APPENDIX ‘E’ – ASPHALT PAVEMENT WORKS

PUBLIC WORKS DEPARTMENT • SERVICE DES TRAVAUX PUBLICS Engineering Division • Division de l'ingénierie	**Special Provision 2026** **DIVISION 4**
Special Provision	**ASPHALT PAVEMENT WORKS**

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1. DESCRIPTION

1.1 General

1.1.1 This specification covers the requirements for the materials, equipment, and processes for proportioning and mixing hot mix asphalt (HMA) including warm mix asphalt (WMA), recycled mixes, and mixes for miscellaneous work in accordance with the Marshall and Superpave methods.

1.1.2 This Specification covers the preparation of hot/warm-mixed, hot/warm-laid, asphalt paving mixes for, and all placing operations relating to, the construction of asphalt pavements, overlays and other related pavement works.

1.1.3 The Work to be done by the Contractor under this Specification shall include the furnishing of all superintendence, overhead, labour, materials, equipment, tools, supplies and all other things necessary for and incidental to the satisfactory performance and completion of all work as hereinafter specified.

1.2 Definitions

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

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

1.2.3 Lift means the compacted thickness of asphalt material laid in a single application.

1.2.4 Base Course means the layer of material between the sub-base and the pavement wearing surface.

1.2.5 SP1 means dense-graded asphalt mix using Superpave mix design for surface course. SP1 is intended for the reconstruction of expressways, major arterials, and minor arterials, industrial/commercial collectors, residential major collectors, as well as the paving of bridge decks. SP1 can also be used for asphalt overlay of expressways, major arterials, and minor arterials, where specified in the Contract Documents.

1.2.6 SP2 means dense-graded asphalt mix using Superpave mix design for intermediate and bottom lifts. SP2 is intended for the reconstruction of high traffic volume streets, including expressways, major arterials, minor arterials, industrial/commercial collectors as well as the paving of bridge decks.

1.2.7 MS1 means dense-graded asphalt mix using Marshall mix design for surface course. MS1 is intended for the reconstruction of intermediate and low volume streets including residential minor collectors, residential local, public lanes, asphalt pathways and associated approaches. MS1 is also intended for asphalt overlay of all street classifications and the reconstruction or asphalt overlay of all approaches except where otherwise specified in the Contract Documents.

1.2.8 MS2 means dense-graded asphalt mix using Marshall mix design for intermediate and bottom lifts. MS2 is intended for intermediate and low volume streets including residential major or minor collectors, residential local, public lanes, asphalt pathways and associated approaches.

1.2.9 MS3 means a fine-graded asphalt mix using Marshall mix design intended for thin asphalt overlays and specialized surfaces such as basketball courts, tennis courts, driveways, sidewalks, boulevards, and other narrow or constrained paving areas.

1.2.10 Reclaimed asphalt pavement (RAP) means the processed HMA or WMA material that is recovered by partial or full depth removal.

1.2.11 Deleterious Material means soft or friable material that would decay or disintegrate from weathering including ironstone, porcelain, vegetation, organic material, wood, glass, alkali, plastic, metal, reinforcing steel, building rubble, brick, shale, mica, coal, clay lumps, and loam or other deleterious substances.

1.2.12 Job-Mix Formula (JMF) means the percentage passing on each designated sieve of the total mass of aggregate and the amount of asphalt cement as a percentage by mass of the mixture that are based on specified mix design procedures, and when mixed results in a paving mixture in accordance with this specification.

1.2.13 Mix Design means the design of the proportions of aggregates, asphalt cement, and additives that when uniformly mixed results in an acceptable asphalt mix in accordance with the specified method.

1.2.14 Performance Graded Asphalt Cement (PGAC) means an asphalt binder that is asphalt-based cement produced from petroleum residue, either with or without the addition of non-particulate modifiers, in accordance with AASHTO M320.

1.2.15 Superpave means the method for specifying material components and asphalt mix design using the Superpave Gyratory Compactor (SGC).

1.2.16 Effective Asphalt Cement is the portion of asphalt binder in hot and warm asphalt mixes that remains effective (available) to coat aggregate particles and provide binding after subtracting the asphalt absorbed into the aggregate.

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

1.2.18 Prime Coat means application of emulsified asphalt cement on a granular surface.

1.2.19 Tack Coat means application of emulsified asphalt cement on existing asphalt or portland cement concrete pavement prior to overlay, or between layers of new bituminous pavement.

1.2.20 Prime coat has cured when water has totally separated from the emulsified asphalt. Prime coat is required to fully set and not remain tacky before placing asphalt.

1.2.21 Tack coat break is when water has separated enough from the emulsified asphalt to show a color change from brown to black and remain tacky. Tack coat is not required to fully cure; however, asphalt placement shall not proceed until the emulsion has broken and sufficient bond can be achieved without pickup or tracking.

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

1.2.23 Lot means a specific quantity of material, approximately 150 tonnes or less, from a single source and produced by the same process within a single operational day. Actual size of Lot may vary based on scaled quantities delivered to the road.

2. MATERIALS

2.1 Handling and Storage of Materials

2.1.1 All asphalt constituent materials shall be stored in a manner that will prevent contamination or deterioration. Access to the storage facilities shall be provided for inspection by the Contract Administrator.

2.1.2 All fabricated and incidental materials, such as anti-stripping, prime coat, tack coat, etc., shall be stored in accordance with the manufacturer's instructions.

2.1.3 The Contract Administrator shall approve all materials before any construction is undertaken. If, in the opinion of the Contract Administrator, such materials, in whole or in part, do not conform to this Specification or are found to be defective in manufacture or have become damaged in transit, storage or handling operations, then such material

shall be rejected by the Contract Administrator and replaced by the Contractor at his own expense. There shall be no charge to the City for any materials taken for testing purposes.

2.2 Aggregate

2.2.1 Aggregate shall consist of crushed stone or gravel or a combination of these materials conforming to the requirements of this Specification.

2.2.1.1 Each of the fine- and coarse-fractions of the combined aggregate shall meet all the requirements of this Specification and shall be handled and weighed separately to maintain uniformity. The supplier shall provide the City of Winnipeg, Research and Standards Engineer with test data demonstrating that the material will produce asphalt mixes of acceptable quality that meet all the requirements of this Specification.

2.2.1.2 Aggregates shall be hard and durable fragments with a maximum of 2% deleterious materials in both coarse and fine aggregates in accordance with ASTM Standard C142, Standard Test Method for Clay Lumps and Friable Particles in Aggregate and ASTM C123/C123M - Standard Test Method for Lightweight Particles in Aggregate by Washing as well as visual inspection of aggregates to identify deleterious materials.

2.2.1.3 The combined aggregate gradation and physical properties shall comply with the requirements in Table CW 3410.1.

TABLE CW 3410.1 - Combined Aggregate Gradation and Physical Properties Limits

	Test Method	SP1	SP2	MS 1	MS 2	MS 3
Sieve Size, mm		Percent of Total Dry Weight Passing Each Sieve				
19.0 16.0 12.5 9.5 4.75 2.36 1.18 0.60 0.15 0.075	ASTMC 136 or ASTM D5444 (Note 1)	-- 100% 90% - 100% 75% - 90% 48% - 70% 28% - 58% 19% - 40% 13% - 30% 4% - 15% 2% - 8%	100% 90% - 100% 70% - 90% 60% - 80% 40% - 62% 23% - 50% 15% - 35% 10% - 22% 4% - 14% 2% - 8%	-- 100% 90% - 100% 75% - 90% 48% - 70% 28% - 58% 19% - 40% 13% - 30% 4% - 15% 2% - 8%	100% 90% - 100% 75% - 95% 70% - 90% 55% - 70% 35% - 55% 28% - 46% 17% - 32% 4% - 12% 3% - 10%	-- -- -- 100% 90% - 95% 74% - 80% 55% - 64% 35% - 46% 11% - 30% 5% - 11%
Fine Aggregate Angularity, %min (Note 2)	ASTM C1252 – Method A	45%	45%	40%	40%	40%
Clay Content (Sand Equivalency), %min (Note 3)	ASTM D2419	45%	45%	45%	40%	40%
Crush Count, %min (2 Fractured Faces) (Note 4)	ASTM D5821	95%	80%	80%	80%	80%
Flat and Elongated Particles, % Max	ASTM D4791	6%	10%	--	--	--
Absorption, %max	ASTM C127	2%	2%	2%	2%	2%
Abrasion, %max (Note 4)	ASTM C131	35%	35%	35%	35%	35%
Micro-Deval, %max (Note 4)	ASTM D6928	15%	15%	15%	17%	15%
Soundness (Note 5)	ASTM C88	Note 3	Note 3	Note 3	--	--
Lightweight Particles Content, %max (Note 6)	ASTM C123	3%	5%	3%	5%	3%

- Note 1: ASTM C136 shall be used for determining the particle size distribution of fine and coarse virgin aggregates while ASTM D5444 shall be used for determining the particle size distribution of extracted aggregates from bituminous mixtures.
- Note 2: Test criteria shall apply for fine aggregates passing 4.75mm sieve. Test results shall be based on combined aggregates prior to the addition of RAP. Fine Aggregate Angularity (FAA) of 43% is acceptable, provided the mix complies with all other specified requirements.
- Note 3: Test results shall be conducted on the combined aggregate mix before the addition of Reclaimed Asphalt Pavement (RAP).
- Note 4: Test criteria shall apply for coarse aggregates retained on 4.75 mm sieve.
- Note 5: Soundness - Coarse aggregate when subjected to five cycles of the soundness test shall have a weighted loss of not more than twelve (12) percent when sodium sulphate is used or not more than eighteen (18) percent when magnesium sulphate is used in accordance with ASTM Standard C88, Test for Soundness of Aggregates by Use of Sodium Sulphate or Magnesium Sulphate.
- Note 6: The lightweight particle content is the percentage of lightweight particles by weight of all particles retained on 4.75mm sieve.

2.2.1.4 Quarried limestone and dolomite shall not be acceptable as asphalt aggregate materials for Superpave mixes and MS1 surface lifts.

2.3 Asphalt Cement

2.3.1 Asphalt cement shall be performance graded asphalt cement in accordance with AASHTO M 320 unless otherwise specified in the Contract Documents.

2.3.1.1 Use only those materials listed as Approved Products for Surface Works. The Approved Products are available in Adobe Acrobat (.pdf) format at the City of Winnipeg, Corporate Finance, Material Management Internet site at:
https://legacy.winnipeg.ca/matmgt/spec/default.stm

2.3.2 The PGAC shall be homogeneous, free of water and any contamination, and shall not foam when heated to the temperatures specified by the manufacturer for the safe handling and use of the product. It shall be shipped, used, and always handled in accordance with the manufacturer's specifications.

2.3.3 All PGAC shall be in accordance with AASHTO M 320 when tested using the methods designated in AASHTO R29, Test Procedure for Grading an Unknown Asphalt Binder and continuous grading temperatures and reported continuous grading temperatures rounded to the nearest 0.1 °C.

2.3.4 Grades shall be tested at a temperature of 58 °C to determine the average percent recovery at 3.2 kPa ($R_{3.2}$) in accordance with the requirements of AASHTO T350 Multiple Stress Creep Recovery (MSCR) Test using a Dynamic Shear Rheometer. The minimum MSCR Elastic Recovery shall be 25%.

2.3.5 The PGAC performance grading test result requirements shall be

- Equal to or above XX* and equal to or below -YY*; or
- ≤ 0.5 °C below XX and ≤ 0.5 °C above -YY

Where *XX is the specified high temperature performance grade and design maximum pavement temperature and -YY is the specified low temperature performance grade and design minimum pavement temperature.

2.3.6 The PGAC shall comply with the performance grading requirements in Table CW 3410.2.

Table CW 3410.2: Minimum Categories for PGAC

Asphalt Type		Specified Standard Grade*
Top lift	SP1	PG 64-34P
	MS1	PG 58-34
	MS3	PG 58-34
Other lifts	SP2	PG 58-34P
	MS2	PG 58-34

2.4 Mineral Filler

2.4.1 Mineral filler, when required, shall consist of finely divided mineral matter such as rock dust, slag dust, hydrated lime, hydraulic cement, fly ash, loess or other suitable mineral matter, and shall conform to the requirements of ASTM Standard D242, Standard Specification for Mineral Filler for Bituminous Paving Mixtures. Mineral filler shall be free from organic matter and shall be non-plastic when tested in accordance with ASTM D2974 Standard Test Methods for Determining the Water (Moisture) Content, Ash Content, and Organic Material of Peat and Other Organic Soils

2.5 Incidental Materials

2.5.1 Prime Coat

2.5.1.1 Prime coat shall consist of an emulsified asphalt. Method of application shall conform to the manufacturer's recommendations.

2.5.1.2 Use only those materials listed as Approved Products for Surface Works. The Approved Products are available in Adobe Acrobat (.pdf) format at the City of Winnipeg, Corporate Finance, Material Management Internet site at:
https://legacy.winnipeg.ca/matmgt/spec/default.stm

2.5.2 **Tack Coat**

2.5.2.1 Tack coat shall consist of emulsified asphalt. Method of application shall conform to the manufacturer's recommendations.

2.5.2.2 Use only those materials listed as Approved Products for Surface Works. The Approved Products are available in Adobe Acrobat (.pdf) format at the City of Winnipeg, Corporate Finance, Material Management Internet site at:
https://legacy.winnipeg.ca/matmgt/spec/default.stm

2.5.3 **Reclaimed Asphalt Pavement (RAP)**

2.5.3.1 Reclaimed asphalt pavement shall consist of sound durable particles produced by crushing and screening.

2.5.3.2 RAP is not permitted in Superpave mixes.

2.5.3.3 Up to 10% by mass of RAP is permitted in MS1 where used as a surface course.

2.5.3.4 Up to 15% by mass of RAP is permitted in MS1 and MS2 where used in lifts other than surface course.

2.5.3.5 RAP shall be blended during production of the asphalt and the mix produced shall consist of a uniform blend of all materials.

2.5.3.6 All physical requirements and combined aggregate gradation limits shall meet the requirements of Table CW 3410.1.

2.5.4 Recycled Asphalt Shingles (RAS)

2.5.4.1 RAS shall be blended during production of the asphalt and the mix produced shall consist of a uniform blend of all materials.

2.5.4.2 RAS shall consist of sound durable particles produced from recovered organic asphalt, shingles, asphalt caps and asphalt rolled roofing. Fiberglass shingles are not permitted.

2.5.4.3 RAS material can be incorporated to a maximum 3% by weight of the total mix into MS1, MS2, and SP2 where used in lifts other than surface course.

2.5.4.4 RAS particles shall be a maximum size of 10mm and shall otherwise meet the gradation requirements in Table CW 3410.1.

2.5.4.5 RAS shall be free of chemical contaminants. Deleterious substances shall be a maximum of 3% of RAS by weight. Deleterious substances include fiberglass shingles, metal, glass, rubber, nails, soil, brick, tars and asbestos.

3. DESIGN REQUIREMENTS FOR ASPHALT PAVING MIX

3.1 Testing Laboratories

3.1.1 The City of Winnipeg, Research and Standards Engineer will maintain a list of approved Testing Laboratories. To obtain approval, Testing Laboratories must submit the following information to the Research and Standards Engineer annually prior to April 1st:

3.1.1.1 Valid Category "B" Asphalt laboratory certification or higher by Canadian Council of Independent Laboratories (CCIL);

3.1.1.2 A complete list of the certified testing; and,

3.1.1.3 List of the field personnel and their qualifications.

3.2 Asphalt Suppliers

3.2.1 Asphalt suppliers must submit the following information to the Research and Standards Engineer three weeks prior to paving:

3.2.1.1 Asphalt suppliers Approval Guidelines and Application is available at the City of Winnipeg, Corporate Finance, Material Management Division website at;

https://legacy.winnipeg.ca/matmgt/spec/default.stm

3.2.1.2 Names of suppliers and sources for all materials and admixtures;

3.2.1.3 Asphalt mix designs. The mix design shall be completed by an approved laboratory with CCIL Type "A" certification based on the asphalt type;

3.2.1.4 Copies of valid scale calibration reports for the asphalt batch plant;

3.2.1.5 Test data for aggregates (in accordance with Clause 2.2);

3.2.1.6 Sieve analysis test reports for the individual aggregates and the combined aggregate gradations to be used in the asphalt. The sieve analysis test reports shall be representative of the material to be used during asphalt production;

3.2.1.7 Test data for asphalt cement (in accordance with Clause 2.3) and the following items shall be submitted:

3.2.1.7.1 The PGAC supplier and location that the product shall be supplied from;

3.2.1.7.2 All documentation from the PGAC supplier confirming the grade of PGAC;

3.2.1.7.3 Applicable mixing and compaction temperatures for the product;

3.2.1.7.4 The minimum temperature of the mix immediately after spreading as recommended by the PGAC supplier; and,

3.2.1.7.5 Documentation of construction, storage, and handling requirements, including the material safety data sheet, recompaction temperature, and mix discharge temperature.

3.2.1.8 Performance data from trial batches prior to construction to demonstrate the asphalt mix will achieve the performance criteria in Table CW 3410.4 and Table CW 3410.5. Three (3) separate sets of test results from a trial batch will be required for approval of the corrected mix design statement;

3.2.1.9 Quality control program for all materials, including a proposed sampling and testing plan in accordance with Clause 3.4;

3.2.1.10 The supplier shall hold a valid development license issued in accordance with the Manitoba Environment Act for the operation of the Bituminous Mix plant. The plant shall be located and operated in accordance with the terms and conditions of the license; and,

3.2.1.11 The supplier shall control dust at the plant site in accordance with health, safety and environmental requirements.

3.2.2 The City of Winnipeg, Research and Standards Engineer will conduct inspections at least once a year during production. Samples of materials may be taken and tested.

3.2.3 Testing for qualification or acceptance purposes shall be done in accordance with this Specification and applicable test procedures and standard practices. There shall be no charge for any materials taken for testing purposes.

3.2.4 Changes in the source of any asphalt constituent materials will not be permitted without approval of the City of Winnipeg, Research and Standards Engineer. For new sources, all materials shall be tested.

3.2.5 Once approved, all asphalt shall be supplied in accordance with the approved Mix Design Statement. No changes in the asphalt mix designs will be permitted without written permission from the City of Winnipeg, Research and Standards Engineer.

3.2.6 Any change in the constituent materials of the asphalt shall require a new asphalt mix design.

3.2.7 No asphalt supply or placement shall proceed until the asphalt cement submittal, mix design and Job Mix Formula are approved.

3.3 Asphalt Mix Design and Job Mix Formula

3.3.1 The Mix Design for all asphalt types shall be submitted to the City of Winnipeg, Research and Standards Engineer for approval. The mix shall be proportioned to produce asphalt in accordance with the requirements of Table CW 3410.3 or Table CW 3410.4.

Table CW 3410.3: Marshall Mix Requirements

Mix Properties	MS1	MS2	MS3
Asphalt Cement, % total sample weight	5.3% to 6.5%	5.0% to 6.0%	5.5% to 6.5%
Effective Asphalt Cement, %min	4.8%	4.5%	4.8%
Voids in Mineral Aggregate, %min	14%	13%	16%
Voids Filled with Asphalt (%)	67% to 78%	67% to 75%	67% to 78%
Air Voids	3.0% to 5.0%	3.0% to 5.0%	3.0% to 5.0%
Marshall Stability, kN at 60°C	8 min.	8 min.	5 min.
Flow Index, units of 250 µm	8.0 to 14.0	8.0 to 16.0	8.0 to 16.0

Note: The mix shall be designed using 75 blows per side of the test specimen with manual compaction hammer or a mechanical equivalent device.

Table CW 3410.4: Superpave Mix Requirements

Mix Properties			SP1	SP2
% of Theoretical Maximum Specific Gravity		Mix Gyratory Compaction Requirements		
	$N_{initial}$	8	≤ 89.0	≤ 90.5
	N_{design}	100	96.0	96.0
	N_{max}	160	≤ 98.0	≤ 98.0
Voids in Mineral Aggregate, %min			14	13
Voids Filled with Asphalt, %			67 – 75	65 – 75
Air Voids, %			3.8 – 4.2	3.8 – 4.2
Dust to Binder Ratio			0.6 – 1.2	0.6 – 1.2
Minimum Tensile Strength Ratio (TSR), % (AASHTO T283)*			80%	70%
Asphalt Cement, %min total sample weight			4.8%	4.6%
Effective Asphalt Cement, %min			4.5%	4.3%

* If the specified TSR is not met, an approved anti-stripping additive shall be incorporated into the mix at a rate recommended by the anti-strip manufacturer and approved by the City of Winnipeg, Research and Standards Engineer.

3.3.2 If the deviation between QA results and JMF exceeds those identified in Table CW 3410.5, the asphalt supplier shall submit new Mix Design(s) to the City of Winnipeg, Research and Standards Engineer for approval.

Table CW 3410.5: Maximum Deviation from JMF

Mix Properties	**Maximum Deviation Between the QA Results and JMF, %**
Asphalt Cement	± 0.3
Effective Asphalt Cement	± 0.3
RAP	± 5
Passing 16.0 mm, 12.5 mm, 9.5 mm sieves	5.0
Passing 4.75 mm, 2.36 mm, 1.18 mm, 0.6 mm, 0.15 mm sieves	3.0
Passing 0.075 mm sieve	1.0

3.3.3 The mix design shall be valid for a maximum of twelve (12) months from when the mix design was developed. To extend use of the mix design beyond the initial twelve (12) months, a minimum of one test of each property listed in Section 3 shall be submitted to the City of Winnipeg, Research and Standards Engineer for approval. A full mix design shall be submitted every three years.

3.4 Plant Quality Control

3.4.1 The asphalt supplier shall be responsible for quality control of the plant to ensure all materials meet the approved mix designs. This information shall be submitted monthly and will be monitored by the City of Winnipeg, Research and Standards Engineer. Failure to submit the quality control results shall be cause for immediate suspension of the asphalt supplier.

3.4.2 Quality Control testing shall be conducted by a laboratory certified in accordance with the requirements of Clause 3.1 and approved by the City of Winnipeg, Research and Standards Engineer.

3.4.3 The quality control program shall include all testing in accordance with Sections 2 and 3 of this Specification. A minimum of one test for aggregate gradation and asphalt materials shall be provided monthly during production.

3.4.4 Testing of any asphalt constituent materials may be undertaken by a testing laboratory designated by the City of Winnipeg, Research and Standards Engineer. The asphalt supplier shall be equipped with suitable means or a device for obtaining a representative sample of the asphalt cement. Any material which fails to comply with the requirements of this specification will be rejected. Material that has been rejected must be removed immediately by the asphalt supplier.

4. SUPPLY OF MATERIALS

4.1 General

4.1.1 All asphalt suppliers shall be approved by the City of Winnipeg, Research and Standards Engineer. A list of approved asphalt suppliers is available at the City of Winnipeg, Corporate Finance, Material Management Division website at:
https://legacy.winnipeg.ca/matmgt/spec/default.stm

4.1.2 Unless otherwise specified, only use of stationary asphalt mixing plants will be permitted.

4.2 Aggregate

4.2.1 The different sizes of aggregate used shall be kept separate and adequate provision shall be made to keep them from becoming mixed or otherwise contaminated.

4.2.2 Where blending of materials from one or more sources and/or sizes, each material shall be placed in separate stockpiles.

4.2.3 Separate aggregate feeds capable of delivering a uniform flow of material to the dryer shall be provided for each separate stockpile of aggregate, RAP, supplementary material and VMA additive used to produce the asphalt mix.

4.2.4 The aggregates shall be dried at a minimum temperature of 135°C before mixing with the asphalt.

4.3 Asphalt Cement

4.3.1 The asphalt cement shall be heated in a storage tank to a temperature that falls within the mixing temperature range recommended by the asphalt cement manufacturer. The mixing temperature shall be based on the temperature-viscosity curve for the asphalt cement and shall be sufficient to produce a uniform and homogeneous mixture in which all particles of the aggregate are thoroughly and uniformly coated. All information related to the asphalt cement shall be made available to the Contract Administrator upon request.

4.3.2 The asphalt cement shall be heated at the plant to a maximum temperature of 160°C before mixing with the aggregates. In no case shall the temperature of the asphalt and aggregates differ by more than 15°C when placed in the mixing drum.

4.4 Transportation of Asphalt Paving Mix

4.4.1 The mixture shall be transported from the plant to the site in trucks with metal bottoms previously cleaned of all foreign materials. If required, truck boxes shall be lightly coated with a uniform application of a non-petroleum-based asphalt release agent. The release agent shall conform to the Manufacturer's specifications and approved by the Contract Administrator. Excess lubricants shall be removed before trucks are loaded with asphalt. Release agents that adversely affect the quality or performance of the asphalt mix shall not be used.

4.4.2 The trucks shall be suitably insulated, as required. Each vehicle shall be equipped with a tarpaulin or other suitable covering material of sufficient size to overhang the truck box on three sides when the vehicle is fully loaded. Such tarpaulins shall be on the truck at all times and shall be used to cover the mixture completely as directed by the Contract Administrator.

5. EQUIPMENT

5.1 General

5.1.1 All equipment shall be of a type approved by the Contract Administrator. The equipment shall be in good working condition for the duration of the Contract.

5.2 Prime/Tack Coat Distributors

5.2.1 For main lane paving, prime/tack coat shall be applied using self-propelled or tow-along pressure distributors capable of applying the product at the specified rate and in a continuous and uniform manner both longitudinally and transversely for the full lane width.

5.2.2 The distributors shall be equipped with a volume metering system of sufficient sensitivity to measure the quantity of tack/prime coat. The metering system shall be calibrated annually and all the certifications shall be made available to the Contract Administrator upon request. The distributors shall contain a thermometer for measuring the temperature of the tank contents.

5.2.3 All nozzles shall be set in the spray bar such that the nozzle slots make an angle between 15° to 30° with the longitudinal axis of the spray bar. Clogged nozzles shall be removed and cleaned with solvent before being used.

5.2.4 The use of a hand-held pressure applicator is acceptable only for prime/tack coating of small or irregularly shaped areas such as cuts, approaches, etc.

5.3 Mechanical Pavers

5.3.1 Asphalt pavers shall be self-propelled and capable of laying a consistent lift which is true to the specified geometrics, cross-section and alignment. Pavers shall be equipped with hoppers and distributing screws capable of placing the hot mix evenly in front of the screeds.

5.3.2 Asphalt pavers shall be equipped with automatic longitudinal and transverse grade and slope controls which are capable of being operated from either side of the paver. The longitudinal grade control shall be readily adjustable for lift thickness in small increments without the necessity of stopping the paver.

5.3.3 The use of any paver that is experiencing difficulty in achieving a consistent and smooth lift in conformance with this Specification shall be discontinued until the Contractor demonstrates suitable corrective measures.

5.4 Rollers

5.4.1 A rolling pattern shall be established and submitted by the Contractor to the Contract Administrator for approval before paving. The Contract Administrator shall approve any deviation from the rolling pattern during construction.

5.4.2 The Contract Administrator shall be provided with the mass of the rollers and may require they be weighed.

5.4.3 Rollers shall be classified into categories in accordance with Table CW 3410.6.

Table CW 3410.6: Roller Classifications

Type	Description	Classification	Minimum Mass, tonnes
Class S	Self-propelled steel-drum roller	S1	7
		S2	9
Class R	Self-propelled pneumatic-tired rollers Or Self-propelled combination roller	R1	8
		R2	15
Class V	Self-propelled vibratory roller	V1	4
		V2	5.2
		V3	5.8

5.4.4 Rollers shall be equipped with an automatic device that prevents the drum from vibrating unless the roller is moving and shall automatically halt vibration before coming to a stop. Frequency of vibration shall not be less than 2200 per minute. Vibration should not be used where there is potential to damage services and structures, or cause nuisance complaints as directed by the Contract Administrator.

6. CONSTRUCTION METHODS

6.1 General

6.1.1 All construction methods shall conform to this Specification, except as otherwise approved by the Contract Administrator.

6.2 Preparation of Base Course for Asphalt Pavement

6.2.1 General

6.2.1.1 Placing of the asphalt mixture shall not commence until the construction of the sub-grade, sub-base and Base Course has been completed in accordance with the requirements of Specification CW 3110, and the installation of pavement and boule-vard structures and appurtenances has been completed to the satisfaction of the Contract Administrator.

6.2.1.2 Where Base Course has raveled, the loose material shall be removed or recompacted to a uniform surface.

6.2.2 Prime Coat

6.2.2.1 Application of prime coat shall consist of flushing the final accepted Base Course layer with diluted emulsified asphalt. Use an equal volume of water to dilute the emulsified asphalt unless otherwise specified by the Contract Administrator. Surfaces to be prime coated shall be free of standing water and contamination, such as mud, loose aggregate, or debris.

6.2.2.2 The application rate of undiluted prime shall be between 0.5 to 1.0 L/m^2 and shall be approved by the Contract Administrator.

6.2.2.3 Prime coat shall be placed with sufficient time to cure prior to paving. Asphalt mix shall not be placed on prime coated areas until the prime coat is fully cured for a minimum of eight (8) hours and until prime coat cannot be tracked by foot traffic and tires. Paving and construction equipment shall not be permitted onto the prime coat until it has fully cured and set. Traffic shall not be permitted on the prime coat.

6.2.2.4 Prime coat shall be visually uniform. Prime coat shall be reapplied to areas of insufficient or non-uniform coverage. A hand spray can be used to apply prime coat to areas missed or inaccessible by the distributor. When prime coating is performed using hand spray, the visual appearance of such areas shall be consistent with the adjacent areas.

6.2.2.5 Prime coat shall not be applied when the weather is foggy or rainy or when the ambient temperature is less than 0°C. If the ambient temperature is less than 0°C as forecast by the nearest official meteorological office, the product used for prime coat shall be approved by the Contract Administrator.

6.2.2.6 Before applying the prime coat, the surface shall be flushed with water to create optimal conditions for adhesion, absorption control, and overall effectiveness of the prime coat and shall be approved by the Contract Administrator.

6.2.2.7 After curing, if any excess primer remains on the surface, the Contractor shall apply an approved sand where necessary to blot up the excess prime. The sand cover, where used, shall consist of clean, granular, mineral material approved by the Contract Administrator, all of which shall pass a 4.75 mm sieve. Only sufficient sand shall be spread to blot up excess prime and such areas shall be broomed to remove the excess sand prior to paving.

6.2.2.8 Prime coat shall be inspected and approved by the Contract Administrator before any asphalt is placed. Otherwise the asphalt shall be rejected by the Contract Administrator and shall be removed by the Contractor at his own expense.

6.2.2.9 When traffic flow must be maintained, prime coat shall be applied to one direction of the roadway at a time. No prime coat shall be applied to the other direction of the roadway until the first direction has cured to accommodate vehicular traffic.

6.3 Preparation of Asphalt or Portland Cement Concrete Pavement for Asphalt Overlay

6.3.1 Asphalt Surface Pavement

6.3.1.1 A layer of the existing asphalt surface course shall be removed to such depth as is specified on the Drawings or as directed by the Contract Administrator. This work will be done and paid for in accordance with Specification CW 3450.

6.3.1.2 If the entire existing asphalt overlay is removed to the existing portland cement concrete pavement, the preparation of the existing Portland cement concrete pavement for asphalt overlay shall be in accordance with Section 6.4 of this Specification.

6.3.1.3 If the surface remaining after the removal of the specified layer of asphalt surface course is asphalt, the Contractor shall proceed to fill any remaining holes and depressions with asphalt paving mixture and compact these areas with a steel wheel roller before paving. The asphalt surface upon which the asphalt overlay is to be placed shall be approved by the Contract Administrator prior to placing asphalt.

6.3.1.4 At the locations designated on the Drawings and at any other locations designated by the Contract Administrator, the Contractor shall adjust existing structures and appurtenances, reconstruct sections of curb, seal all cracks and do other repair works as required. The adjustment of existing structures and appurtenances shall be done and paid for in accordance with Specification CW 3210, and the curb renewal, crack

sealing and other repair works shall be done and paid for in accordance with Specifications CW 3230, CW 3240, and CW 3250.

6.3.2 **Portland Cement Concrete Pavement Surface**

6.3.2.1 At the locations designated on the Drawings and at any other locations designated by the Contract Administrator, the Contractor shall adjust existing structures and appurtenances, reconstruct sections of concrete pavement, reconstruct sections of curb, seal all joints and cracks and do other repair works as required. The adjustment of existing structures and appurtenances shall be done and paid for in accordance with Specification CW 3210, and the pavement reconstruction, curb renewal, joint and crack sealing and other repair works shall be done and paid for in accordance with Specifications CW 3230, CW 3240, and CW 3250.

6.3.3 Tack Coat

6.3.3.1 Application of tack coat shall consist of flushing the final accepted surface with undiluted emulsified asphalt. Surfaces to be tack coated shall be free of standing water and contamination, such as mud, loose aggregate, or debris.

6.3.3.2 Tack coat shall be applied following the application rate in accordance with Table CW 3410.7, unless otherwise specified by the Contract Administrator.

Table CW 3410.7: Application Rate for Tack Coat

Surface Type	Application Rate, L/m^2	Max Allowable Tolerance, L/m^2
New Asphaltic pavement	0.25	0.03
Old Asphaltic pavement, Portland Cement Concrete, Milled Surface	0.35	0.05

6.3.3.3 Tack coat shall be placed with sufficient time to break prior to paving. Asphalt mix shall not be placed on tack coated areas until the tack coat is broken for a minimum of three (3) hours or until tack coat cannot be entirely tracked by foot traffic and tires. If trackless tack is used, the breaking time can be reduced in accordance with the manufacturer's specifications unless otherwise specified by the Contract Administrator. Paving and construction equipment shall not be permitted onto the tack coat until it has broken. Traffic shall not be permitted on the tack coat.

6.3.3.4 Tack coat shall be visually uniform. Areas of insufficient or non-uniform tack coat coverage shall be re-sprayed. Hand spray can be used to apply tack material to areas missed or inaccessible by the distributor including curb areas attached to the asphalt.

When tack coating is performed using hand spray, the visual appearance of such areas shall be consistent with the adjacent areas of machine applied material.

6.3.3.5 Tack coat shall not be applied when the weather is foggy or rainy or when the ambient temperature is less than 5°C. If the ambient temperature is less than 5°C as forecast by the nearest official meteorological office, the product used for tack coat shall be approved by the Contract Administrator.

6.3.3.6 Tack coat shall be inspected and approved by the Contract Administrator before any asphalt is placed. Otherwise the asphalt shall be rejected by the Contract Administrator and shall be removed by the Contractor at his own expense.

6.4 Placing Asphalt Paving Mixture

6.4.1 General

6.4.1.1 The Contract Administrator shall approve the surface upon which new asphalt is to be placed before paving operations may begin.

6.4.1.2 The mixture shall be delivered to the job and placed at a temperature that allows for proper compaction, taking into consideration the weather conditions, the temperature of the surface on which the mixture is to be placed, and the thickness of the lift. In no case shall the asphalt mixture be placed at a temperature lower than the values specified in Table CW 3410.8.

Table CW 3410.8: Limits for Asphalt Mixes Temperatures

Asphalt Type	Temperature for Asphalt before Placing, °C		Minimum Temperature During Rolling, °C
	Minimum	Maximum	
HMA	125	160	90
WMA	115	155	80

6.4.1.3 Unless otherwise permitted by the Contract Administrator, the mixture shall be spread by means of a mechanical self-powered paver capable of spreading the mixture true to the line, grade and crown required.

6.4.1.4 Pavers shall be equipped with hoppers and distributing screws of the reversing type to place the mixture evenly in front of adjustable screeds. The mixture shall be dumped in the centre of the hoppers and care exercised to avoid overloading and slopping over of the mixture upon the base.

6.4.1.5 When laying the mixture, pavers shall operate so as to provide as continuous an operation as possible at a speed of between three meters and six meters per minute. They shall be equipped with a quick and efficient steering device and shall have forward and reverse travelling speeds of not less than 25 meters per minute.

6.4.1.6 Pavers shall be capable of spreading the mixture, without segregation, in thicknesses as specified on the Drawings or approved by the Contract Administrator. Placement widths shall vary from a minimum of 1.5 meters to a maximum of 4.5 meters unless approved by the Contract Administrator. They shall be equipped with blending or joint levelling devices for smoothing and adjusting all longitudinal joints between strips or courses of the same thickness. Pavers shall be equipped with screeds.

6.4.1.7 The term screed includes any strike-off device operated at workable temperature without tearing, shoving or gouging the finished surface.

6.4.1.8 The minimum and maximum thickness of a compacted lift for reconstruction shall be in accordance with Table CW 3410.9, unless otherwise specified by the Contract Administrator.

Table CW 3410.9: Lift Thicknesses

Mix Type	Thickness, mm	
	Minimum	Maximum
MS1	35	55
MS2	50	75
MS3	25	40
SP1	35	55
SP2	50	75

6.4.1.9 No construction traffic shall travel on the finished surface until the surface has cooled to a temperature of 60°C or less.

6.4.2 Main Line Paving

6.4.2.1 Main line paving shall include the placement of bottom and top lifts for asphalt pavements and overlays utilizing mechanical pavers with automatic grade control for:

6.4.2.1.1 All through and parallel turning lanes greater than 15.0 meters in length;

6.4.2.1.2 Other lanes greater than 15.0 metres in length; and,

6.4.2.1.3 Intersections through which the main line continues.

6.4.2.2 Main line paving with mechanical pavers shall utilize automatic grade control, except for:

6.4.2.2.1 Intersections through which the main line continues and where traffic must be maintained; and,

6.4.2.2.2 The side of the paver adjacent active traffic.

6.4.2.3 Hand placement shall be minimized. Hand placed asphalt shall be spread and compacted to match the finished grade to the satisfaction of the Contract Administrator.

6.4.3 Tie-Ins and Approaches

6.4.3.1 Tie-Ins and approaches shall include the placement of leveling and surface courses for pavements and overlays for all areas other than main line paving lanes. This includes intersecting side streets to the main road under construction except as noted in Section 6.4.2 of this specification, intersection turnouts, right turn cut-offs, median openings, and private approaches. Tie-ins include miscellaneous asphalt for temporary ramping, sidewalk in-fill and isolations.

6.4.3.2 Tie-Ins and approaches shall utilize mechanical pavers where possible with or without automatic grade control, or hand methods as approved by the Contract Administrator.

6.4.3.3 Hand placement shall be minimized. Hand placed asphalt materials shall be spread and compacted to match the finished grade to the satisfaction of the Contract Administrator.

6.4.4 Weather Limitations

6.4.4.1 Asphalt shall be laid upon a surface which is dry, clean and free from standing water, and only when weather conditions are suitable in accordance with Table CW 3410.10.

Table CW 3410.10: Minimum Placement Temperature for Asphalt

Asphalt Type	Location	Lift Thickness, mm	Temperature*, C°	
			Wind Speed, km/hr > 10	Wind Speed, km/hr ≤ 10
HMA	Top Lift	< 50	10°C	6°C
		≥ 50	8°C	6°C
	Other than top lift	> 50	2°C	2°C
WMA	Top Lift	< 50	4°C	0°C
		≥ 50	2°C	0°C

	Other than top lift	> 50	0°C	-2°C

*Temperature shall be based on the nearest official meteorological office. The Contract Administrator may confirm the temperature by measuring the temperature in the shade and 150 mm above the surface.

6.4.4.2 Asphalt shall be placed on unfrozen material, free of water, snow, and ice. Frozen material will be identified by measuring the surface temperature using infrared thermometers or similar devices. If the surface temperature is less than or equal to 0°C, the material will be considered frozen. The Contractor shall use suitable heating methods to maintain the surface temperature above 0°C. Salt shall not be used to thaw ice, snow, or frost.

6.4.4.3 Paving shall not be permitted while there is frost within 750 mm of the surface upon which the asphalt is to be placed. Asphalt shall only be laid under conditions that the Contract Administrator determines to be conducive to obtaining the specified results.

6.4.4.4 Notwithstanding the above, when weather conditions are unfavourable, or are likely to become unfavourable, paving operations shall be suspended.

6.5 Joints

6.5.1 General

6.5.1.1 Joints shall be smooth, well bonded and tightly sealed. Joints shall conform smoothly and accurately to adjacent pavement surfaces such that when tested with a 3-metre straight edge placed across the joint the distance between the straight edge and the surface of the pavement shall not exceed 5 mm at any point.

6.5.1.2 When matching a compacted joint, the depth of the uncompacted lift shall be set to allow for compaction. The paver screed shall overlap the adjoining lift by no more than 25 mm.

6.5.1.3 On straight sections the joint line shall not deviate from a straight line by more than 75 mm at any point. On curved or tapered sections, the joint shall be shaped so as to be as smooth as possible. Jagged, stepped or wandering edges shall be reshaped to a smooth line, to the satisfaction of the Contract Administrator, before the adjacent lift is laid.

6.5.2 Location of Joints

6.5.2.1 The location of joints shall be subject to the approval of the Contract Administrator and shall conform to the following requirements:

6.5.2.1.1 Longitudinal joints shall not be located within 150 mm of a longitudinal joint in any underlying pavement structure.

6.5.2.1.2 Transverse joints shall not be located within two (2) meters of any other transverse joint in the same paving course or within one (1) meter of a transverse joint in any underlying pavement structure.

6.5.2.2 Longitudinal cold joints are to be avoided wherever possible. Transverse joints shall be established with sufficient frequency to allow the full width of the paving course to be placed in a single shift. No paving lane shall progress more than 500 m beyond the end of an adjacent paving lane in the same course without the prior approval of the Contract Administrator.

6.5.3 Preparation of Joints

6.5.3.1 Hot Joints

6.5.3.1.1 Hot joints shall be considered to be those longitudinal joints between adjacent mats in which the previously laid lift retains sufficient heat, above 90 °C for HMA and 75 °C for WMA, to facilitate good bonding and sealing of the joint. The edge of the previously laid lift shall be inspected prior to laying the new mat. Any areas not conforming to line and grade or having a rounded-off top corner shall be cut out to the full depth of the lift to a minimum width of 100 mm and replaced with fresh material and compacted when laying the new mat.

6.5.3.2 Cold Joints

6.5.3.2.1 Cold joints shall be considered to be those longitudinal and transverse joints where the existing adjacent pavement lift is at or below 90 °C. Transverse joints shall be cut back to a straight line for the full depth and width of the mat. The transverse joint shall be cut back to a location such that the pavement immediately before the joint, where checked with a 3-metre straight edge, exhibits no tapering or rounding.

6.5.3.2.2 Longitudinal edges of existing mats shall be inspected before laying the new mat. Any areas not conforming to line and grade shall be cut out full depth to a minimum width of 150 mm and replaced with fresh material and compacted when laying the new mat. Any areas with a rounded corner shall be removed to the full depth of the lift to form a vertical face with a vertical face.

6.5.3.2.3 Joints against existing asphalt pavements shall be prepared by saw cutting, cold planing or other method(s) approved by the Contract Administrator, such that the face of the existing pavement is vertical with a square corner.

6.5.3.2.4 All contact surfaces of cold joints shall be painted with a uniform coat of tack before the new asphalt is placed against them.

6.5.4 Construction of Joints

6.5.4.1 Fresh asphalt shall not be placed against the existing lift until the joint preparation has been completed in accordance with 6.5.3 and is approved by the Contract Administrator.

6.5.4.2 For asphalt reconstructions, longitudinal joints shall be prepared in accordance with Section 6.5.3.2 unless the Contractor maintains joint temperatures that meet the requirements of Clause 6.5.3.1.1 at the time the adjacent mat is placed. Acceptable methods to maintain hot joint conditions include, but are not limited to, echelon paving, staggered paving operations, or the use of infrared joint heating equipment, subject to approval of the Contract Administrator.

6.5.4.3 For pavements with an asphalt overlay on residential local streets and public lanes, or where otherwise specified by the Contract Administrator, cutting of longitudinal joints is not required where paving is completed as a continuous operation within the same day. Where paving is completed on separate days, longitudinal joints shall be cut unless pavement repair fabric is used, subject to approval of the Contract Administrator.

6.5.4.4 The fresh lift shall be laid to an elevation such that, when compacted, it will conform accurately to the grade of the existing pavement. Wherever practicable, this shall be done using mechanical pavers.

6.5.4.5 Joints shall always be rolled before the remainder of the mat. Wherever practicable the joint shall be rolled with the roller travelling parallel to the joint and with a minimum of seventy-five (75%) percent of the width of the main roller(s) supported on the existing mat.

6.6 Asphalt Patching

6.6.1 Remove and replace existing asphalt pavements adjacent to proposed or renewed sidewalks and concrete approaches for grade adjustment to ensure drainage and rideability are maintained. Areas to be considered as asphalt patches shall be less than

1.5 meters in width. The locations requiring asphalt patching shall be shown on the Drawings or as directed by the Contract Administrator.

6.6.2 The Contractor shall saw cut the asphalt pavement full-depth along the limits designated. The asphalt pavement shall be removed and disposed of in accordance with CW 3110. Upon removal of asphalt, the existing base materials shall be levelled and compacted. The asphalt shall match the thickness of the existing pavement. The material shall be placed and compacted by acceptable methods in accordance with Clause 6.7 of this specification to the satisfaction of the Contract Administrator.

6.6.3 All costs incurred for asphalt removal, compaction of existing base materials and placement of Base Course and asphalt materials shall be included in the unit price for "Construction of Asphalt Patches"

6.7 Compaction of Asphalt Paving Mixture

6.7.1 General

6.7.1.1 A rolling pattern shall be established by the Contractor and approved by the Contract Administrator. The Contract Administrator shall approve any deviation from the rolling pattern.

6.7.1.2 The minimum number of rollers is identified in Table CW 3410.11.

Table CW 3410.11: Maximum Rates Per Paver and Roller Sequence

Asphalt Placement, tonnes/hr	Minimum Roller Combinations per Paver Breakdown + Intermediate + Finish*
≤ 100	S2 + R1 +S1 V1 + R1 + S1
> 100	S2 + 2 x R1 + S1 S2 + R2 + S1 V2 + 2 x R1 +S1 V2 + R2 + S1

*No vibration shall be used when paving bridge decks. If Class V rollers are used, they shall be in static mode. The V3 roller can be used as a substitute for the V2 roller.

6.7.1.3 The operating speed of rollers shall not exceed 5 km/hr and shall be slow enough to avoid undue displacement of the asphalt. Rollers shall operate with the drive wheel forward in the direction of paving.

6.7.1.4 Any displacement occurring as a result of reversing the direction of the roller or any other cause shall be corrected. Rolling shall proceed continuously until all roller marks

are eliminated and no further compression is possible. To prevent adhesion of the mixture to the roller, the wheels shall be kept properly moistened with water, limewater, or an approved detergent. Excess moisture will not be permitted.

6.7.2 Rolling procedures

6.7.2.1 Compaction of the paving mixture shall consist of three (3) separate rolling operations as follows:

6.7.2.1.1 Breakdown rolling: Rolling shall start longitudinally at the sides and proceed toward the centre of the pavement overlapping on successive passes by at least 150 mm. Breakdown rolling shall consist of at least two complete coverages by the roller. Delays in rolling freshly placed asphalt shall not be permitted.

6.7.2.1.2 Intermediate rolling shall immediately follow breakdown rolling. Passes shall be arranged to ensure overlapping successive tire paths. The rolling operation shall prevent pick-up of the mixture on the tires.

6.7.2.1.3 Final rolling shall be undertaken while the paving mixture is still warm enough to eliminate roller marks. Where the width permits, the asphalt shall be rolled diagonally in two directions, the second diagonal rolling crossing the first rolling direction. Final rolling shall start longitudinally at the high edge and proceed towards the lower edge of the mat. Final rolling shall be continue until there is no evidence of consolidation.

6.8 Compaction of Irregular Areas

6.8.1 Along curbs, manholes and similar structures and at all places not accessible to rollers, compaction shall be performed by plate compactors to the satisfaction of the Contract Administrator. All joints around these structures shall be effectively sealed.

6.8.2 The asphalt may be heated to a maximum temperature of 120°C to facilitate the compaction where approved by the Contract Administrator.

6.9 Requirements After Final Rolling

6.9.1 After final rolling the surface of each lift shall be smooth and true to the established crown and grade. Any low or defective spots shall be remedied by milling to a minimum depth of 40 mm or as directed by the Contract Administrator, and replacing it with a fresh mixture.

6.9.2 The corrected area shall have a smooth transition to the surrounding pavement without negatively affecting any adjacent sections, impairing the functionality and the service life of the area.

6.10 Filling of Core Holes

6.10.1 Where cores are collected, the Contractor shall patch each core hole immediately with an approved cold asphalt product.

6.10.2 The patch shall be finished flush with the surface. Immediately before filling, the surface of each hole shall be thoroughly cleaned to ensure a proper bond. After filling each hole, all excess material shall be removed from the surface.

6.10.3 Where HMA or WMA are not available, use only those materials listed as Approved Products for Surface Works. The Approved Products are available in Adobe Acrobat (.pdf) format at the City of Winnipeg, Corporate Finance, Material Management Internet site at:
https://legacy.winnipeg.ca/matmgt/spec/default.stm

6.11 Surface Tolerance

6.11.1 The surface of the asphalt pavement shall be checked with a 3-metre straight edge and be within ± 5 mm from the surrounding area. Areas that do not meet these tolerances shall be corrected to the satisfaction of the Contract Administrator.

6.11.2 Where the posted speed limit is greater than 60 km/hr, the Contract Documents shall identify smoothness requirements for longitudinal profile of the pavement surface. The smoothness requirements shall be approved by the City of Winnipeg, Research and Standards Engineer.

6.12 Opening to Traffic

6.12.1 In no case shall traffic or construction equipment be allowed on the asphalt pavement until completion of quality assurance testing by the Contract Administrator and until the completed pavement has cooled to atmospheric temperature or to such other temperature, as may be approved by the Contract Administrator, that will ensure no deformation of the pavement surface under traffic loading.

6.12.2 The Contract Administrator's decision as to when the pavement will be opened to traffic shall be final. Prior to opening to traffic, the pavement shall be clean and free of aggregates or other deleterious materials on the surface.

7. QUALITY ASSURANCE

7.1 General

7.1.1 Tests used for purposes of assessing compliance with this specification or for acceptance of any products shall be conducted by a certified laboratory approved by the City of Winnipeg, Research and Standards Engineer.

7.1.2 Field sampling and testing of asphalt shall be performed by a certified person.

7.1.3 The Contract Administrator shall be allowed access to all sampling locations and reserves the right to request quality assurance sample(s) at any time.

7.1.4 Samples shall be protected during transportation from any exposure to adverse conditions.

7.1.5 If any sample shows distinct evidence of improper sampling, handling, or testing, the test shall be disregarded and a new sample shall be collected.

7.1.6 Testing in addition to the requirements of this Specification shall be as directed by the Contract Administrator.

7.2 Testing Frequency

7.2.1 Asphalt shall be sampled for acceptance in accordance with Table CW 3410.12.

Table CW 3410.12: Frequency of Sampling and Testing of Asphalt

Asphalt Type	Quantity (tonnes)	Minimum Frequency
MS1, MS2	< 150 150 - 300 > 300	2 tests/day 3 tests/day 2 test/150 tonnes
MS3	< 50 50 - 100 > 100	1 test/day 2 tests/day 2 test/100 tonnes
SP1, SP2	--	2 tests/150 tonnes

7.2.2 Additional testing shall be as directed by the Contract Administrator.

7.2.3 Copies of all test results shall be sent to the City of Winnipeg, Research and Standards Engineer and to the Contract Administrator.

7.2.4 Copies of asphalt plant scale tickets shall be provided to the Contract Administrator.

7.3 Acceptance Criteria

7.3.1 The Contractor shall reimburse the City for any additional costs the City incurs as a result of failed tests.

7.3.2 Where the work is not funded or administered by the City of Winnipeg or their representative, the party approved by the City of Winnipeg to execute the work will be responsible for making pay adjustments to the City of Winnipeg.

7.3.3 All corrective actions shall be performed at the Contractor's expense.

7.3.4 Acceptance of asphalt shall be based on the following:

7.3.4.1 Visual Inspection:

7.3.4.1.1 The Contract Administrator may reject visually defective asphalt areas based on, but not limited to the following defects: flushing, bleeding, segregation, fat spot, surface damage, and surface contamination. Such defective areas shall be removed and replaced at the Contractor's expense.

7.3.4.2 Bituminous Mix Properties:

7.3.4.2.1 Air Voids: If the measured air voids fall outside the limits specified in Clause 3.3 of this Specification, the Contract Administrator shall apply a payment adjustment in accordance with Table CW 3410.13 against the entire Lot represented by the failed test(s).

TABLE CW 3410.13 – Payment Adjustment for Air Voids

Asphalt Type	Average of the Failed Tests	Percent of Price Reduction %
MS1, MS2, MS3 SP1, SP2	≤ 0.5%	0.0
	0.5% to 1%	0.0*
	> 1%	Remove and replace at Contractor's expense

*Paving shall be suspended until necessary adjustments are made and approved by the Contract Administrator.

7.3.4.2.2 Voids in Mineral Aggregate (VMA): If the measured voids in mineral aggregate falls outside the limits specified in Clause 3.3 of this Specification, the Contract Administrator shall apply a payment adjustment in accordance with Table CW 3410.14 against the entire Lot represented by the failed test(s).

TABLE CW 3410.14 – Payment Adjustment for Voids in Mineral Aggregate

Average of the Failed Tests	Percent of Price Reduction %
≤ 0.5%	0.0
0.5% to 1%	0.0*
1% to 2%	
> 2%	Remove and replace at Contractor's expense

*Paving shall be suspended until necessary adjustments are made and approved by the Contract Administrator.

7.3.4.2.3 Asphalt Cement Content: If the measured asphalt cement content falls outside the limits specified in Clause 3.3 of this Specification or if it exceeds the allowable deviation for the JMF specified in Table CW 3410.5, the Contract Administrator shall apply a payment adjustment in accordance with Table CW 3410.15 against the entire Lot represented by the failed test(s).

TABLE CW 3410.15 – Payment Adjustment for Asphalt Cement Content

Average of the Failed Tests	Percent of Price Reduction %
≤ 0.15%	0.0
0.15% to 0.5%	0.0*
> 0.5%	Remove and replace at Contractor's expense

*Paving shall be suspended until necessary adjustments are made and approved by the Contract Administrator.

7.3.4.2.4 Gradation: If the gradation falls outside the limits specified in Table CW 3410.1 or if it exceeds the allowable deviation for the JMF specified in Table CW 3410.5, the Contract Administrator shall apply a payment adjustment in accordance with Table CW 3410.16 against the entire Lot represented by the failed test(s).

TABLE CW 3410.16 – Payment Adjustment for Gradation

Percent Passing Outside the JMF for Each Sieve	Percent of Price Reduction %

19, 16, 12.5, 9.5	4.75, 2.36, 1.18, 0.6, 0.15	0.075	
<2	<1	-	0.0
2-4	1-2	<1	0.0*
> 4	> 2	≥ 1	Remove and replace at Contractor's expense

*Paving shall be suspended until necessary adjustments are made and approved by the Contract Administrator.

7.3.4.3 Density:

7.3.4.3.1 Density testing shall be conducted at least once every 150 m^2. The Contract Administrator shall ensure that the density tests cover the full width of the construction area.

7.3.4.3.2 An area is deemed unacceptable if the compaction does not meet all of the following:

7.3.4.3.2.1 The average density results shall be between 93% and 95% of the theoretical maximum density; and,

7.3.4.3.2.2 No individual location shall be less than 90% or higher than 98% of the theoretical maximum density.

7.3.4.3.3 Nuclear density test gauge results shall be used to assess in-place density. When density test results do not meet the minimum percent density specified herein, a coring and testing program can be undertaken to verify density percentage of the mix by Core Density Testing. If core density results confirm the Nuclear density results, the Contractor shall reimburse the City for any additional costs associated with coring, transmittal of cores, filling of cores and testing the City incurs as a result of failed tests.

7.3.4.3.4 The Contract Administrator shall apply a payment adjustment in accordance with Table CW 3410.17 against the entire lot represented by the failed test(s).

TABLE CW 3410.17 – Payment Adjustment for Density

Average of the Density Tests	Percent of Price Reduction %

> 98%	Remove and replace at Contractor's expense
97.9% to 97.1%	0%*
97% to 93%	0%
92.9% to 90%	0%*
< 90%	Remove and replace at Contractor's expense

*Paving shall be suspended until necessary adjustments are made and approved by the Contract Administrator.

7.3.4.4 Segregation and Surface Defects

7.3.4.4.1 Surface defects include but are not limited to: gouges, slippage, cracking, tearing, pocketing, blistering, shoving, wash boarding, surface depressions or surface defects shall be repaired to the satisfaction of the Contract Administrator.

7.3.4.5 Asphalt Thickness:

7.3.4.5.1 A Lot is deemed unacceptable if the asphalt thickness does not meet all of the following:

7.3.4.5.1.1 The average thickness is less than the required thickness; and,

7.3.4.5.1.2 No individual thickness shall be less than 90% of the required thickness.

7.3.4.5.2 The Contract Administrator shall apply a payment adjustment in accordance with Table CW 3410.19 against the entire Lot represented by the insufficient thickness.

TABLE CW 3410.19 – Payment Adjustment for Pavement Thickness

Average Thickness	**Percent of Price Reduction %**
Less than specified thickness but more than 90% of specified thickness	0.0*
Less than 90% of specified thickness	Remove and replace at Contractor's expense

*Paving shall be suspended until necessary adjustments are made and approved by the Contract Administrator.

8. MEASUREMENT AND PAYMENT

8.1 Construction of Asphalt Pavement

8.1.1 Construction of asphalt pavement will be measured and paid for at the Contract Unit Price per tonne for the "Items of Work" listed here below, measured as specified herein, which price shall be payment in full for supplying all materials and performing all operations herein described and all other items incidental to the work included in this Specification.

Items of Work:

i. Construction of Main line Paving (*)"
ii. Construction of Tie-ins and Approaches (*)

* Specify either MS1, MS2, MS3, SP1, or SP2

8.1.2 The weight to be paid for shall be the total number of tonnes placed and compacted in accordance with this Specification and accepted by the Contract Administrator, as measured on a certified weigh scale.

8.2 Construction of Asphalt Patches

8.2.1 Construction of asphalt patches will be measured and paid for at the Contract Unit Price per square meter for "Construction of Asphalt Patches", measured as specified herein, which price shall be payment in full for supplying all materials and performing all operations herein described and all other items incidental to the work included in this Specification.