 to 5.80	5.61 to 5.80	-2.0
	6.81 to 7.00	5.81 to 6.00	5.81 to 6.00	-2.5
	7.01 to 7.20	6.01 to 6.20	6.01 to 6.20	-3.0
	7.21 to 7.40	6.21 to 6.40	6.21 to 6.40	-3.5
	7.41 to 7.60	6.41 to 6.60	6.41 to 6.60	-4.0
	7.61 to 7.80	6.61 to 6.80	6.61 to 6.80	-4.5
	7.81 to 8.00	6.81 to 7.00	6.81 to 7.00	-5.0
	8.01 to 9.00	7.01 to 8.00	7.01 to 8.00	-10
	9.01 to 10.00	8.01 to 9.00	8.01 to 9.00	-15
	>10.00	>9.00	>9.00	Reject
75	0.0 to 0.80	0.0 to 0.50	0.0 to 0.50	0.0
	0.81 to 0.90	0.51 to 0.60	0.51 to 0.60	-1.0
	0.91 to 1.00	0.61 to 0.70	0.61 to 0.70	-2.0
	1.01 to 1.10	0.71 to 0.80	0.71 to 0.80	-3.0
	1.11 to 1.20	0.81 to 0.90	0.81 to 0.90	-5.0
	1.21 to 1.30	0.91 to 1.00	0.91 to 1.00	-7.5
	1.31 to 1.50	1.01 to 1.20	1.01 to 1.20	-12.0
	>1.50	>1.20	>1.20	Reject

In addition to the acceptance/rejection requirements for gradation, the following shall apply:

a) The Lot will be rejected if the average of the Lot test results for the 4,750µm sieve size falls outside the gradation limits specified in Table 3.

b) The Lot payment will be reduced by $5.00 per tonne if the average of the Lot test results for the 75µm sieve size exceeds, up to the maximum of 1.0%, the upper gradation limit specified in Table 3.

c) The Lot will be rejected if the average of the Lot test results for the 75µm sieve size exceeds, by more than 1.0%, the upper gradation limit specified in Table 3.

.10 Price Adjustment for Asphalt Binder Content (PA_{ABC})

Table 15 - PA_{ABC}

Mean of the Deviations of Actual Asphalt Binder Content from JMF		Price Adjustment for Asphalt Binder Content ($ per Tonne)
A-HF, B-HF	0.00 to 0.40	0.00
	0.41 to 0.45	-1.00
	0.46 to 0.50	-2.00
	0.51 to 0.55	-3.00
	0.56 to 0.60	-4.00
	0.61 to 0.65	-5.00
	> 0.66	Reject
C-HF, D-HF, E-HF	0.00 to 0.30	0.00
	0.31 to 0.35	-1.25
	0.36 to 0.40	-2.50
	0.41 to 0.45	-3.75
	0.46 to 0.50	-5.00
	> 0.51	Reject

6.6 Thickness

.1 For new construction as well as paving atop a milled surface, the average compacted thickness of the hot mix asphalt mat shall be within 5 mm with all core results within 10 mm of the thickness as specified by the contract documents or by the Engineer.

.2 For all mix types and layer thicknesses, the lift thickness for a Lot shall be calculated as the average of the lift thicknesses measured for each sample obtained from that Lot.

3. The calculated Price Adjustment for Thickness (PA_T) using Table 15. Based on the thickness test results determined by the Engineer's testing agency, the following unit price adjustment table will be applied:

Table 16 - PA_T[10][11]	
Scenario of Core Results	**Price Adjustment / square metre**
1) Average Core Results greater than total specified thickness	+$0.50 / mm)[12]
2) Average Core Results deficient more than 5 mm relative to the total specified thickness	-$1.00 / mm)[13]
3) For each individual Core Result deficient more than 10 mm relative to the total specified thickness	(-$1.50 / mm[14]) / (total # of core samples taken on project)

[10] Items 1 & 2 will not apply on projects in which hot mix asphalt payment is on a per mass (metric tonne) basis.

[11] Table will be applied in numerical order. When item 2 applies, item 3 will not be applied on the same project. Items 1 and 3 will each be applied on a project if applicable.

[12] Applied to a maximum of 5 mm or $2.50 / m² unit price adjustment. No price adjustment will be applied if any compaction penalty applies.

[13] Thickness deviation will be difference between average and specified thickness.

[14] Thickness deviation on individual core results is as follows:

[(Specified Thickness - 10 mm tolerance) - Actual Thickness]

.4 Should the Contractor wish to appeal the thickness results obtained from QA testing, the Engineer shall be notified of the dispute in writing within 5 business days of receiving the QA test results. Duplicate cores taken at the time of sampling for QA testing shall be measured for thickness in the case of dispute. The results from the measurement of these duplicate cores and the associated payment adjustment shall be binding. Should the price adjustment for thickness remain the same or increase, the Contractor will be responsible for the cost of the appeal testing. Should the price adjustment be eliminated or be reduced, the cost of the appeal testing will be borne by HRM.

6.7 Price Adjustment Phasing Price adjustments for mix properties and compaction will be phased in. Prices adjustments will be reduced by 50% for projects conducted between Jan 1, 2025 and Dec 31, 2025.

Reductions will not apply to price adjustments for thickness.

PART 7 - PRICE ESCALATION / DE-ESCALATION - PERFORMANCE GRADED ASPHALT BINDER (PGAB)

7.1 General

The Contractor may be assessed a price increase or decrease for asphalt concrete mix placed under the contract (not including off road asphalt work if the tonnage is less than 200 tonne), if the Monthly Asphalt Binder Rack Price (MABRP) for the PGAB specified differs by more than $10.00 per tonne of PGAB, from the month prior to the month in which this tender closes and the month(s) in which the asphaltic concrete placement is performed. The MABRP will be the weighted average posted rack price established for the month, based on the rack prices provided by each approved supplier. This information can be reviewed on the Nova Scotia Department of Public Works website at the end of each month: https://novascotia.ca/tran/trucking/rackprice.asp

Participation in the price escalation / de-escalation program for performance graded asphalt binder (PGAB) used in asphaltic concrete mix is mandatory.

The Engineer's assessment of a price increase/decrease will be based on the difference between the posted weighted average MABRP for the month prior to the month in which the tender closes, and the weighted average MABRP for the month(s) in which the asphaltic concrete placement is performed.

Price differentials will only be applied for MABRP differences of $10.00 or more per tonne of PGAB. Corresponding amounts will be calculated based on the number of tonnes of asphalt concrete mix placed and accepted by the Engineer multiplied by $0.50 per tonne of hot mix for each full $10.00 incremental difference in the posted MABRP.

Where the contract unit rate for asphaltic concrete is by the square metre, conversion to tonnes shall be calculated based on the measured surface area of asphalt placed multiplied by the average thickness determined from the cores multiplied by 2.3 tonnes per cubic metre.

Price adjustments due to the Contractor or amounts owing to HRM will be paid/recovered when all the asphaltic concrete placement is completed.

Asphaltic concrete associated with vertical deflections including, but not limited to speed humps and tables, will not be included or considered for escalation/de-escalation.

All efforts shall be taken to complete the work in a timely manner and price adjustments will not be applied for any time periods where liquidated damages are being charged.

Examples of price adjustment calculations follow:

Example #1

1. Project tender closed June 5
2. Paving work carried out in June and July (total of 5,000 tonnes of hot mix)
3. 3,000 tonnes of hot mix placed in June and 2,000 tonnes placed in July
4. MABRP for PG 58-28 posted for month of May is $598.71
5. MABRP for PG 58-28 posted for month of June is $593.33
6. MABRP for PG 58-28 posted for month of July is $741.93

Weighted average price (for months in which mix was placed)
((3,000 x $593.33) + (2,000 x $741.93)) / 5,000 = $652.77

Price Differential = $652.77 - $598.71 = $54.06 or 5 full increments of $10.00

Amount Owing to the Contractor = 5,000 tonnes x (5 x $0.50) = $12,500.00

Example #2

1. Project tender closed May 8
2. Paving work carried out in June and July (total of 5,000 tonnes of hot mix)
3. 3,000 tonnes of hot mix placed in June and 2,000 tonnes placed in July.
4. MABRP for PG 58-28 posted for month of April is $500.00
5. MABRP for PG 58-28 posted for month of May is $500.00
6. MABRP for PG 58-28 posted for month of June is $493.33
7. MABRP for PG 58-28 posted for month of July is $475.00

Weighted average price (for months in which mix was placed)
((3,000 x $493.33) + (2,000 x $475.00)) / 5,000 = $486.00

Price Differential = $486.00 - $500.00 = -$14.00 or 1 full increment of $10.00

Amount Recovered from the Contractor = 5,000 tonnes x (1 x $0.50) = $2,500.00

PART 8 - WARM MIX ASPHALT

8.1 General

The following WMA products or technologies are approved for use on HRM projects:

- Gencor Ultraform GX
- Astec Double Barrel Green Foaming
- Evotherm M1 and P25
- Cecabase RT Bio 10
- Advera WMA
- Zycotherm SP
- Green Mantra Ceranovus

The Contractor shall inform the Engineer of when WMA is used on HRM projects. The WMA must meet the Superpave mix properties

outlined in S-1 and shall provide the manufactures recommended compaction temperatures for Superpave compliance testing.

The Engineer shall be notified of every project containing WMA prior to paving.

In no case shall the temperature of the WMA exceed 165ºC. WMA shall have temperatures of at least 105ºC immediately prior to loading into the spreader hopper.

PART 9 – WARRANTY

9.1 General

The 2-year warranty shall begin upon substantial completion of the project. During this period any failure to the asphaltic concrete including but not limited to segregation, cracking, surface deformation, spalling, delamination, debonding, and joint failure shall be repaired and/or reconstructed at the contractor's expense to the satisfaction of the Engineer. The cost of materials, hauling, labour and all other related work including traffic control required for repair and/or reconstruction of unacceptable areas shall be borne by the contractor.

Regarding lane width requirements for remediation, the minimum repair shall include replacement of the affected lifts of asphaltic concrete by cold planing to the center joint, all repairs shall be full lane width. If echelon paving was specified or used during the original paving, the repair patch shall be the full width that was paved in echelon. If the deficiency continues below the surface lift of asphaltic concrete, then both lifts shall be removed and reconstructed as necessary.

PART 10 – MEASUREMENT FOR PAYMENT

10.1 General

Payment for all works carried out in accordance with this specification will be paid for per the payment items detailed in Section 01 22 00 Measurement and Payment, of the Contract.

****** END OF SECTION S-1 ******

Section S-1 Appendix A – Asphalt Mix Type and Usage

The following recommendations may be used by designers to determine suitable asphalt mix types for different applications and lift thicknesses for selected mix types.

Asphalt Mix Type	Typical Mix Application
A-HF	Nominal maximum aggregate size for the mix is 25.0 mm. The mix would be suitable for a lower binder/base course. A layer of B-HF would typically be placed on top, followed by a surface course of C-HF or D-HF. Typical layer thicknesses range from 100 mm to 60 mm.
B-HF	Nominal maximum aggregate size for the mix is 19.0 mm. The mix would be suitable for a binder/base course. A layer of surface course of C-HF or D-HF asphalt mix would be placed on top. Typical layer thickness would range from 50 mm to 90 mm.
C-HF	Nominal maximum aggregate size for the mix is 12.5 mm. The mix would be suitable for a surface course. Typical layer thickness would range from 40 mm to 60 mm.
D-HF	Nominal maximum aggregate size for the mix is 9.5 mm. The mix would be suitable for a surface course. Typical layer thickness would range from 30 mm to 50 mm.
E-HF	Nominal maximum aggregate size for the mix is 4.75 mm. The mix would be suitable for a thin overlay as a preservation treatment. Typical layer thickness would range from 20 mm to 40 mm.

Section S-1 Appendix B – Traffic Category Typical Applications

The following table provides the typical applications for the different traffic categories.

Traffic Category	Equivalent Single Axle Loads	Typical Application
A	0.3 to 3 Million	Parking lots, local road, and minor collectors
B	3 to 10 Million	Major collectors and minor arterials
C	> 10 Million	Major arterials, highways, and bus routes