



City of Estevan

Construction Specifications

SECTION 2320
ASPHALTIC CONCRETE PAVEMENT

1.0 GENERAL

This section governs the requirements for the supply and placement of Asphaltic Concrete pavement.

2.0 MATERIALS

2.1 Aggregate

Shall consist of hard, durable, uniformly graded, crushed gravel free of organic or soft materials, materials that break up when alternately frozen and thawed or wetted and dried, or other deleterious materials. The blended aggregate shall conform to the Section 1090 - Granular Materials and Aggregates.

The maximum aggregate size for type of roadway and nature of work shall be in accordance with the following table:

<u>Type of Road</u>	<u>Nature of Paving</u>	<u>Maximum Aggregate Size</u>
Local/Residential	Surface Course	12.5mm or 16.0mm
Collector/Bus Route	Surface Course	16.0mm
Arterial/Industrial	Surface Course	16.0mm or 20.0mm
Local/Residential	Resurfacing	12.5mm
Collector/Art./Indust.	Resurfacing	16.0mm or 20.0mm

2.2 Mineral Filler

When the mineral aggregate is deficient in mineral filler, add in the weigh hopper of the asphalt plant, mineral filler in such quantities as will be required to meet the gradation of aggregate as specified above. Mineral filler shall consist of Portland Cement, Pozzolan, commercially ground stone dust, or other approved mineral dust. Mineral filler shall have a plasticity index of zero.

2.3 Asphaltic Binder

The asphaltic binder shall be uniform in character, free of water and shall not foam when heated to 175°C and conform to the following specifications.

ASTM CHARACTERISTICS	ASTM TEST METHOD	SPECIFICATIONS 150-200 (A)	
		Min	Max
Penetration, @ 25 C, 100g, 5 seconds	D5	see table below	
Viscosity @ 60 C, Mpa.s	D2171	see table below	
Flash Point (Cleaveland Open Cup), C	D92	205	-----
Thin Film Oven Test Weight Loss, mas %	D1754	-----	1.0
Penetration, @ 25 C, 100g, 5 seconds	D5	50	-----
Ductility: @25 C	D113	100	-----
Solubility in Trichloroethylene, min%	D2042	99.5	-----

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The limits of the viscosity and penetration shall be as follows:

		Limits			
150-200(A)	<u>Viscosity</u>	<u>155</u>	<u>78</u>	<u>50</u>	<u>92</u>
	Penetration	150	150	200	200

2.4 Mix Design

Prior to the commencement of any work, the Contractor shall employ a testing laboratory at his own expense to produce a mix design and recommendations concerning blending of aggregates. The Marshall Method of mix design shall be used in accordance with ASTM Designation D1559 or AASHTO T245, Resistance to Plastic Flow of Bituminous Mixtures Using Marshall Apparatus. The mix, for Minimum 50 Blow Marshall Stability, shall conform to the following criteria:

Local/Residential	5,700 Newtons
Collector/Bus Route	7,000 Newtons
Arterial/Industrial	10,000 Newtons
Minimum Retained Stability	70% of Initial Stability
% Voids of Total Mix	3-5
Minimum V.M.A. (Max. Agg.)	15% (12mm), 14.5% (16mm) 13% (20mm)
Maximum Flow in mm	5
Minimum Flow in mm	2

The retained stability test is to ensure that the asphaltic mix has reasonably good durability. One of the Marshall specimens is soaked in a water bath at 60°C for twenty-four (24) hours. A Marshall stability performed on this specimen shall have retained a minimum of 70% of the initial stability.

Minimum Film Thickness	7.5µm
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Film Thickness shall be determined in accordance with Saskatchewan Highways and Transportation Standard Test Procedure STP 204-19.

Job-Mix Formula

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The job-mix formula shall form the basis to which the hot mix will be compared to determine the acceptance of the aggregate gradation and asphalt cement content. The hot mix shall consist of all asphalt cement and mineral constituents uniformly combined in such proportions as to produce a mixture which conforms to the job-mix formula. The mineral aggregate gradation shall be within the limits as specified in Section 1090 Granular Materials and Aggregates and the maximum permissible variation from the job-mix formula gradation shall be as follows:

20mm sieve	± 5%
16mm sieve	± 5%
12.5mm sieve	± 5%
10mm sieve	± 5%
5mm sieve	± 5%
2mm sieve	± 4%
800µm sieve	± 3%
160µm sieve	± 2%
80µm sieve	± 1.5%

Hot mix asphalt shall not be supplied until the Engineering Services Division gives permission in writing to proceed with a specific job-mix formula. Any changes to the job-mix formula shall require written approval of the Engineering Services Division. The three point moving average of asphaltic binder in the mix shall not vary by more than zero point three percent (0.3%) from the job-mix formula design.

3.0 ASPHALTIC CONCRETE PRODUCTION

3.1 Plant Operation

The asphalt mixing plant shall be capable of producing a uniform mix of designed proportions and to maintain this mix. The plant shall be equipped with screens and bins capable of proportioning by weight or volume and must be accurate. Asphalt binder storage tanks shall be protected from open flame and be equipped with and easily read thermometer.

Temperatures shall be controlled in accordance with the following limits:

Penetration Asphalt	Temp of Dry Aggregate	Asphalt Storage Temperature	Asphaltic Concrete Mix at the Pugmill
150-200(A)	150-165°C	120-150° C	130-155°C

The aggregate, immediately before entering the pugmill, shall not contain more than one-half percent (0.5%) moisture by weight.

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- 3.2 **Quality Control**
 Before commencing hot mix production, the Contractor shall submit to the Engineering Services Division a quality control plan. This plan shall include a testing schedule.

4.0 INSTALLATION

- 4.1 Transport of the asphaltic concrete mix from the mixing plant to the site of the work in vehicles with tight metal bottoms previously cleaned of all foreign materials. Insulate the vehicle when required and cover each load with canvas or other suitable material of sufficient size to protect the mix from weather conditions. Drop in mix temperature from mixing plant to the site of the work shall not exceed 10°C. Lightly lubricate the inside of all vehicles with a thin oil or soap solution prior to loading.
- 4.2 Place the asphaltic concrete mix with a mechanical self-powered spreader capable of spreading the mixture true to line, grade and crown as required. The paver shall be equipped with hopper and reversing type distributing screw to place the mixture evenly in front of adjustable screeds. The paver shall be equipped with an adjustable strike off screed of such design that drag marks will be eliminated and with built-in tamping bars for compaction during spreading.

Do not place asphaltic concrete mix when the air temperature is 2°C and falling Place the asphaltic concrete mixture on a base which has been approved by the Engineering Services Division. Remove all loose and foreign material and water.

- 4.3 Place the mixture and roll to the widths and thicknesses shown on the drawings or as directed by the Engineering Services Division. Minimize the number of longitudinal joints.

Ambient Air Temperature C	Mimumum Spreading Temperature°C for Various Mat Thickness (mm)				
	20	25	40	50	65 and Over
2-5°C				146°	138°
5-10° C			149°	141°	135°
11-15° C		149°	146°	138°	132°
16-20° C	149°	143°	141°	135°	129°
21-27° C	143°	141°	128°	132°	129°
28-32 °C	138°	135°	132°	129°	127°
32° C +	135°	132°	129°	127°	124°

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Place pavement thicknesses greater than 80mm in two lifts. Do not place the second lift over the bottom lift until the temperature of the bottom lift has dropped to 60°C.

- 4.4 Place pavements of 80mm or less thickness in one lift. Before commencing to roll, check the asphalt surface and adjust for variations in depth, irregularities in alignment, grade or cross section, fatty spots or sandy accumulation.
- 4.5 Provide competent workmen to correct variations. Operate the pavers for no more than one day on any lane before paving the adjacent lane.

Maintain a steady supply of hot asphaltic concrete mix to avoid interruptions so that there is no delay in work. Cut back the mat to the graded and compacted area if temperature of an uncompacted area cools below 120°C.

- 4.6 Areas which are inaccessible to the spreading machine may be paved by other methods. Use motor graders or approved types of truck attached spreaders to pave inaccessible or irregularly shaped areas. Keep hand raking to a minimum.
- 4.7 A continuous well-sealed bond is required between old and new surfaces. Paint the contact surface of all longitudinal joints with a thin and uniform coat of hot asphalt prime before placing the new mix. Where the asphaltic concrete material is placed in two layers, longitudinal joints in the two layers shall be staggered by a minimum of 150mm.

When matching a longitudinal joint to a previously laid mat, an overlap of not less than 25mm nor more than 75mm shall be made. The depth of the overlapping mat should be such so that subsequent compaction after rolling will bring the new mat down to the level of the adjacent mat.

- 4.8 Keep rollers in continuous motion while compacting a hot mat to provide uniform compaction. Use competent and experienced personnel to operate rollers.
- 4.9 The motion of the rollers shall be slow enough at all times to avoid displacement of the hot mixture. Any displacement as a result of reversing the direction of the roller, or from any other cause shall be corrected immediately by the use of lutes and fresh mixture when required.

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- 4.10 Where new pavement structure abuts an existing pavement surface that is 100mm thick or greater, cold plane 50mm of existing surface for a distance of a minimum two(2) metres to allow the top lift to be placed across the construction joint. The end of the milled joint shall be providing a straight line across the paved surface with a vertical face to pave to. For existing pavement surfaces less than 100mm thick, saw cutting is acceptable. The finished surface across the joint shall be smooth, such that when a three (3) metre straight edge is placed across the joint, no gaps appear between the straight edge and the pavement edge.
- 4.11 The breakdown rolling shall take place as closely behind the laying machine as the temperature and condition of the mat will allow. Carryout pneumatic tire rolling by adjusting tire pressure such that only light rutting is evident. Complete pneumatic tired rolling before temperature of the mix falls below 95°C.
- 4.12 Use a steel tired roller for final rolling. After final rolling of the surface course, the asphalt surface shall not be superelevated higher than above the lip of the gutter, except on the high side of curves, where it shall be flush with the lip of the gutter. Carry out final rolling until all roller marks are eliminated and no further compaction is possible.
- 4.13 The completed pavement shall have an average density of ninety-eight percent(98%) and in no case shall any individual density test be less than ninety-six percent(96%) of the laboratory compacted density as determined by ASTM D1559 or AASHO T425, Resistance to Plastic Flow of Bituminous Mixtures Using Marshall Apparatus, using a compaction of fifty blows for each face. The intent is that a long term durable product be provided.
- 4.14 Do not allow traffic on the finished surface until it has cooled to 60°C or until permitted by the Engineering Services Division.
- 4.15 Use asphalt spreaders to patch areas 100m² and larger. Ensure that old patches are removed prior to applying a new patch. Mixtures using Marshall Apparatus, using a compaction of fifty blows for each face.
- 4.16 Apply a leveling course, spread and compact to fill all depressions on an existing surface prior to resurfacing.
- 4.17 Apply seal coat in conformance with Section 2310 Asphalt prime, tack and seal coats. Do not allow traffic on the sealed surface until the coat has set and cured.

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5.0 TOLERANCES

The finished surface shall be true to the required profile and cross-section, with a tolerance of ± 5 mm from the required elevations. The finished grade shall neither be consistently high or low from the design grade. The surface shall show no depressions or bumps exceeding 5mm under a straight edge three metres long, placed parallel to the road centre line.

The average asphalt concrete thickness must meet or exceed the required thickness and in no case shall any individual core thickness reduction exceed 5mm.

6.0 MEASUREMENT AND PAYMENT

6.1 The following work items in this section shall be paid in accordance with the Contract Unit Prices, which shall be deemed full compensation for all labour, materials, equipment, supplies, superintendence, overhead and profit for all work incidental to the supply, installation, completion and maintenance during warranty period of the respective items:

- (I) Asphaltic Concrete Surfacing or Resurfacing shall be paid on the basis of measured area in square meters of specified thickness and Marshall Stability of Asphaltic Concrete Surfacing or Resurfacing.
- (II) Asphaltic Concrete Leveling Course shall be paid on the basis of tonnes of hot mix placed, calculated from the weights marked on delivery tickets certified by the Engineering Services Division.

The Contract Unit Price shall be deemed to include all work items in this section incidental to a complete installation.