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6.1 SECTION 1 – SUPPLY OF ASPHALT CEMENT AND/OR ASPHALT EMULSION**6.1.1** DESCRIPTION

This work consists of supplying asphalt materials including ordering, scheduling, delivering, supplying storage facilities, handling, storing, sampling, testing and other related work.

For this specification, "Asphalt Cement and/or Emulsion Supplier" shall mean the party awarded an order by the Contractor for the supply of asphalt cement and/or emulsion.

6.1.2 MATERIALS**6.1.2.1** **General**

The Contractor shall supply the types and grades of asphalt cement and/or emulsion specified in the Contract.

All asphalt cements and/or emulsion shall be prepared from petroleum oils and shall be free from impurities. Emulsifiers used to stabilize asphalt emulsions shall not be harmful to the performance of the asphalt in service.

The Contractor shall ensure that the asphalt cement and/or emulsion supplied meets all requirements for the types and grades specified. The Contractor may be required to use more than 1 type or grade of asphalt cement and/or emulsion for a particular purpose. Any change in asphalt cement and/or type or grade must be approved by the Engineer.

The Engineer reserves the right to discontinue the use of any asphalt product that fails to handle or perform to expectation or satisfaction, regardless of its compliance with the specifications.

6.1.2.2 **Delivery, Handling and Storage**

The Contractor shall supply the Engineer with the Asphalt Suppliers' weight certificates and records of all asphalt received and/or returned, on a daily basis.

The Contractor shall provide, maintain and reclaim asphalt storage facilities.

The Contractor must receive approval from the applicable Land Use Authority of the storage location of their asphalt materials, prior to the set-up of storage facilities.

Storage facilities for asphalt cement shall be capable of heating the material under effective and positive control at all times and shall contain provisions for measuring and sampling.

No asphalt cement and/or emulsion type or grade shall be diluted or mixed with a different type or grade of asphalt, or with any other material, without the specific prior approval of the Engineer.

The Contractor shall prevent contamination of the asphalt cement and/or emulsion, by asphalt cement and/or emulsion of another type or grade, by solvent, or by any other material. Asphalt cement and/or emulsion storage tanks shall be emptied of one type or grade of asphalt cement and/or emulsion and cleaned as necessary to prevent detrimental contamination of the asphalt cement and/or emulsion, before placing another type or grade of asphalt cement and/or emulsion therein. Asphalt emulsions shall be protected from freezing.

6.1.3 TESTING AND SAMPLING**6.1.3.1** **Quality Control and Quality Control Testing**

Quality control and quality control testing are the responsibility of the Contractor.

Tests performed by the Department will not be considered to be quality control tests.

The Contractor shall retain and utilize either Professional Engineering Services provided by an engineering consulting company registered by NAPEG, or a qualified Asphalt Suppliers' laboratory or other certified laboratory, to carry out all quality control and quality control testing.

The Contractor shall not retain or utilize the engineering consulting company or personnel retained by the Department with respect to the Contract, for any work on or associated with the Contract.

6.1.3.2 Quality Assurance Sampling and Testing

The Contractor shall obtain representative, uncontaminated samples of all asphalt products delivered to the project for quality assurance testing, in accordance with the latest edition of AASHTO T 40, Sampling Bituminous Materials.

The Contractor shall ensure that all asphalt delivery vehicle tanks are equipped with sampling valves maintained in good operating condition which are designed and located to enable the safe and representative sampling of asphalt into 1 L containers. Where pressure distributors are utilized for the application of asphalt subsequent to delivery to the project, quality assurance samples shall be obtained from the pressure distributor.

The Contractor shall deliver all quality assurance samples to the Engineer on the day they are sampled, at the following minimum frequencies, and the Engineer will test the quality assurance samples and accept or reject the asphalt material based on the results of the tests:

Product	Minimum Frequency for Each Asphalt Type and Grade
1) Asphalt Cement for Asphalt Concrete Pavement	1 per day
2) Asphalt Emulsion for Prime, Tack and Fog Coats	1 per each 100 tonnes
3) Asphalt Emulsion for Asphaltic Surface Treatments and Seal coats	1 per day

The Engineer may require increases in the minimum frequencies specified for quality assurance sampling and all asphalt shall be subject to inspection and sampling by the Department or its representatives.

6.1.3.3 Quality Acceptance

Within this specification, certain requirements, limits and tolerances are specified regarding the quality of materials to be supplied. Compliance with these requirements, limits and tolerances shall be measured and the materials accepted or rejected based on the Department's quality assurance test results.

Asphalt products supplied and incorporated into the work will be considered for acceptance provided the specified quality assurance samples have been submitted to the Engineer within the time frame specified and where both the work and the asphalt product meet the specifications.

Should the Contractor fail to supply the required quality assurance samples, or the asphalt material fails to meet the specifications, the Engineer reserves the right to deduct the value of the corresponding quantity of asphalt, as estimated by the Engineer, from payment to the Contractor. If the asphalt material fails to meet the specifications, the Engineer reserves the right to reject the corresponding quantity of asphalt, and the Contractor shall remove and replace the rejected material at their own expense.

The Engineer is under no obligation to provide the Contractor with test results and this testing shall in no way

relieve the Contractor of their responsibility to supply asphalt materials that meet the specifications in all respects.

The materials testing laboratory, provided by the engineering consulting company utilized by the Department to carry out quality assurance testing, will not be located at the project site. Quality assurance test results will therefore not be completed for approximately 10 days from the date of receipt of the quality assurance samples from the Contractor.

6.1.4 MEASUREMENT AND PAYMENT

- a) Unless otherwise specified, the Supply and/or Application of accepted Asphalt will not be paid for separately. The cost of this work will be considered included in the unit price of the Contract item for which the asphalt material is used.
- b) If the Contract calls for the Supply of Asphalt, then measurement will be made in tonnes for the quantity of asphalt material acceptably supplied.
Measurement for payment for the Supply of Asphalt will be by the tonne for the net weight as indicated on the refinery weight certificate or as verified by the Engineer, whichever is applicable, acceptably supplied. The net weight certificate from the refinery shall include the density and temperature of the supplied asphalt.
The final measurement for payment will be adjusted after reconciliation with actual quantities required on the project.
- c) If the Contract calls for the Supply and Application of Asphalt, then measurement will be made in square-metres for the quantity of asphalt material acceptably supplied and applied.
The final measurement for payment for the Supply and Application of Asphalt will be reconciled with the net weight as indicated on the refinery weight certificate or as verified by the Engineer, whichever is applicable, for the quantity of asphalt material acceptably supplied and applied.
- d) The Engineer reserves the right to check quantities of asphalt delivered to and/or applied on the project by weighing the delivery vehicles before and after unloading at the asphalt storage facility and/or by weighing the application vehicles before and after application.
- e) If the Contract does not require the installation of a weigh scale for weighing materials, the Engineer will determine quantities by measuring the liquid level in each tank truck or storage tank, as required. When asphalt quantities are determined by this method, the Contractor shall calibrate the distributor trucks and storage tanks. The measurement of liquid level in the storage tank or trucks shall be by means of pre mounted meters that are capable of showing accurate temperature measurements at mid volume or mass, and not the edge.
- f) If there is a variance between the quantities measured by the Engineer and the Asphalt Suppliers' weight certificates, the Engineer will determine the quantity on which payment will be based.
- g) No payment will be made for asphalt materials delivered to the project that exceed the actual quantities required, unless otherwise required by the Engineer.
- h) Payment for Supply of Asphalt at the applicable contract unit price shall be compensation in full for the ordering, purchasing, scheduling, delivering, supplying, storage facilities, handling, storing, sampling, heating, application, quality control and quality control testing and the supply of all equipment, labour, materials, tools and incidentals necessary to complete the work in accordance with the specifications.
- i) The applicable unit price shall include all work required to comply with the provisions of the Territorial Lands Act.

6.1.5 SPECIFICATIONS FOR ANIONIC EMULSIFIED ASPHALTS

Anionic emulsified asphalts shall conform to the requirements specified in the following table, in accordance with the latest edition of the following test methods, for the grade designated by the Engineer.

Requirements	Type	Rapid Setting						Medium Setting				Slow Setting						Test Method
	Grade	RS-1		RS-2		RS-1HH		MS-1		MS-2		SS-1		SS-1H		SS-1HH		
		Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	
Tests on Emulsion																		
Viscosity, Saybolt Furol Seconds: at 25°C at 50°C	20	100	--	--	20	60	20	60	--	--	20	60	20	60	20	60	20	ASTM D 244 and D 88
	--	--	75	300	--	--	--	--	35	400	--	--	--	--	--	--	--	
Residue by Distillation, % by Mass	55	--	60	--	55	--	55	--	65	--	55	--	55	--	55	--	ASTM D 244	
Settlement, %, 5 Days	--	3	--	3	--	5	--	3	--	3	--	5	--	5	--	5	ASTM D6930	
7 Days	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--		
Demulsibility, % 35 ml, 0.02 N CaCl2	60	--	60	--	60	--	--	--	--	--	--	--	--	--	--	--	ASTM D 244	
50 ml, 0.1 N CaCl2	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--		
Oil Portion of Distillate, % by Volume/Mass	--	--	--	--	--	1	--	--	--	10	--	--	--	--	--	1	ASTM D 244	
Sieve Text, % by Mass	--	0.1	--	0.1	--	0.1	--	0.1	--	0.1	--	0.1	--	0.1	--	0.1	ASTM D 244	
Cement Mixing Test, % by Mass	--	--	--	--	--	--	--	--	--	--	--	2.0	--	2.0	--	--	ASTM D 244	
Particle Charge	NEGATIVE OR NEUTRAL																	ASTM D 244
Coating Ability and Water Resistance, %, Note 1	--	--	--	--	--	--	--	80	--	80	--	80	--	80	--	--	--	ASTM D 244
Tests on Residue																		
Penetration (at 25°C, 100 g, 5 s), 0.1 mm	100	200	100	200	20	55	100	200	100	250	100	200	40	100	20	55	ASTM D5	
Ductility (at 25°C, 5 cm/min), cm	60	--	60	--	40	--	40	--	40	--	40	--	40	--	40	--	ASTM D 113	

6.1.6 SPECIFICATIONS FOR CATIONIC EMULSIFIED ASPHALTS

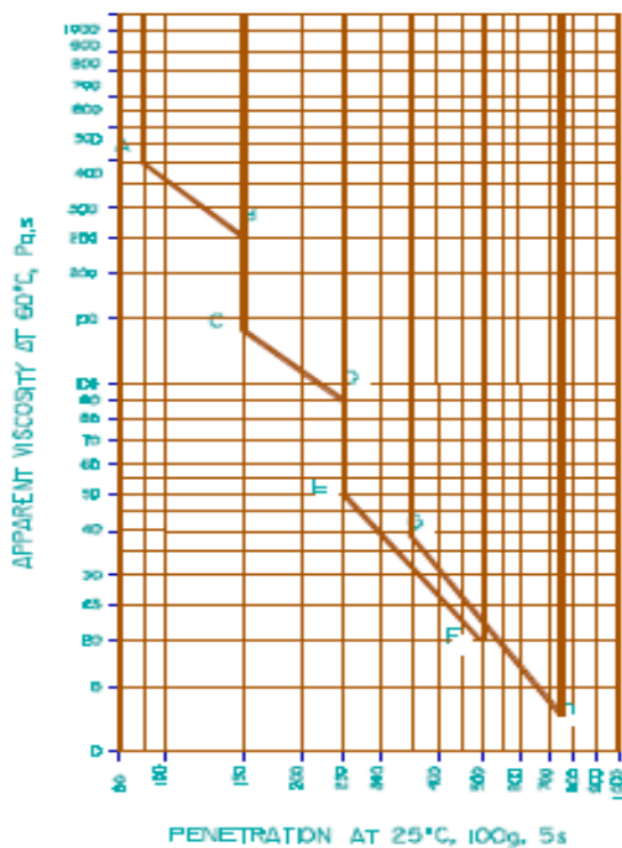
Cationic emulsified asphalts shall conform to the requirements specified in the following table, in accordance with the latest edition of the following test methods, for the grade designated by the Engineer.

Requirements	Type	Rapid Setting						Medium Setting				Slow Setting						Slurry Seal		Test Method
	Grade	CRS-1		CRS-2		CRS-1HH		CMS-2		CMS-2H		CSS-1		CSS-1H		CSS-1HH		CSS-H		
		Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	
Tests on Emulsion																				
Viscosity, Saybolt Furol Seconds: at 25°C at 50°C		-- 50	-- 150	-- 100	-- 400	20 --	60 --	-- 50	-- 400	-- 50	-- 400	20 --	100 --	20 --	100 --	20 --	60 --	20 --	100 --	ASTM D 244 and D 88
Residue by Distillation, % by Mass		62	--	67	--	55	--	65	--	65	--	57	--	57	--	55	--	57	--	ASTM D 244
Settlement, %, 5 Days		--	5	--	5	--	5	--	5	--	5	--	5	--	5	--	5	--	5	ASTM D6930
Demulsibility, % 35 ml 0.8% Dioctyl Sodium Sulfosuccinate Solution		40	--	40	--	40	--	--	--	--	--	--	--	--	--	--	--	--	--	ASTM D 244
Oil Portion of Distillate, % by Volume/Mass		--	3	--	3	--	1	--	10	--	10	--	5	--	5	--	1	--	--	ASTM D 244
Sieve Text, % by Mass		--	0.1	--	0.1	--	0.1	--	0.1	--	0.1	--	0.1	--	0.1	--	0.1	--	0.1	ASTM D 244
Cement Mixing Test, % by Mass		--	--	--	--	--	--	--	--	--	--	--	2.0	--	2.0	--	--	--	--	ASTM D 244
Particle Charge		POSITIVE																		ASTM D 244
Coating Ability and Water Resistance, % (Note 1)		--	--	--	--	--	--	80	--	80	--	80	--	80	--	--	--	--	--	ASTM D 244
Test on Residue																				
Penetration (at 25°C, 100 g, 5 s), 0.1 mm		100	250	100	250	20	55	100	250	40	125	100	250	40	125	20	55	40	125	ASTM D 5
Ductility (at 25°C, 5 cm/min), cm		60	--	60	--	40	--	60	--	40	--	60	--	40	--	40	--	40	--	ASTM D133

6.1.7 SPECIFICATION FOR HIGH FLOAT EMULSIFIED ASPHALT

High float emulsified asphalts shall conform to the requirements specified in the following table, in accordance with the latest edition of the following test methods, for the grade designated by the Engineer.

Test on Emulsion	HF-150S/HF-150P		HF-250S		HF-350S		Test Method
	Min	Max	Min	Max	Min	Max	
Viscosity, Saybolt Furol Second at 50°C	30	150	35	150	75	400	ASTM D244
Residue by Distillation, % by mass	62	-	62	-	65	-	CAN 2-16.5-M84 Section 6.2.1
Demulsibility, % 50 ml 0.10 N CaCl2	75	-	-	-	-	-	ASTM D244
Oil Proportion of Distillate, % by Volume/Mass	0.5	4	1	6	1.5	6	ASTM D244
Sieve Test, % by Mass	-	0.10	-	0.10	-	0.10	ASTM D244
Coating Test	Note 1		Note 1		Note 2		ASTM D6988
Storage Stability 24h, % by Mass	-	1.5	-	1.5	-	1.5	ASTM D6930
Test on Residue	HF150S		HF250S		HF350S		Test Method
	Min	Max	Min	Max	Min	Max	
Penetration (at 25°C, 100 g, 5 s, 0.1 mm)	150	250	250	500	350	750	CAN 2-16.5-M84 Section 6.2.4
Solubility in Trichloroethylene, % by Mass	-	97.5	-	97.5	-	97.5	ASTM D2042
Float Test at 60 °C, s	-	1200	-	1200	-	1200	CAN 2-16.5-M84 Section 6.2.6
Apparent Viscosity (at 60 °C), Pa·s	Requirements outlined in figure below.						CAN 2-16.5-M84 Section 6.2.5
Note 1: Follow ASTM D244, except that the mixture of limestone and emulsified asphalt shall be capable of being mixed vigorously for five min., at the end of which period the stone shall be thoroughly and uniformly coated. The mixture shall then be completely immersed in tap water and the water poured off. The stone shall then not be less than 90% coated. Note 2: Follow ASTM D244, except that the mixture of limestone and emulsified asphalt shall be mixed vigorously for five min., then allowed to stand for three hours after which the mixture shall be capable of being mixed an additional five min. The mixture shall then be rinsed twice with approximately its own volume of tap water, without showing appreciable loss of bituminous film. After the second mixing the aggregate shall be at least 90% coated.							



Viscosity shall be within the graphic regions above the line designated by specific letters, and between penetration limits contained in vertical lines extending upwards from these points.

Viscosity value shall be reported at $0.5s^{-1}$ for grades HF-100S and HF-150S and at $10s^{-1}$ for grades HF-250S and HF-350S.

Grade of HF Emulsified Asphalt	HF-100S	HF-150S	HF-250S	HF-350S
	A, B	C, D	E, F	G, H

FIGURE 1

Viscosity Requirements for Distillation Residues from High-Float Emulsified Asphalts

6.1.8 SPECIFICATION FOR ASPHALT CEMENTS

Asphalt cements used in asphalt concrete mixes shall conform to CAN/CGSB 16.3-M.

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6.2 SECTION 2 – ASPHALT CONCRETE PAVEMENT

6.2.1 DESCRIPTION

Asphalt concrete pavement shall consist of well graded crushed aggregate, filler material as required, and asphalt cement, combined in a hot mix plant as hereinafter specified, placed and completed on a prepared base in conformity with the lines, grades, dimensions and cross-sections as provided and as shown on the plans herein.

6.2.2 MATERIALS

6.2.2.1 **Asphalt**

- a) The Contractor shall be responsible for the supply and delivery of all necessary asphalt to the approved job site storage point. The Contractor shall be responsible for arranging delivery, and handling of asphalt product in accordance with the provision of "Asphalt", (Division 6, Section 1.).
- b) The Contractor shall not order asphalt heated above a temperature of 175°C for delivery to their plant site.
- c) Asphaltic materials supplied by the Contractor for the purpose of this contract shall not be fluxed with oil or any other fluxing agent.
- d) The asphalt cement grade to be used in asphaltic concrete pavement shall be as specified in the Special Provisions.

6.2.2.2 **Aggregates**

Hot Mix Paving Aggregate shall satisfy all requirements of Tables 1 and 2 of this specification and unless otherwise specified shall be:

- a) Crushed rock composed of hard, uncoated, cubical fragments, produced from rock formations or boulders of uniform quality.
or,
- b) Crushed gravel composed of hard, durable, uncoated particles, produced from naturally formed deposits.

Fine aggregates shall consist of natural sand and/or manufactured material derived from crushing stone, slag or gravel. All particles shall be clean, durable, moderately sharp and free from coatings of clay, silt or other deleterious materials and shall contain no organic matter.

6.2.2.3 **Physical Requirements**

- a) Physical requirements of aggregates shall be within limits shown on Table 2.
- b) Do not use aggregates having known polishing characteristics in mixtures for surface courses.
- c) Regardless of compliance with the physical requirements, aggregates may be accepted or rejected based on past field performance.

6.2.2.4 **Gradation**

- a) Gradation of aggregates blended to the job mix formula shall be within the limits shown in Table 1 when tested to ASTM C117 and ASTM C136 and giving a smooth curve without sharp breaks when plotted on semi-log grading chart.
- b) Coarse aggregate is aggregate retained on 5,000 µm sieve and fine aggregate is aggregate passing 5,000 µm sieve.
- c) When a dryer drum mixing plant is used, process aggregate through a 5,000 µm sieve and stockpile fine aggregate separately from coarse aggregate.

6.2.2.5 Mineral Filler

- a) Mineral filler shall be finely ground particles of limestone, hydrated lime, Portland cement or other approved non-plastic mineral matter, thoroughly dry and free from lumps.
- b) Add mineral filler when necessary to meet asphalt mix design properties or as directed to improve mix properties.
- c) Mineral filler shall be dry and free flowing when added to aggregate.

6.2.2.6 Blend Sand

- a) Shall be one or a blend of following:
 - i) Natural sand
 - ii) Manufactured sand
 - iii) Screenings produced in crushing of quarried rock, boulders or gravel.
- b) Add blend sand when necessary to meet the job mix aggregate gradation or as directed to improve mix properties.
- c) Blend sand shall be sufficiently dry to be free flowing when added to aggregate.

Table 1

CAN/CGSB-8.2-M Sieve Designation (μm)	Percent Passing Designated Sieve			
	Sand Mix	12.5 mm	16 mm	20 mm
20,000				100
16,000			100	
12,500	100	100		83 - 100
10,000	83 - 100		75 - 100	72 - 92
5,000	47 - 81	55 - 75	50 - 72	50 - 70
2,500	33 - 65			36 - 55
2,000		35 - 55	32 - 51	
1,250	24 - 51			27 - 42
630	17 - 41			18 - 30
400		12 - 30	15 - 27	
315	13 - 30			14 - 24
160	7 - 19	5 - 16		8 - 16
80	3 - 10	3 - 8	3 - 8	4 - 10

Table 2 – Physical Tests for Hot Mix Aggregate

Physical Test	Fine Aggregate	Coarse Aggregate	Notes
Los Angeles Abrasion ASTM C131 Gradation "B" Max % Loss	----	25	
Percent Crushed Minimum * (Minimum 2 freshly fractured faces)	----	85	
Sand Equivalent ASTM D2419 Minimum	35	----	
Magnesium Sulphate Soundness ASTM C88 Max % Loss	16	12	
Absorption ASTM C127 Max % by Mass	----	1.75	
Loss by Washing ASTM C117 Max % Passing Sieve	----	1.5	
Light Weight Particles (Specific Gravity less than 1.95) ASTM C123M Max % by Mass		1.5	For surface course only
Flat & Elongated Particles Ratio greater than 5:1 Max % by Mass	----	15	
Liquid Limit ASTM D4318 (minimum)	25	----	
Plasticity Index ASTM D4318 (maximum)	4	----	

* The percent of crushed material will be determined by examining the fraction retained on the 5,000 µm sieve and dividing the mass of the crushed particles by the total mass retained on the 5,000 µm sieve.

6.2.3 MIX DESIGN

- Job mix formula shall be provided by the Contractor.
- Design of mix shall employ Marshall method using 75 compaction blows on each face of test specimen.
- At least one week before commencing paving operations, the Contractor shall supply, for approval, a mix design based on the aggregate and asphalt materials as specified in this Section.
- The Contractor shall use professional engineering services and a qualified testing laboratory certified for Marshall mix design and approved by the Engineer. The asphalt mix design must be signed off by a qualified member of a professional engineering association or a registered member of an applied science technology association in Canada.
- Do not change job mix without prior approval of the Engineer. Should a change in a material source be proposed and approved, a new job mix formula shall be provided by the Contractor at no additional cost. The new job mix formula must be signed off by the individual who signed the original, or if that

individual is unavailable, someone with equal or better qualifications from the same company.

- f) The mix design shall meet the following specifications:

Marshall Method Mix Criteria	12.5 mm and 16.0 mm Mix		Sand and 20 mm Mix	
	Minimum	Maximum	Minimum	Maximum
Stability ASTM D6927 (kN @ 60°C)	8.0		6.7	
Flow ASTM D6927 (mm)	2	4	2	4
Air Voids ASTM D3203 (% Total Mix)	3.0	5.0	3.0	5.0
Film Thickness (µm)	7.0		7.0	
Voids in Mineral Aggregate (%)	See Asphalt Institute MS-2 Table 5.3	---	See Asphalt Institute MS-2 Table 5.3	---
Voids Filled with Asphalt (%)	68	75	65	75

Notes:

Percent voids in mineral aggregate to be calculated on the basis of the ASTM bulk specific gravity for the aggregate.

The portion of asphalt cement lost by absorption into the aggregate particles must be allowed for when calculating percent air voids.

Retained Stability is percentage of original stability retained after immersion in water at 60°C for 24 hours.

6.2.4 CONSTRUCTION

6.2.4.1 **Plant and Mixing Requirements**

- a) Batch and continuous mixing plants
 - i) To conform to ASTM D995
 - ii) Heat asphalt cement and aggregate to mixing temperature as per asphalt mix design. Do not heat asphalt cement above 160°C.
 - iii) Before mixing, dry aggregates to a moisture content not greater than 0.5% by mass or to a lesser moisture content if required to meet mix design requirements.
 - iv) Using current asphalt cement viscosity data at the plant and relative to the viscosity of asphalt being used, adjust the temperature of the completed mix at the plant and the paver after considering hauling and placing conditions.
 - v) Feed aggregates from individual stockpiles through separate bins to cold elevator feeders.
 - vi) Feed cold aggregates to plant in proportions that will ensure continuous operations.
 - vii) Immediately after drying, screen aggregates into hot storage bins in sizes to permit recombining into gradation meeting job mix requirements.
 - viii) Store hot screened aggregates in a manner to minimize segregation and temperature loss.

- ix) Maintain temperature of materials within + 5°C of the specified mix temperature during mixing.
- x) Mixing time:
 - In batch plants, adhere to both dry and wet mixing times as per asphalt mix design. Continue wet mixing as long as necessary to obtain a thoroughly blended mix but not less than 30 s or more than 45 s.
 - In continuous mixing plants, mixing time shall be as per asphalt mix design but not less than 45 s.
 - Do not alter mixing time unless directed by Engineer.
- b) Dryer drum mixing plant
 - i) Feed aggregates by means of a multi-bin cold feed unit and blend to meet job mix requirements by adjustments of variable speed feed belts and gates on each bin.
 - ii) Meter total flow of aggregate by an electronic weigh belt system with an indicator that can be monitored by plant operator and which is interlocked with asphalt pump so that proportions of aggregate and asphalt entering mixer remain constant.
 - iii) Provide for easy calibration of weighing systems for aggregates without having material enter mixer.
 - iv) Make provision for convenient sampling the full flow of materials from the cold feed.
 - v) Provide screens or other suitable devices to reject oversize particles or lumps of aggregate from cold feed prior to entering drum.
 - vi) Provide a system interlock which will stop all feed components if either asphalt or aggregate from any bin stops flowing.
 - vii) Accomplish heating and mixing of asphalt mix in a dryer-mixer approved by the Engineer. Control heating to prevent fracture of aggregate or excessive oxidation of asphalt. Equip system with automatic burner controls and provide for continuous temperature sensing of asphalt mixture at discharge, with a printing recorder that can be monitored by plant operator. Submit printed record of mix temperatures daily to the Engineer.
 - viii) Mixing period and temperature shall produce a uniform mixture in which particles are thoroughly coated, and moisture content of material as it leaves the mixer shall be less than 2%.
- c) Temporary Storage of Hot Mix
 - i) Provide mixture storage of sufficient capacity to permit continuous operation and designed to prevent segregation.
 - ii) Do not store asphalt mix in storage bins in excess of 3 hours.
- d) While producing asphalt mix for this project, do not produce mix for other projects unless approved by the Engineer.
- e) Mixing tolerances
 - i) Permissible variation in aggregate gradation from job mix (percent of total mass):

CAN/CGSB 8.2-M Sieve Designation (μm)	Variation %
5,000 sieve and larger	5.0
2,000 sieve	4.0
400 sieve	3.0
80 sieve	2.0

ii) The amount of asphalt cement designated for the job mix shall be maintained within the tolerance of 0.3 percentage points.

iii) The temperature of mixing asphaltic mixtures shall not vary from those specified in the job mix formula by more than +5°C.

6.2.4.2 Equipment

- a) Pavers: Mechanical, grade controlled, self-powered pavers capable of spreading mix within specified tolerances, true to line, grade and crown indicated.
- b) Rollers: Sufficient number of rollers of type and weight to obtain specified density of compacted mix.
- c) Haul trucks: Of adequate size, speed and condition to ensure orderly and continuous operation and as follows:
 - i) Boxes with tight metal bottoms and cleaned of all foreign materials.
 - ii) Covers of sufficient size and weight to completely cover and protect asphalt mix when truck is fully loaded.
 - iii) In cool weather or for long hauls, insulate entire contact area of each truck box.
 - iv) Trucks which cannot be weighed in a single operation on scales supplied will not be accepted.
- d) Hand tools:
 - i) Lutes or rakes with covered teeth during spreading and finishing operations.
 - ii) Straight edges, 4.5 m in length to test finished surface.
- e) Plant testing facility: Provide electric power and water for Engineer's laboratory trailer at plant site. The laboratory trailer will be supplied by the Engineer.

6.2.4.3 Preparation

- a) Level existing road surface to design grades and prepare shoulders.
- b) Apply tack coat in accordance with Division 6 Section 4 Bituminous Prime, Tack and Fog Coat, to edges of existing pavement, curbs, gutters, utility covers, and other structures which will abut the new asphaltic concrete, and allow to cure before paving.
- c) Prior to laying mix, clean surfaces of loose and foreign material.

6.2.4.4 Transportation of Mix

- a) Transport mix to job site in vehicles cleaned of foreign material.
- b) Paint or spray truck beds with light oil, limewater, soap or detergent solution, at least once a day or as required. Elevate truck bed and thoroughly drain. No excess solution will be permitted.
- c) Schedule delivery of material for placing in daylight, unless Engineer approves artificial light.
- d) Deliver material to paver at a uniform rate and in an amount within capacity of paving and compacting equipment.
- e) Deliver loads continuously in covered vehicles and immediately spread and compact. Deliver and place

mixes at a temperature within range as specified in the asphalt mix design, but not less than 135°C.

6.2.4.5 Material Transfer Vehicle (MTV)

- a) The Contractor has the option of using an MTV for the placement of all asphalt material.
- b) MTVs shall be self-propelled equipment capable of transferring asphalt material from the hauling equipment into the paver, and shall have the following characteristics:
 - i) Minimum storage capacity of 20 tonnes;
 - ii) A conveyor system to transfer asphalt material from the hauling equipment to the paver hopper insert and an auger system in the MTV or paddle mixers in the hopper insert to remix the asphalt mix prior to discharge from the hopper insert;
 - iii) MTV shall be a Roadtec Model SB-2500D or equivalent as approved by the Engineer.

6.2.4.6 Placing

- a) Place asphalt concrete in compacted lifts to thicknesses, grades and lines as indicated on the drawings, plans, or in the Contract documents, or as directed by the Engineer.
- b) Placing conditions:
 - i) Place asphalt mixture only when air temperature is above 5°C.
 - ii) When temperature of surface on which material is to be placed falls below 10°C, provide extra rollers as necessary to obtain required compaction before cooling.
 - iii) Do not place hot-mix asphalt when pools of standing water exist on surface to be paved, during rain, or when surface is damp.
 - iv) Use only skilled, well experienced paver operators to place asphalt concrete.
 - v) Spread and strike off mixture with self-propelled mechanical finisher.
 - Construct longitudinal joints and edges true to line markings. Establish line parallel to centreline of proposed pavement for paver to follow. Position and operate paver to follow established line closely.
 - When using pavers in echelon, have first paver follow marks or lines, and second paver follow edge of material placed by first paver. Work pavers as close together as possible and in no case permit them to be more than 30 m apart.
 - If segregation occurs, immediately suspend spreading operation until cause is determined and corrected as per 6.2.5.1 d) Pavement Segregation.
 - Correct irregularities in alignment left by paver by trimming directly behind machine.
 - Correct irregularities in surface of pavement course directly behind paver. Remove by shovel or lute excess material forming high spots. Fill and smooth indented areas with hot mix. Do not broadcast material over such areas.
 - Do not throw surplus materials on freshly screeded surfaces.
 - vi) When hand spreading is used
 - Distribute the material uniformly. Do not broadcast material.
 - During spreading operation, thoroughly loosen and uniformly distribute material by lutes or covered rakes. Reject material that has formed into lumps and does not break down readily.
 - Following placing and before rolling, check surface with templates and straight edges and correct irregularities.
 - Provide heating equipment to keep hand tools free from asphalt. Avoid high temperatures which may burn material. Do not use tools at a greater temperature than temperature of mix being placed.

6.2.4.7 Compacting

- a) Roll asphalt continuously to a density not less than 97% of 75 blow Marshall Density.
- b) General
 - i) Provide at least two rollers and as many additional rollers as necessary to achieve specified pavement density. When more than two rollers are required, one roller must be pneumatic tired type.
 - ii) Start rolling operations as soon as placed mixture can bear weight of roller without undue displacement of material or cracking of surface.
 - iii) Operate roller slowly initially to avoid displacement of material. For subsequent rolling, do not exceed 5 km/h for steel wheeled rollers and 8 km/h for pneumatic tired rollers.
 - iv) Overlap successive trips of roller by at least one half width of roller and vary trip lengths.
 - v) Keep wheels of roller slightly moistened with water to prevent pick-up of material but do not over-water.
 - vi) After longitudinal joints and edges have been compacted, start rolling longitudinally at low side and progress to high side.
 - vii) Where rolling causes displacement of material, loosen affected areas at once with lutes or shovels and restore to original grade of loose material before re-rolling.
 - viii) Do not permit heavy equipment or rollers to stand on finished surface before it has been compacted and has thoroughly cooled.
 - ix) When paving in echelon, leave unrolled 50 to 75 mm of edge which second paver is following and roll when joint between lanes is rolled.
 - x) Do not use rollers with vibrator operating when pavement is cooler than 100°C.
- c) Breakdown rolling
 - i) Commence breakdown rolling immediately following rolling of longitudinal joint and edges.
 - ii) Operate rollers as close to paver as necessary to obtain adequate density without causing undue displacement.
 - iii) Operate breakdown roller with drive roll or wheel nearest the finisher. Exceptions may be made when working on steep slopes or super-elevated sections.
 - iv) Use only experienced roller operators for this work.
- d) Second rolling
 - i) Use pneumatic-tired, steel wheel or vibratory rollers and follow breakdown rolling as closely as possible and while paving mix temperature allows maximum density from this operation.
 - ii) Rolling shall be continuous after initial rolling until mix placed has been thoroughly compacted.
- e) Finish rolling
 - i) Accomplish finish rolling with two-axle or three-axle tandem steel wheel rollers while material is still warm enough for removal of roller marks. If necessary, to obtain desired surface finish, the Engineer will specify use of pneumatic-tired rollers.
 - ii) Conduct rolling operations in close sequence.

6.2.4.8 Joints

- a) General:
 - i) Trim to vertical face to provide true surface and cross section against which new pavement may be laid. Remove loose particles.
 - ii) Overlap previously laid strip with spreader by 100 mm.
 - iii) Remove surplus material from surface of previously laid strip. Do not dispose on surface of

freshly laid strip.

b) Transverse joints:

- i) Prior to placing asphalt concrete, preheat joint face with an approved heater or apply a tack coat as directed by the Engineer.
- ii) Construct and thoroughly compact transverse joints to provide a smooth riding surface.
- iii) Stagger joint locations by a minimum of 2 m.
- iv) Offset transverse joint in succeeding lifts by at least 600 mm.
- v) For transverse end transitions to existing asphaltic pavement, create butt joint by milling a minimum depth of 40 mm of sufficient longitudinal distance to provide smooth transition profile approved by Engineer.
- vi) At the end of each completed portion and prior to opening that portion of pavement to traffic, sections of hot mix concrete course shall be ramped transversely for a minimum distance of 1.5 m. In all cases, the ramps shall not form part of the permanent asphalt pavement and shall be removed prior to continuing paving operations.

c) Longitudinal joints:

- i) Before rolling, carefully remove and discard coarse aggregate in material overlapping joint with a lute or rake.
 - ii) All longitudinal joints left exposed overnight or those that have been exposed to moisture shall receive an application of tack coat as directed by the Engineer.
 - iii) Roll longitudinal joints directly behind paving operation.
 - iv) When rolling, shift roller over onto freshly placed lane in order that not more than 150 mm of roll rides on edge of previously laid lane, then operate roller to pinch and press fines gradually across joint. Continue rolling until a thoroughly compacted neat joint is obtained.
 - v) Offset longitudinal joints in succeeding lifts by at least 150 mm.
- d) Construct feather joints so that thinner portion of joint contains fine graded material obtained by changed mix design or by raking out coarse aggregate in mix. Place and compact joint so that joint is smooth and without visible breaks in grade.

6.2.5 MEASUREMENT AND PAYMENT

“Lot” is a portion of the work being considered for acceptance and is defined as the following:

- a) One day’s plant production of more than four hours where approved changes to the following criteria have not occurred:
 - i) Mix design
 - ii) Pavement density specifications
 - iii) The project
- b) One day’s plant production of less than four hours will be dealt with at the discretion of the Engineer, as follows:
 - i) The material will be added to the previous day’s Lot if the criteria specified in 6.2.5 remains the same, or
 - ii) The material will be added to the next day’s Lot with the same criteria specified in 6.2.5, or
 - iii) If it is the last time the mix is produced with these criteria then the production will be designated as a Lot.
- c) If the Engineer identifies a portion of a Lot as substandard, the Engineer may order extra testing to define the area and severity of the deficiency. A new Lot will be designated for this portion if this extra testing indicates the mix is subject to Unit Price adjustment or rejection.

“Lot Mean and Range”: The Lot Mean is the arithmetic mean of a set of five or more test results constituting the sample for the Lot. The Range represents the difference between the highest and lowest values within a set of test results.

“Rejection Limit” is the Rejection Limit for Density and asphalt content, and is the limiting value of the Lot Mean beyond which a Lot is rejected and not paid for.

“Sublot” is a portion of a Lot that is one paver width wide and 100 m long on which the quality of surface finish and assessment of segregation and obvious defects are based.

6.2.5.1 Measurement of Payment

- a) Accepted Hot Mix Asphalt Concrete Paving for Overlays will be measured in tonnes of asphalt concrete actually incorporated into work, based on approved weigh scale tickets submitted as the asphalt concrete mix is delivered to the paving site.
- b) The Unit Price bid for Hot Mix Asphalt Concrete Paving for Overlays is subject to the Unit Price adjustments and assessments hereinafter specified and will be full compensation for mix design, production and supply of aggregates, supply of asphalt cement, production and transportation of asphalt concrete mix, preparation of road surface, placement and compaction of the mixture, finishing, cleanup and all other work, equipment, and materials incidental to complete the work as specified.
- c) Density price adjustment
 - i) The Engineer may use a nuclear densometer, core samples, or other methods to monitor pavement densities.
 - ii) Each density test using core samples will represent approximately 1,000 m² per constructed driving lane lift. Asphalt densities shall be not less than 97% of laboratory Marshall.
 - iii) Each density test using a nuclear densometer will represent approximately 100 m per paving lane, per lift. Asphalt densities shall be not less than 97% of laboratory Marshall density.
 - iv) If any density test indicates failure to achieve the specified density, two additional density tests within 1 m of the failed tests will be taken within the area in question, and the average density of the three tests will represent the area.
 - v) Density test locations will be determined by the Engineer using random methods.
 - vi) Density tests will not be taken on the shoulders where only one lift is placed or on small areas such as access roads. The Contractor shall establish a rolling pattern under supervision of the Engineer to achieve maximum compaction in these areas.
 - vii) If the densities for any particular lift are less than specified, the Contract Unit Price will be adjusted as follows:

Percentage of 75 blow Marshall Density	Percentage Reduction
97 and over	0
96.6 – 96.9	5
96.1 – 96.5	15
95.1 – 96.0	30
94.1 – 95.0	50
94 and lower	Replace

- viii) The Engineer reserves the right to reject density deficient pavement rather than apply a price

adjustment.

d) Pavement segregation

i) General

- The finished surface of the top lift of hot mix asphalt concrete pavement shall have a uniform texture and be free of segregated areas.

ii) Classifying pavement segregation

- A segregated area is defined as an area of the pavement where the texture differs visually from the texture of the surrounding pavement. For the purposes of classifying pavement segregation, only segregated areas greater than 0.1 m² and centre-of-paver streaks greater than 1 m long will be considered.
- Moderate or severe segregated areas which do not meet these size parameters will be considered obvious defects. Pavement segregation will be classified as follows:
 - "Slight": The matrix, asphalt cement and fine aggregate are in place between the coarse aggregate. However, there is more stone in comparison to the surrounding acceptable mix.
 - "Moderate": Significantly more stone than the surrounding mix; moderately segregated areas usually exhibit a lack of surrounding matrix.
 - "Severe": Appears as an area of very stony mix, stone against stone, with very little or no matrix.
 - "Centre-of-Paver Streak": Appears as a continuous or semi-continuous longitudinal "streak" typically located in the middle of the paver "mat".

iii) Inspections for pavement segregation

- Inspections by the Contractor
 - The Contractor shall perform a daily inspection of the paving operations on all lifts of pavement to identify any instances of pavement segregation. If segregation is evident, the Contractor shall take immediate corrective action to their operations to identify the cause and prevent any further occurrence of segregation.
- Inspections by the Engineer
 - Inspections during construction
 - The Engineer will inspect the pavement to identify any instances of pavement segregation. If segregation is evident, the Engineer will immediately notify the Contractor so that corrective action can be taken to prevent further occurrence of segregation.
 - Typically, each pavement Lot would be inspected as soon as possible after the Lot is placed. During the inspection(s), the Engineer will identify and record any areas of moderate and severe segregation and any areas of centre-of-paver streak. Areas requiring repair in accordance with 6.2.5.1 d) will be marked. The Engineer will provide the Contractor with a written assessment (location and severity) of the segregated areas as soon as possible following each inspection. The locations referenced in the Engineer's written assessment shall be only approximate.
 - Inspection following construction
 - The Engineer will conduct a second inspection of the top lift, normally one week after the substantial completion of paving work. During this inspection, the Engineer will identify and record any areas of slight, moderate and severe segregation and any areas of centre-of-paver streak which were not

identified in the inspections during construction. The Engineer will provide the Contractor with a written assessment (location and severity) of the segregated areas as soon as possible following this inspection.

iv) Repairing pavement segregation

- Pavement segregation, obvious defects, deteriorated repairs or failures identified during the inspection performed approximately one week after Substantial Performance of paving operations will require repair.
- Pavement segregation identified in the inspections performed during construction shall be repaired at the Contractor's expense and in accordance with the following:
 - Moderate and severe segregation in the top lift of pavement and on entrances and intersections shall require repair.
 - For entrances and the portion of intersections outside the through travel lanes and shoulders, areas of moderate and severe segregation shall be repaired in accordance with the methods of repair listed for moderate segregation. Intersections and entrances shall also be neatly shaped, smooth and free of surface defects and depressions.
- Slight segregation on any lift of pavement will not require repair.
- Moderate segregation on lower lifts will not require repair.
- Severe segregation on lower lifts will only require repair in instances where, in the opinion of the Engineer, the segregated area will affect the long term structural integrity of the pavement structure. Such repair will not be required in instances where the Engineer determines that the paver screed is "dragging" due to distortion of the existing surface.
- Only moderate and severely segregated centre-of-paver streak on the top lift of pavement will require repair.
- Methods of repair
 - Moderate Segregation - The Contractor has the option of using a slurry patch or a hot mix asphalt concrete patch.
 - Severe Segregation - The Contractor has the option of removal and replacement or overlay.
 - Any other methods of repair proposed by the Contractor will be subject to the approval of the Engineer.
 - The minimum repair area shall be such that the repair can be carried out using paver for a hot mix asphalt concrete patch and using machine application for a slurry patch.
- The Engineer will mark out the area of repair. The "marked area" will extend a minimum of 0.5 m beyond the segregated area. For centre-of-paver streak, the "marked area" will extend a minimum of 100 mm laterally and 0.5 m longitudinally beyond the streak.
- Cut the pavement so that all edges are vertical, the sides are parallel to the direction of traffic and the ends are skewed between 15 and 25 degrees. Coat edges with a tack coat conforming to Division 6, Section 4 Bituminous Prime, Tack and Fog Coat and allow to cure.
- Repairs for segregation using an overlay shall be for the entire pavement width. Repairs for segregation using removal and replacement shall be for the full lane width, full lane width and shoulder or the shoulder only as applicable, depending on the extent of the segregated area. The full depth of the asphalt lift shall be removed and replaced with new hot mix asphalt concrete pavement using an appropriate paver and cold milling

- equipment.
- Make all repairs regular in shape and finish using good workmanship practices to provide an appearance suitable to the Engineer. Keep traffic off all repairs for a sufficient period of time to ensure that tracking does not occur.
- Properly compact all hot mix asphalt concrete patching and other repairs for which compaction is normally required.
- In the event repairs cover existing roadway lines or markings, the Contractor shall reinstate the lines and markings at their expense and to the satisfaction of the Engineer.
- Repairs shall be completed during construction or shortly after construction, except when prevented by inclement weather or seasonal shutdown. In these cases, the Contractor shall complete the repairs prior to June 15 of the following year.
- v) Segregation payment holdback
 - Payment holdbacks of up to 25% of each progress payment may be withheld until the final product is accepted by the Engineer. If deficiencies are identified during the inspection approximately one week after Substantial Performance, the payment will be held until the deficiencies are repaired and meet specification requirements. If no deficiencies are identified during the inspection approximately one week after Substantial Performance, the payment will be released within two weeks of the inspection.
 - Payment holdbacks for pavement segregation will apply to deficiencies identified in the top and bottom lift of hot mix asphalt concrete pavement. Segregated areas, centre-of-paver streak and any repaired segregated areas identified by the Engineer either during construction or during the inspection conducted approximately one week after Substantial Performance of paving work, will be used to determine payment holdbacks.
- e) Payment for work that had been rejected, but was made acceptable
 - i) When defects have been remedied in Lots or Sublots which had been rejected, the work will no longer be considered deficient. Acceptable work will not delay the release of payment.
- f) Repair of failed areas in existing surfaces
 - i) Repair of failed areas in existing surfaces will be paid for at the Contract Unit Prices bid for the work.
- g) Finish surface quality tolerances
 - i) Finished asphalt surface will be inspected after final rolling at selected locations.
 - ii) Finished asphalt surface shall not have irregularities exceeding 5 mm when checked with a 4.5 m straight edge placed between any two contacts.
- h) Defective work
 - i) Correct irregularities which develop before completion of rolling by loosening surface mix and removing or adding material as required. If irregularities or defects remain after final compaction, remove surface course promptly and lay new material to form a true and even surface and compact immediately to specified density.
 - ii) Repair areas showing checking or hairline cracking.
 - iii) Asphalt pavement not meeting the specified density, thickness, segregation or finish surface quality tolerances may be required to be replaced or overlaid at the Contractor's expense.
- i) Cored areas
 - i) Fill all core holes with hot mix asphalt concrete material immediately after the core has been removed from the road surface. Compaction and finished surface quality are required to meet density specifications and surface quality specifications.

6.2.5.2 Quality Control and Quality Assurance

- a) The Contractor will be responsible for quality control.
- b) The Engineer will be responsible for quality assurance.
- c) Provide the Engineer with full access to production and storage sites at all times during production.
- d) Core samples taken by the Engineer will conform to ASTM D5361, and will be taken at locations determined by the Engineer using random access methods.
- e) Random samples will not be taken in areas of obvious defects as indicated in 6.2.5.1 Classifying Pavement Segregation. These areas will be marked and repaired in accordance with 6.2.5.1 Repairing Pavement Segregation.
- f) Core samples will not be taken closer than 300 mm to edges of pavement and longitudinal joints, nor closer than 5 m to transverse joints.
- g) Density, thickness, and percentage of asphalt cement will be based on core samples.

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6.3 SECTION 3 – ASPHALT STABILIZED BASE COURSE

6.3.1 GENERAL

6.3.1.1 **Description**

The asphalt stabilized base course shall consist of an intimate mixture of gravel and/or crushed stone, sand and asphalt, combined as hereinafter specified, and shall be placed, compacted and finished upon the previously prepared roadway, entrances and intersections, in accordance with the typical plans herein, in layers to the thickness, density, grade and cross-section specified.

6.3.2 MATERIALS

6.3.2.1 **Aggregate Materials**

Production and processing of crushed aggregate shall be carried out by the Contractor in accordance with the provisions of Division 5, Section 1, "Crushed Aggregate Production". Gradation of the aggregate produced shall meet the requirements for the Designation and Class as specified in the Special Provisions.

6.3.2.2 **Asphalt**

The Contractor shall be responsible for the scheduling, ordering, and receipt into storage, of asphalt products in accordance with the provisions of "Asphalt", (Division 6, Section 1).

6.3.3 EQUIPMENT

6.3.3.1 **Weigh Scales**

The Contractor shall at their own expense provide, install and maintain a scale approved by Weights and Measures, which shall be tested at the Contractor's expense as often as the Engineer may direct. The test certificates shall be exhibited to the Engineer as requested. The approved scale shall be of enough size and capacity such that the weighing of any vehicle can be carried out in a single operation with all wheels on the platform.

6.3.3.2 **Compaction Equipment**

The compacting unit of each pneumatic-tired roller used in base course compaction shall be not less than 1.5 m in width and shall weigh not less than 45 kg per linear centimetre of width. It shall be so constructed that the entire surface for the full width of the compacting unit shall be compacted at a single passage of the roller.

Each steel roller shall be an approved type of self-propelled smooth steel-tired roller weighing not less than eight tonnes and equipped with a satisfactory means of varying the weight when and as required by the Engineer.

Compaction equipment other than that specified above may be used upon the approval of the Engineer, providing such equipment will produce a completed stabilized base equal to that which would be produced by the means specified.

The Department reserves the right to order the discontinuance of the use of any equipment which, in the opinion of the Engineer, fails to produce satisfactory results.

6.3.4 CONSTRUCTION METHODS

6.3.4.1 **General**

Asphalt stabilized base course shall consist of a mixture of crushed gravel of the designation numbers and classes specified and as shown on the plans, and asphalt, constructed to a total compacted thickness as specified and, in a manner, as hereinafter detailed.

The material shall be laid in a single layer when the compacted thickness specified does not exceed 75 mm. When thicknesses in excess of 75 mm are specified, the material shall be laid and compacted in layers not exceeding 75 mm per layer.

Each layer shall be compacted to 100% of Standard Proctor density, at the required asphalt content and any ruts or irregularities formed in the surface of any layer during compaction shall be eliminated by blading during the rolling operations.

The Contractor may carry on the placing, spreading, compacting and shaping operations on sections of the roadway of convenient lengths, subject to the approval of the Engineer, but each layer must be thoroughly consolidated, finished and dried on a section before the succeeding layer is placed on that section.

The crushed gravel shall be windrowed uniformly upon the prepared base and mixed and dried by blading back and forth.

When the material has dried to a moisture content of 2% or lower, it shall be spread by blades, and light cut-back asphalt uniformly applied by an approved type of pressure distributor at a rate of from 4.3 to 7.1 L/m² as required by the Engineer.

The application of asphalt emulsion shall be performed only when the air temperature in the shade is not less than 5°C, and under general weather conditions acceptable to the Engineer. Care shall be taken to avoid rich or lean areas at the ends of each distributor run.

Mixing shall start immediately and shall continue until uniform colour is obtained and the cut-back has been released by thorough aeration of the material. The mixture shall then be brought to a single windrow and from there bladed out to required cross-section and uniform depth.

The surface shall then be rolled with pneumatic-tired rollers or such other equipment as approved by the Engineer in conjunction with light blading where necessary to maintain the required cross-section and grade until 100% of Standard Proctor density, as determined by the Engineer, is obtained.

Rolling shall be continued where necessary, until the asphalt layer is impervious to moisture penetration. Final rolling shall be done by an approved type of steel roller to obtain a smooth, finished surface.

In lieu of mixing the asphalt emulsion with the aggregate as specified above, the Contractor may employ such other procedures as approved by the Engineer.

The Department reserves the right to order the discontinuance of the use of any equipment or procedure which, in the opinion of the Engineer, fails to produce a satisfactory mixture.

Where the crushed gravel placed in any course becomes segregated during the work operations, the Contractor shall reblend the material in a manner to produce satisfactory grading such that the required density and resistance to moisture penetration will be obtained.

Loose material and other waste shall be bladed off the side slopes and uniformly spread over the ditch bottom in a manner satisfactory to the Engineer.

6.3.4.2 Bituminous Fog Coat

Following final rolling of the asphalt stabilized base course the finished surface shall be cleaned of loose

deleterious material by sweeping with a power broom supplemented by hand brooming, if necessary.

Upon the broomed surface of the asphalt stabilized base course, a bituminous fog coat shall be applied uniformly at the rate of 0.8 to 0.5 L/m² by means of an approved pressure distributor and at an application temperature between 10°C and 65°C as directed by the Engineer.

It shall be applied only after the finished surface has been approved by the Engineer and when the surface is dry or slightly damp and when the air temperature in the shade is not less than 5°C.

The bituminous fog coat shall be applied for the full width of the roadway between shoulders, or to such other width as may be specified by the Engineer and shall be MC-30 unless otherwise specified.

6.3.5 MEASUREMENT

The Contractor shall, at their own expense, provide, install, and maintain such approved scales and all suitable facilities as may be required to enable the Engineer to determine accurately the weight of gravel loaded in each vehicle.

Such scales shall be in acceptable condition and may be tested from time to time by Inspectors appointed by the Engineer. All testing shall be carried out at the Contractor's own expense.

- a) The Supply and Application of Bituminous Materials to be measured for payment shall be the number of tonnes of each Bituminous Material, acceptably utilized in the "Bituminous Prime Treatment", "Asphalt Stabilized Base Course", and "Bituminous Fog Coat", which has been acceptably placed on the road in accordance with these specifications.

The quantity of Asphalt Stabilized Base Course to be measured for payment shall be the number of tonnes of Base Course Gravel utilized in the Asphalt Stabilized Base Course mixture, acceptably placed on the road in accordance with these specifications.

No payment will be allowed for any material used to repair failures which may occur in the base course laid under this contract. Any expense incurred in the production, hauling and placement of such material shall be borne by the Contractor.

- b) The quantity of blending material required to meet the specified crushed aggregate gradation will be considered incidental to the gravel operation and will not be measured separately for payment.
- c) The quantity of Haul to be measured for payment shall be the number of tonne-kilometres of Base Course Gravel Haul for Asphalt Stabilized Base Course acceptably placed in accordance with these specifications.

6.3.6 BASIS OF PAYMENT

- a) Payment for Supply and Application of Bituminous Material for "Asphalt Stabilized Base Course" will be at the Contract unit price per tonne, measured as provided in Section 6.3.5.

The unit price will be compensation in full for all equipment, plants, labour, tools and incidentals necessary to complete the work in accordance with these specifications and shall include preparing the gravel on the road, heating, handling, hauling from the Contractor's storage to the work and spraying the asphalt emulsion, mixing and aerating the mixture.

The cost of spreading, shaping, and compacting the cured mix shall be considered as part of the

Contract unit price per tonne of "Asphalt Stabilized Base Course" in Section 6.3.6. The Contractor shall comply with the provisions of "Asphalt" (Division 6, Section 1).

- b) Payment for Asphalt Stabilized Base Course material will be at the Contract unit price per tonne of Base Course Gravel measured as provided in Section 6.3.5.

Payment will be compensation in full for all equipment, plants, labour, tools and incidentals necessary to complete the work in accordance with these specifications and shall include either:

- i) Loading from crushed stockpile, adding or eliminating sand, loading to trucks, or
- ii) Excavating, screening, crushing, adding or eliminating sand, loading to trucks, or
- iii) Loading to crusher from uncrushable stockpile, screening, crushing, adding, or eliminating sand, loading to trucks, or
- iv) Excavating, screening, crushing, adding or eliminating sand, hauling and loading to railway cars, unloading from railway cars at the specified points of delivery, or
- v) Loading from crushed stockpile, adding or eliminating sand, hauling and loading to railway cars, unloading from railway cars at the specified points of delivery, loading to trucks, and
- vi) Placing the material on the roadway, entrances and intersections, mixing, blading, shaping and compacting the material, maintaining traffic and constructing the surface complete.

Payment will only be made for the quantity of accepted base course gravel actually incorporated into the work and compacted to the density and thickness specified.

- c) Payment for Supply and Application of Bituminous Materials for "Bituminous Prime Treatment" and "Bituminous Tack Coat" will be at the Contract unit price per tonne measured as provided in Section 6.3.5.

The unit price will be compensation in full for preparing the surface, providing traffic control, loading, unloading, storing, hauling, heating, and applying the Bituminous Material and the supply of all materials, equipment, labour, tools and incidentals, including supply, haul, and application of sand for blotting purposes (as specified by the Engineer) necessary to complete the work in accordance with the specifications.

The application of the Prime Coat shall be carried out in accordance with "Bituminous Prime Treatment" (Division 6, Section 4). Furthermore, the Contractor shall comply with the provisions of "Asphalt" (Division 6, Section 1).

- d) Payment for clearing will be in accordance with the requirements for "Clearing" (Division 3, Section 1).
- e) Payment for grubbing will be in accordance with the requirements for "Grubbing" (Division 3, Section 2).
- f) Payment for removal of overburden and construction of haul roads will be in accordance with the requirements for "Borrow Excavation" (Division 3, Section 4).
- g) Payment for haul will be at the Contract unit price per tonne-kilometre of Base Course Gravel hauled for the Asphalt Stabilized Base Course in accordance with these specifications and the requirements for "Haul" (Division 5, Section 3).

6.3.7 **FINAL ACCEPTANCE****6.3.7.1** **Acceptance**

Conditions requisite for the final acceptance of the work shall include, in addition to the terms and conditions set forth in the Contract:

- a) A roadway smooth and compact over its entire width,
- b) Smooth side slopes with regular shoulder lines,
- c) Clean side ditches and satisfactory approaches.

Gravel pits and stockpile sites shall be left in a neat and tidy condition and haul roads repaired and restored, to the satisfaction of the Engineer.

Any Contractor shall, at their own expense, adequately repair any failures which may occur due to their neglect or faulty workmanship and shall maintain the subgrade and each layer of base course constructed, to the satisfaction of the Engineer.

6.3.7.2 **Maintenance Requirement**

Prior to the release of the Contract Holdback, the Contractor shall furnish the Department with a Maintenance Bond in the amount of 10% of the total Contract bid price as a guarantee that they will hold themselves responsible for, and will repair at their own expense, any failures and/or damages resulting from failures in the work by reason of neglect or faulty workmanship by the Contractor in the performance of the work, which have occurred within the period of one year as specified in the Maintenance Bond.

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6.4 SECTION 4 – BITUMINOUS PRIME, TACK AND FOG COATS

6.4.1 DESCRIPTION

This work consists of placing an asphalt material on a prepared surface at locations shown on the plans or as designated by the Engineer.

6.4.2 DEFINITIONS

6.4.2.1 Prime Coat

An application of emulsified asphalt to an absorbent surface to waterproof and promote bonding between the surface being primed and the next course.

6.4.2.2 Tack Coat

An application of emulsified asphalt to ensure a bond between the surface being paved and the next course.

6.4.2.3 Fog Coat

An application of emulsified asphalt to seal small cracks and surface voids.

6.4.3 MATERIALS

The Contractor shall supply the types and grades of asphalt material specified in the Contract.

The Contractor shall supply the asphalt material in accordance with "Supply of Asphalt" (Division 6, Section 1).

When emulsified asphalt is used for Prime, Tack or Fog Coat, the material as delivered by the supplier shall be diluted by adding an amount equal volume of water to the volume of emulsified asphalt supplied.

Sand used for the blotting of excess asphalt material on Prime Coats shall be supplied by the Contractor.

6.4.4 CONSTRUCTION

6.4.4.1 Quality control and Quality Control Testing

a) General

- i) Quality control and quality control testing are the responsibility of the Contractor throughout every stage of the work, from the supply of the asphalt material to the final accepted product.
- ii) Tests performed by the Department will not be considered to be quality control tests.
- iii) The Contractor shall provide, pay for and maintain equipment and qualified personnel to perform all field testing necessary to determine and monitor the characteristics of the materials supplied and incorporated into the work and the final product produced.
- iv) Prior to commencement of the work, the Contractor shall provide the Engineer with their program and schedule of testing for quality control and shall demonstrate to the satisfaction of the Engineer that the program and schedule are adequate to provide reliable quality control within the limits specified.
- v) The Contractor shall retain and utilize Professional Engineering Services provided by an engineering consulting company registered by NAPEG to carry out all quality control and quality control testing.
- vi) The Contractor shall not retain or utilize the engineering consulting company or personnel retained by the Department with respect to the Contract, for any work on or associated with the Contract.
- vii) All quality control tests and test results shall be calculated, recorded and submitted to the Engineer on industry standard worksheets. The tests and test results shall be certified for correctness by the engineering consulting company employed by the Contractor to perform the tests and shall be

signed by the Contractor's representative. Original copies of all worksheets, including calculations, shall be submitted to the Engineer daily. All worksheets shall be reviewed and certified for correctness by a Professional Engineer from the engineering consulting company employed by the Contractor to perform the tests, on a minimum weekly basis.

- viii) The Contractor shall interpret quality control test results and alter their operation if necessary, so that the product meets all required specifications.

6.4.4.2 Survey, Layout, Staking and Grading Requirement

a) General

- i) The Contractor shall provide and pay for qualified personnel to carry out all surveying, layout, staking, grading and referencing required for the blading, shaping and/or preparation of the surface to be treated, the establishment of centreline and the accurate placement and control of Prime, Tack and Fog Coat operations.
- ii) Prior to the application of Prime Coat on untreated granular surfaces, the Contractor shall utilize an in-place balance grading method to ensure that the surface to be treated is bladed and shaped to the lines, grades and cross sections indicated on the Drawings. The in-place balance grading method shall include the surveying, staking and setting of grades every 20 m along the roadway. The Contractor shall blade and shape the surface to be treated such that the finished surface is smooth, uniform, true to grade and cross-section and suitable for the application of subsequent material thereon.
- The finished surface shall not deviate more than 30 mm from the specified grade and cross-section.
- iii) The Contractor shall notify the Engineer when the surface to be treated has been completed in accordance with the specifications and shall provide ample opportunity for the Engineer to take cross-sections prior to the application of subsequent material thereon.
- The Engineer will not take cross-sections at any time prior to notification by the Contractor that the surface to be treated has been completed in accordance with the specifications.
- The completion of cross-sections by the Engineer shall in no way constitute acceptance of the surface to be treated by the Engineer.

6.4.4.3 Seasonal, Weather and Other Limitation

Asphalt material for Prime, Tack and Fog Coat shall be applied only when:

- a) The surface to be treated is dry,
- b) The weather is not foggy or rainy,
- c) The surface temperature is above 0°C for the application of cutback asphalts, and
- d) The surface temperature is above 5°C for the application of emulsions,

or as otherwise approved by the Engineer.

6.4.4.4 Equipment

Equipment shall be provided in good mechanical condition, properly adjusted and free from wear which would impair the quality of work.

The asphalt shall be applied by means of a self-powered pressure distributor equipped with the following control devices in proper operating condition:

- a) Tachometer.
- b) Pressure gauge.

- c) Adjustable length spray bar.
- d) Positive displacement asphalt pump with separate power unit.
- e) Heating coils and burner capable of applying even heat to the asphalt material.
- f) Thermometer well and accurate thermometer.

Before applying asphalt material, the Contractor shall ensure that the distributor meets the following adjustments and requirements:

The distributor vehicle will maintain a constant height of the spray bar as the tank is unloaded.

- a) All spray bar nozzles are of the same manufacture, type and size.
- b) Clogged nozzles have been removed and cleaned with solvent.
- c) All nozzles have been set in the spray bar so that the nozzle slots make the same angle (15° to 30°) with the horizontal axis of the spray bar.
- d) The spray bar has been adjusted to the correct height to ensure uniform application without streaking.
- e) The spray bar has been provided with a positive shut-off to prevent dribbling.
- f) The distributor can maintain a uniform speed.

The distributor may be checked for calibration by the Engineer before being used on the work.

6.4.4.5 Surface Preparation

Before applying the asphalt material, loose dirt or other objectionable material shall be removed from the prepared surface by brooming or other methods acceptable to the Engineer.

Where base courses become ravelled, the loose material shall be moistened and recompact to achieve a tight, uniform surface.

6.4.4.6 Application of Asphalt Material

Application rates for Prime, Tack and Fog Coats shall be as specified by the Engineer. The application rate of for a diluted tack coat on a milled asphalt pavement surface or an asphalt pavement surface that was placed in the previous calendar year or prior shall be a minimum of 0.30 L/m² and a maximum of 0.40 L/m². The application rate for a diluted tack coat on asphalt pavement surface that was placed in the same calendar year shall be a minimum of 0.20 L/m² and a maximum of 0.30 L/m². The application rate for a diluted prime coat on granular surface shall be a minimum of 0.80 L/m² and 1.0 L/m². The application rate for a diluted fog coat on asphalt stabilized base course shall be a minimum of 0.45 L/m² and 0.70 L/m².

The asphalt material shall be uniformly applied without streaking.

Joints and seams shall not be excessively overlapped.

Structures, curbs, wheel guards, guardrail and other roadway appurtenances shall not be splattered by the asphalt material. The Contractor shall remove any spattering caused by their operation, at their own expense.

Areas missed by the distributor or inaccessible to the distributor shall be treated using a hand spray or pouring pot.

6.4.5 ACCOMMODATION OF TRAFFIC

Traffic shall not be permitted to travel on Tack Coat or Fog Coat until it has cured.

Traffic shall not be permitted to travel on Prime Coat until six hours after application or until it has cured. After this period, excess asphalt material remaining on the surface shall be blotted by sand before traffic is permitted to travel on the surface. The "blotter sand" may be any clean sand free from organic or other deleterious materials, approved by the Engineer.

When traffic must be accommodated, the Contractor shall apply the Prime, Tack or Fog Coat to only one- half of the roadway at a time. The other half shall not be sprayed until the first half has properly cured, and in the case of Prime Coat, all puddles and excess free asphalt have been blotted.

6.4.6 MAINTENANCE OF WORK

Prime Coat and Tack Coat shall be maintained by the Contractor at their own expense, including the cost of the required liquid asphalt. Any area of Prime Coat or Tack Coat that has become fouled shall be repaired before the application of subsequent material thereon.

6.4.7 MEASUREMENT AND PAYMENT

Accepted Prime Coat and Fog Coat will be measured in square metres.

Payment for Prime Coat and Fog Coat will be at the Contract unit price per square metre. No separate payment shall be made for prime coat and fog coats if there is no Contract unit price for these items and they are considered to be incidental to placement of granular layer or asphalt stabilized granular layers, respectively.

For Prime Coat, the unit price shall be compensation in full for preparing and cleaning the surface to be treated, surveying, layout, staking, balance grading, setting grades, referencing, supplying and applying the asphalt material, supplying and applying blotting sand when required, quality control and quality control testing, reporting and certification, maintenance and dust control of the work and haul roads, traffic control and accommodation and the supply of all equipment, labour, materials, tools and incidentals necessary to complete the work in accordance with the specifications.

For Fog Coat, the unit price shall be compensation in full for preparing and cleaning the surface to be treated and the supplying and applying of the asphalt material.

Payment for Tack Coat will be considered included in the unit price of the Contract item for which the Tack Coat is required, and no separate payment will be made.

No payment will be made for any material used to replace or repair rejected work, and all corrective work shall be performed entirely at the Contractor's expense.

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6.5 SECTION 5 - SINGLE ASPHALTIC SURFACE TREATMENT

6.5.1 DESCRIPTION

This work consists of a wearing course composed of an asphalt emulsion and a crushed aggregate spread and compacted in one application on a prepared surface to the lines and dimensions shown on the plans or as designated by the Engineer.

6.5.2 MATERIALS

6.5.2.1 **Aggregate**

Unless otherwise specified, the Contractor shall produce crushed aggregate in accordance with "Crushed Aggregate Production" (Division 5, Section 1), for the Designation and Class of material specified.

6.5.2.2 **Asphalt**

The Contractor shall supply asphalt emulsion in accordance with "Supply of Asphalt Cement and/or Asphalt Emulsion" (Division 6, Section 1).

The asphalt emulsion shall be a high float type emulsion with the grade being as specified in the Special Provisions.

6.5.3 CONSTRUCTION

6.5.3.1 **Quality Control and Quality Control Testing**

a) General

Quality control and quality control testing are the responsibility of the Contractor throughout every stage of the work, from the crushing and production of aggregates to the final accepted product.

Tests performed by the Department will not be quality control tests.

The Contractor shall provide, pay for and maintain equipment and qualified personnel to perform all field testing necessary to determine and monitor the characteristics of the materials produced and incorporated into the work and the final product produced.

Prior to commencement of the work, the Contractor shall provide the Engineer with their program and schedule of testing for quality control and shall demonstrate to the satisfaction of the Engineer that the program and schedule are adequate to provide reliable quality control within the limits specified.

The Contractor shall retain and utilize Professional Engineering Services provided by an engineering consulting company registered by NAPEG to carry out all quality control and quality control testing.

The Contractor shall not retain or utilize the engineering consulting company or personnel retained by the Department with respect to the Contract, for any work on or associated with the Contract.

All quality control tests and test results shall be calculated, recorded and submitted to the Engineer on industry standard worksheets. The tests and test results shall be certified for correctness by the engineering consulting company employed by the Contractor to perform the tests and shall be signed by the Contractor's representative. Original copies of all worksheets, including calculations, shall be submitted to the Engineer daily. All worksheets shall be reviewed and certified for correctness by a Professional Engineer from the engineering consulting company employed by the Contractor to perform the tests, on a minimum weekly basis.

The Contractor shall interpret quality control test results and alter their operation if necessary, so that the product meets all required specifications.

The Contractor shall calibrate distributors and aggregate spreaders in a manner acceptable to the Engineer before the work commences.

b) Aggregate and Asphalt Emulsion Application Rates Testing Requirements

The Contractor's quality control and quality control testing program shall include field sampling to determine the asphalt emulsion and aggregate application rates. The minimum field sampling frequency, and quality control testing procedure requirements, shall include but not be limited to:

- a) At the start of each day's work,
- b) When application rates are changed,
- c) When spraying widths are changed,
- d) For confirming that the correct application rate is being maintained.

For situations (a), (b) and (c), a trial section of 50 m, or an alternate length approved by the Engineer, shall be placed and sampled. Spraying shall not continue until the test result has been obtained. For situation (d), the sample shall be obtained when approximately 1/2 of the total day's production is completed.

All sampling and testing methods shall be to industry standards and shall be approved by the Engineer.

Acceptance

If the test result is within plus or minus 5% of the desired application rate, the test result will be considered acceptable and work may proceed.

If the test result is not within 5% of the desired application rate, the test result will be considered unacceptable and work shall be stopped, and adjustments made to the equipment. Field sampling will be repeated until two consecutive acceptable test results or four unacceptable test results are obtained.

When two acceptable test results are obtained work may proceed.

When four unacceptable test results are obtained before two consecutive acceptable test results, the single asphaltic surface treatment placed with unacceptable test results shall be removed and replaced at the Contractor's expense.

c) Reporting

In addition to the requirements of Section 6.5.3.1 (b), the Contractor's quality control and quality control testing program shall include the reporting of aggregate and asphalt emulsion application rates to the Engineer at the following minimum frequencies:

Description	Minimum Frequency
(A) Aggregate Application	
1) Spread Rate	Every half day
2) Daily Average	Daily
3) Job Average	On completion of the Contract
(B) Asphalt Emulsion Application	
1) Spray Rate	Every 3 lane-km
2) Daily Average	Daily
3) Job Average	On completion of the Contract

d) Quality Acceptance

Within this specification, certain requirements, limits and tolerances are specified regarding the quality of materials and workmanship to be supplied. Compliance with these requirements, limits and tolerances shall be measured and the work accepted or rejected based on the Department's quality assurance test results.

The Engineer and their representatives reserve the right to sample, test, inspect and monitor the quality of material being produced and incorporated into the work by the Contractor at any time and as often as he deems necessary. The Contractor shall cooperate with the Engineer and their representatives for such sampling, testing, inspecting and monitoring. The Engineer is under no obligation to provide the Contractor with test results and this testing shall in no way relieve the Contractor of their responsibility to construct single asphaltic surface treatments that meet the specifications in all respects.

The Contractor shall provide, at their own expense, such stands, sampling devices and other facilities as the Engineer may require to safely obtain representative samples of the materials being produced and incorporated into the work.

The materials testing laboratory provided by the engineering consulting company utilized by the Department to carry out quality assurance testing will not be located at the project site. Quality assurance test results will therefore not be completed for approximately 10 days from the date of sampling.

6.5.3.2 Survey, Layout, Staking and Grading Requirements

a) General

- i) The Contractor shall provide and pay for qualified personnel to carry out all surveying, layout, staking, grading and referencing required for the blading, shaping and/or preparation of the surface to be treated, the establishment of centreline and the accurate placement and control of asphaltic surface treatment operations.
- ii) Prior to the application of asphaltic surface treatment on untreated granular surfaces, the Contractor shall utilize an in-place balance grading method to ensure that the surface to be treated is bladed and shaped to the lines, grades and cross-sections indicated on the Design Drawings. The in-place balance grading method shall include the surveying, staking and setting of grades every 20 m along the roadway.

The Contractor shall blade and shape the surface to be treated such that the finished surface is smooth, uniform, true to grade and cross-section and suitable for the application of asphaltic

surface treatment thereon.

The finished surface shall not deviate more than 30 mm from the specified grade and cross-section.

- iii) The Contractor shall provide cross-sections per the specified sheets in the contract drawings prior to the application of asphaltic surface treatment thereon. The Engineer will not obtain any measurements to develop the cross-sections.

b) Interim Centreline Spotting

The Contractor shall be responsible for the supply and application of interim centreline roadway markings (spotting) on all newly constructed asphaltic surface treatments. Interim centreline spotting shall be completed in accordance with Division 8 Section 8.1.3.2

6.5.3.3 Seasonal, Weather and Other Limitations

Single asphaltic surface treatment shall not be constructed when, in the opinion of the Engineer, damage to the finished product may occur for any reason.

Construction shall be carried out during daylight hours only.

Asphalt emulsion shall not be applied to the prepared surface during any of the following conditions:

- a) The atmospheric temperature at the construction area is less than 10°C,
- b) The weather is misty or rainy,
- c) Precipitation is a threat for the construction area within 12 hours as forecast by Environment Canada for the vicinity, and
- d) An atmospheric temperature at the construction area of less than 5°C is predicted by Environment Canada within 24 hours.

6.5.3.4 Equipment

The Contractor shall use the following equipment:

- a) Self-powered pressure asphalt distributors meeting the requirements listed in "Bituminous Prime, Tack and Fog Coats" (Division 6, Section 4).
- b) Power Sweepers.
- c) Self-propelled aggregate spreaders capable of spreading the aggregate uniformly at the established rate in 1 application over the full width of the asphalt applied.
Spreaders shall be capable of controlling and adjusting the width and rate of spread. Each spreader shall be equipped with the necessary devices to enable it to be attached securely to the aggregate haul truck while in the process of dumping the aggregates into the spreader.
- d) Self-propelled pneumatic tire rollers or self-propelled vibratory rollers with rubber coated drums or both.

A minimum of two pneumatic tired rollers shall be provided with each aggregate spreader.

Hauling vehicles shall be suitably equipped to enable secure attachment to the spreader while in the process of dumping the aggregates.

6.5.3.5 Surface Preparation

- a) When Asphalt Surface Treatment is being placed on untreated granular base, before the asphalt emulsion is applied, the surface to be treated shall be swept clean of all dirt, sand, dust or objectionable matter by means of a power sweeper.

If base courses become raveled, the loose material shall be compacted before brooming.

Dried mud or other foreign matter which cannot be removed with the power sweeper shall be removed by hand, blade or other methods.

Asphalt emulsion shall not be applied until the surface has been cleaned as required and approved by the Engineer.

- b) When Asphalt Surface Treatment is placed on an existing surface treated layer, the surface preparation will include the following:
- i) Wheel path treatment.
 - ii) Asphalt Surface Treatment surface improvement.
 - iii) Hauling/placing/packing 20 mm gravel.
 - iv) Alligator and transverse crack sealing.
 - v) Other crack sealing.
 - vi) Pot hole repairs.

Typically, these activities are planned to be completed in order to cause the least delays to the start of overlay application.

Alligator & Transverse or any other Cracks sealing and Pot hole repairs will not be measured separately for payment and shall be considered incidental to works.

The Contractor shall provide, ahead of mobilization to sites, an experienced quality control technician to cooperate with the Engineer in the establishing of priorities and locations of all the activities required for surface preparation. This will ensure a well-organized completion of this phase of the work.

The cost for the quality control technician shall be considered incidental to the work.

Wheel path treatment shall be measured by actual width and length for each chip layer length applied. Chip layer width shall vary and be placed horizontally to minimize water retention. Deeper wheel ruts shall be applied more than one layer as directed by the Engineer. If any layer applied without consent of Engineer, the layer shall not be measured for payment.

Asphalt Surface Treatment surface improvements consist of asphalt oil specified and 16 mm Asphalt Surface Treatment chips applied to improve areas showing weak seal, surface distortion, breaks, dips, loss of crown/flat areas, failed cold mix repairs, alligator cracking.

Alligator cracking sections where the separation of the surface is negligible shall be applied Asphalt Surface Treatment layer(s) as required to achieve surface seal. Where separation is open, if seal improvement is not applicable, the area may be excavated locally and replaced with gravel and AST application.

At soft, rough areas with underlying ACP, improvements shall be achieved with Asphalt Surface Treatment application.

In areas, where it is known that ACP has been removed with the surface showing softness or roughness and existing chip seal surface is soft and not ready for overlay application, the areas shall be ripped/excavated, compacted, applied 20 mm gravel (not exceeding 150 mm in each lift) and reshaped to crown before Asphalt Surface Treatment application. Each layer of 20 mm

gravel/aggregate shall be compacted to the satisfaction of Engineer.

Ripping/ excavation and compaction will not be measured separately for payment and shall be considered incidental to highway surface preparation.

Cracking shall be repaired with applied asphalt oil using a distributor truck wand and sand. The Engineer may direct the Contractor to apply oil and chips to some large areas with minor size cracking as applicable.

Crack sealing shall be considered incidental to the project.

Major cracking showing surface depressions mostly found at transversal cracking shall require the use of a spray injector patcher as directed by the Engineer. Aggregate material for use with the spray injector patcher shall be available to the Contractor. Contractor will use spray injector where needed.

Major crack sealing shall be considered incidental to the project.

- c) If the Contract contains a bid item for the supply and application of a Bituminous Prime Coat, the Contractor shall apply the Bituminous Prime Coat, as specified, prior to the application of the single asphaltic surface treatment.

The Bituminous Prime Coat shall be applied in accordance with "Bituminous Prime, Tack and Fog Coats" (Division 6, Section 4).

The Contractor shall supply Bituminous Prime Coat material in accordance with "Supply of Asphalt" (Division 6, Section 1).

6.5.3.6 Application of Asphalt Emulsion

Generally, the application rate will be in the range of 1.9 L/m² to 2.5 L/m².

The application temperature of the asphalt emulsion shall be between 50°C and 70°C.

The asphalt emulsion shall be applied with a pressure distributor at the established rate and in a single uniform continuous spread over the section to be treated.

Asphalt emulsion shall be applied only to dry surfaces.

The longitudinal edge of a previously constructed single asphaltic surface treatment shall be power swept prior to constructing the single asphaltic surface treatment on the adjacent section.

All loose aggregates on the sealed lane must be removed to at least 0.15 m from the proposed longitudinal joint with a minimum dislodgement of embedded aggregates.

The Contractor shall ensure that asphalt emulsion application on the previously constructed longitudinal edge is overlapped by not less than 50 mm and not more than 100 mm.

Transverse joint: of successive sections or lanes shall be started and ended on a strip of building paper for each spread, to prevent overlap. The paper shall be removed and disposed of as approved by the Engineer. Skipped areas shall be corrected by hand spray.

Structures, curbs, guardrail, and other appurtenances shall not be spattered with the asphalt emulsion. The Contractor shall remove any spattering caused by their operation.

The application of asphalt emulsion shall not precede the application of the single asphaltic surface treatment by more than 30 m. Asphalt emulsion shall not be spilled, sprayed, or tracked on completed sections of single asphaltic surface treatment. Bridge expansion joints and drains shall be protected with building paper.

Application on bridge decks, where specified, will generally be from curb face to curb face.

6.5.3.7 Application of Aggregate

Generally, the application rate will be in the range of 20 kg/m² to 24 kg/m² or as instructed by Engineer.

The application of aggregates shall follow within 30 m of the application of asphalt emulsion.

The aggregates shall be uniformly spread at the established rate by means of a mechanical spreader.

Longitudinal construction joints between adjacent lanes shall be kept clean of foreign material.

At longitudinal joints, the Contractor shall ensure that aggregates are overlapped by not less than 50 mm and not more than 100 mm.

Immediately after spreading, the aggregate shall be rolled. A minimum of two coverages by the rollers shall be completed within 15 minutes after the aggregate has been spread.

Vibratory rollers shall not operate in the vibratory mode when they are stationary.

After initial set of the asphalt emulsion (normally from one to three hours), further compaction of the asphaltic surface treatment shall continue by using either further rolling or controlled traffic or a combination of both, until the aggregate is properly seated in the asphalt emulsion and a smooth, thoroughly compacted surface is obtained. The Contractor shall determine the amount of additional compaction required based on consideration of compaction equipment, traffic conditions, atmospheric conditions and acceptance requirements.

6.5.3.8 Sweeping

Once compaction has been achieved, light brooming of the surface shall be undertaken to remove any loose aggregate.

The Contractor shall broom the single asphaltic surface treatment during daylight hours only, when required and as often as required, during a two-week period following the initial application or as directed by the Engineer.

Any areas that have not been properly covered after brooming shall be treated using hand methods if necessary.

The chips/aggregate shall be swept off the roadway towards the side slope of the Highway. No windrow shall be accepted on the travel lane or shoulder.

Initial and secondary sweeping operations of the highway surface shall include traffic control signs, flag persons and pilot vehicles.

The Contractor shall use a water truck to dampen the highway surface during sweeping operations for dust

control.

The Contractor shall ensure that highway sections with loose chips are posted with a reduced speed that is suitable for the surface condition but shall not exceed a maximum speed of 50 km/hour and do not exceed 10 kilometres in length. Once the initial sweeping is completed, the Contractor shall increase the speed limit to the posted speed limit but shall reduce the speed to 50 km/hour for subsequent sweeping operations.

6.5.4 ACCOMMODATION OF TRAFFIC

Traffic shall be safely accommodated through the work. The Contractor shall, at their own expense, provide flag persons, pilot vehicles and/or illuminated arrow boards as required.

Traffic and construction equipment, including aggregate haul trucks, shall not travel over uncovered surfaces of fresh asphalt emulsion.

Traffic shall not use sections of single asphaltic surface treatment until after final rolling is complete. From the time all rolling is complete and until 6 hours thereafter, traffic shall be convoyed by pilot vehicles at speeds not exceeding 50 km per hour.

6.5.5 REQUIREMENTS FOR ACCEPTANCE

Requirements for the acceptance of the completed Single Asphaltic Surface Treatment include the following:

- a) Materials shall meet all specific requirements,
- b) A minimum of 99% aggregate coverage shall be obtained with no single bare area greater than 0.01 m²) in any 1 square metre,
- c) There shall be no streaking or raveling,
- d) The finished surface shall have a uniform, even texture,
- e) No over-rich or bleeding areas shall be evident, and
- f) No loose aggregates shall be evident.

Single Asphaltic Surface Treatment that does not meet the foregoing requirements shall be repaired or reconstructed to the satisfaction of the Engineer at the Contractor's expense.

6.5.6 MAINTENANCE OF WORK AND DUST CONTROL

Maintenance and dust control of the entire surface to be treated shall be carried out in accordance with "Execution of Work, Maintenance of Work and Dust Control During Construction" (Division 2, Section 4).

6.5.7 MEASUREMENT AND PAYMENT

Accepted Asphaltic Surface Treatment will be at the Contract unit price per square metre.

The unit price shall be compensation in full for preparing, sweeping and cleaning the surface to be treated, surveying, layout, staking, balance grading, setting grades, referencing, supplying, heating, storing and applying the asphalt emulsion, excavating, loading, hauling, placing and compacting the aggregate, brooming the finished surface, supplying and applying interim centreline spotting material, quality control and quality control testing, reporting and certification, upgrading or construction of haul roads, trimming and grading of all slopes and surfaces in the gravel source areas and haul roads, maintenance and dust control of the work and haul roads, traffic control and accommodation and the supply of all equipment, labour, materials, tools and incidentals necessary to complete the work in accordance with the specifications.

No payment will be made for any material used to replace, repair or overlay rejected work, and all corrective

work shall be performed entirely at the Contractor's expense.

No payment will be made for materials used that exceed the upper limit of application ranges described in specifications or any portion of the Asphaltic Surface Treatment Overlay that does not meet the Requirements for Acceptance. Excessive applications of materials shall not be permitted. The Contractor will be assessed the cost of any excessive application and waste of aggregate or asphalt emulsion.

6.5.8 REPAIR OR RECONSTRUCTION WORK

Single Asphaltic Surface Treatment that does not meet the Requirements for Acceptance shall be repaired or reconstructed to the satisfaction of the Engineer at the Contractor's expense.

The Contractor's one-year warranty period will commence on the date that the Single Asphaltic Surface Treatment is accepted by the Engineer.