

PART 1      GENERAL

1.1            Measurement for Payment

- .1            Pavement crack sealing will be measured in linear metres and paid as per bid item 13 – Routing and Sealing Pavement Cracks.

1.2            Submittals

Submit crack or joint sealant manufacturer's product data to the Departmental Representative at least 7 days prior to use.

1.3            Quality Assurance

- .1            The quality assurance laboratory will perform the following to determine acceptability of the work and end product:
  - .1            Evaluate rout width, depth and centering along the crack.
  - .2            Check sealant temperatures at the heating kettle and at application.
  - .3            Test sealant penetration and flow.
- .2            Definitions: For purposes of evaluating rout width, depth and centering accuracy, a lot is equal to a day's production of a sealing crew, or a portion thereof as designated by the Departmental Representative. Each lot will be represented by a series of measurements at a minimum of 40 points in the lot. The compliance percentage each for width/depth ratio and centering accuracy will be the number of points meeting the specified tolerances divided by the total number of points, expressed in percent.
- .3            For each day's production of a sealing crew, a sample of molten sealant will be taken and tested for penetration and flow.

PART 2      PRODUCTS

2.1            Material

- .1            A hot poured rubberized asphalt sealant conforming to physical requirements in ASTM D1190 shall be used. The sole acceptable brand of sealant at this time is Hydrotech 6160. Alternates will not be accepted at time of tender

2.2            Equipment

- .1            Mechanical Router: portable and capable of cutting the pavement surface in a single pass to a width of 40 mm and to a depth of 8 mm. The Contractor shall demonstrate that the router is capable of following meandering cracks and keeping the crack centred within  $\pm 8$  mm of the centre of rout.
- .2            Compressed Air Lance: capable of blowing dry, oil-free compressed air at a minimum line pressure of 690 kPa.
- .3            Melting Kettle: mobile, rubber tired, double jacketed oil bath kettle, using high flash point oil heat transfer medium; with an automatic agitator to continuously stir the sealant during heating; with 2 thermocouple devices to monitor the temperatures of the heating oil and the sealant with temperature indicators which can be read by the Departmental Representative at road level. The temperature readings shall be in Celsius degrees with an accuracy of  $\pm 2\%$ . The use of a direct fired kettle is not



- .2 **Rout Centering along Crack:**  
 Centre of crack shall not be more than 8 mm from the centre of rout.  
 Non-compliance: A lot with a compliance percentage of less than 80% shall be subject to a pay factor equal to 1.25 multiplied by the compliance percentage for centering.
- .3 **Heating Temperature:**  
 At no point in the heating process shall the sealant temperature exceed 205°C.  
 Discard all overheated or burnt sealant.
- .4 **Application Temperature:**  
 The sealant temperature at the time of application shall not be less than 185°C. If the application temperature is less than 185°C, suspend application until sealant temperatures are corrected in the kettle without overheating.
- .5 **Sealant Quality:**  
 When tested according to ASTM D5329, the sealant shall have the following properties:  
 Penetration at 25°C: 90 maximum  
 Flow at 60°C: 5 mm maximum  
 Non-compliance: If the maximum penetration is exceeded, the day's production represented by the failed test shall be subject to the following pay factors:

Penetration at 25°C	Pay Factor
91-92	100.0%
93-94	99.4%
95-96	98.6%
97-98	97.2%
99-100	95.6%
101-102	93.5%
103-104	91.1%
105-106	88.4%
107-108	85.3%
109-110	80.0%
>110	Reject

- .6 The pay factors shall be individually applied, where applicable, to the contract

### 3.4 Rejected Work

- .1 Sealed cracks shall be rejected if there is evidence of poor workmanship or obvious defects, including:  
 Routed crack not filled completely  
 Lack of bond to sides of rout  
 Excessive debris or moisture in the rout  
 Contamination of the sealant  
 Routed crack not filled flush within  $\pm 2$  mm  
 Tracking of uncured sealant  
 Excessive rounding or spalling of the routed edges
- .2 **Repair of Rejected Work**  
 Repair rejected sealed cracks by removing the sealant and resealing the cracks, to the Departmental Representative's satisfaction and at no further cost to the Client.

3.5 Warranty

- .1 Completed and accepted pavement crack sealing shall be guaranteed for a one year period following the date of the Construction Completion Certificate.
- .2 If, during the warranty period, there is evidence of bond failure or of water or material ingress through the crack, remove the sealant, clean the crack and reseal, to the Departmental Representative's satisfaction.

3.6 Cleanup and Opening to Traffic

- .1 Remove excess material and clean up soiled pavement and concrete surfaces within 48 hours after the sealant has properly cured.
- .2 Keep traffic off the newly sealed pavement until the sealant has properly set up and is in no danger of being damaged or pulled out by traffic.
- .3 Repair damage to the sealant caused by traffic and by the Contractor's operations.

END OF SECTION

PART 1 GENERAL

1.1 Submissions

- .1 At least 2 weeks prior to commencing work inform Departmental Representative of proposed source of granular materials and submit a sieve analysis of the material for the Departmental Representative's review.
- .2 Preliminary review of the material as represented by the test results shall not constitute general acceptance of all material in the deposit or source of supply. Materials may be considered unsuitable even though particle sizes are within the limits of gradation sizes required, if particle shapes are thin or elongated or any other characteristic precludes satisfactory compaction, or if the material fails to provide a roadway suitable for traffic. Rejected material will not be paid for. Additional testing may be required if there are any concerns with the proposed aggregate.

1.2 Measurement for Payment

- .1 Granular sub-base shall be measured in tonnes in place by cross section and calculated by average end area method (or) by truck box measurement and charged under bid item 5 – Granular Sub Base Course.

PART 2 PRODUCTS

2.1 Granular Subbase

- .1 Material for the granular subbase shall consist of sound, hard, durable, well graded crushed gravel within the specified limits and shall not contain organic or soft materials, materials that break up when alternately frozen and thawed or wetted and dried, or other deleterious materials. When compacted near the optimum moisture content to an average of 100%, and no one test less than 98%, of the maximum dry density corrected for the stone content as determined by ASTM D698.
- .2 Granular subbase shall meet Alberta Transportation's Designation 2, Class 40 gradation (minus 40 crushed gravel) as shown in Table below.

Sieve Size (mm)	Percent Passing (by weight)
40	100
25	70-94
16	55-85
10	44-74
5	32-62
1.25	17-43
0.63	12-34
0.315	8-26
0.16	5-18
0.08	2-10

PART 3      EXECUTION

3.1      Preparation

- .1      Provide temporary erosion and sedimentation control measures to prevent soil erosion and discharge of soil-bearing water runoff or airborne dust to adjacent properties and walkways, according to requirements of authorities having jurisdiction

3.2      Placing

- .1      The granular subbase shall not be placed until the underlying course has been inspected by the Departmental Representative. The granular material shall be placed in uniform layers not exceeding 150 mm in thickness before compaction. The material shall be placed by mechanical spreaders or deposited in windrows and levelled with suitable equipment.

3.2      Compaction

- .1      All subbase layers shall be compacted in layers near the optimum moisture content to an average of 100%, and no one test less than 98%, of the maximum dry density corrected for stone content as determined by ASTM D698 for the material used.
- .2      During compaction, the moisture content shall be maintained at the optimum moisture content as determined by ASTM D698. If the moisture content exceeds the optimum moisture content the material shall be aerated by mechanical means until the material has dried sufficiently to reach the optimum moisture content. Water shall be added if the moisture content is below optimum.

3.3      Proof Rolling

- .1      For proof rolling use standard roller of 45400 kg gross mass with four pneumatic tires each carrying [11350] kg and inflated to [620] kPa. Four tires arranged abreast with centre to centre spacing of [730] mm maximum.
- .2      Obtain written approval from Departmental Representative to use non-standard proof rolling equipment.
- .3      Proof roll at level in sub-base as indicated.
  - .1      If non-standard proof rolling equipment is approved, Departmental Representative will determine level of proof rolling.
- .4      Make sufficient passes with proof roller to subject every point on surface to three separate passes of loaded tire.
- .5      Where proof rolling reveals areas of defective subgrade:
  - .1      Remove sub-base and subgrade material to depth and extent as directed by Departmental Representative.
  - .2      Backfill excavated subgrade with sub-base material and compact in accordance with this section.
  - .3      Replace sub-base material and compact.
- .6      Where proof rolling reveals areas of defective sub-base, remove and replace in accordance with this section at no extra cost.

3.4 Testing Compaction

- .1 Testing of materials and compaction testing will be carried out by an independent testing company and paid for by the contractor.
- .2 Compaction results shall be based on a minimum of one density test per 1500 square metres of road. Additional tests may be called for by the Departmental Representative as deemed necessary.
- .3 Field density tests shall conform to ASTM D1556, ASTM D2167, or ASTM D2922 for comparison with a maximum density determined according to ASTM D698.

3.5 Tolerances

- .1 The finished surface of the subbase shall conform to grades and shall be within ten (10) mm of elevation as indicated but not uniformly high or low as measured under a straight edge 3.0 m long placed parallel to the centreline. Granular subbase higher than the approved grades shall be cut to the required grades.

3.6 Inspection

- .1 Before acceptance by the Departmental Representative the granular subbase surface shall be true to cross-section and grade and shall conform to the density and bearing ratio requirements specified.

3.7 Protection

- .1 Maintain finished sub-base in condition conforming to this section until succeeding base is constructed, or until granular sub-base is accepted by Departmental Representative.

END OF SECTION

PART 1 GENERAL

1.1 Submissions

- .1 At least 2 weeks prior to commencing work inform Departmental Representative of proposed source of granular materials and submit a sieve analysis of the material for the Departmental Representative's review.
- .2 Preliminary review of the material as represented in the test results shall not constitute general acceptance of all material in the deposit or source of supply. Materials may be considered unsuitable even though particle sizes are within the limits of the gradation sizes required, if particle shapes are thin or elongated or any other characteristic precludes satisfactory compaction or if the material fails to provide a roadway suitable for traffic. Rejected material will not be paid for. The Departmental Representative has the right to request additional testing if there are any concerns with the proposed aggregate.

1.2 Measurement for Payment

- .1 Granular base shall be measured in tonnes in place by cross section and calculated by average end area method (or) truck box measurement of material and charged under bid item 6 – Granular Base Course.

PART 2 PRODUCTS

2.1 Granular Base Course

- .1 Material for the granular base course shall consist of sound, hard, well graded, durable crushed rock or crushed gravel and shall not contain organic or soft, thin, elongated, or laminated materials, materials that break up when alternately frozen and thawed or wetted and dried, or other deleterious materials. When compacted near the optimum moisture content to not less than 100% of the maximum dry density corrected for the stone content as determined by ASTM D698.
- .2 Granular base course shall meet Alberta Transportation Designation 2, Class 25 gradation (minus 25 crushed gravel) as shown in table below:

Sieve Size (mm)	Percent Passing (by weight)
25	100
20	82-97
16	70-94
10	52-79
5	35-64
1.25	18-43
0.63	12-34
0.315	8-26
0.16	5.18
0.08	2-10

- .3 At least 40 percent by weight of material retained on the 5 mm sieve shall have two or more fractured faces.
- .4 The liquid limit shall not exceed 25 and the plasticity index shall not exceed 6 for the portion of material passing the 400 sieve.

### PART 3 EXECUTION

#### 3.1 Preparation

- .1 Provide temporary erosion and sedimentation control measures to prevent soil erosion and discharge of soil-bearing water runoff or airborne dust to adjacent properties and walkways, according to requirements of authorities having jurisdiction.

#### 3.2 Placing

- .1 The existing granular base material shall be inspected by the Department Representative before proceeding with the asphalt works
- .2 The base material shall not be placed until the underlying course has been accepted by the Departmental Representative. The granular material shall be placed in uniform layers not exceeding 150 mm in thickness before compaction. The material shall be placed by mechanical spreaders or deposited in windrows and levelled with suitable equipment.

#### 3.3 Compaction

- .1 Existing base material:
  - .1 If a satisfactory base can be obtained using existing in place materials, then the existing granular base shall be scarified to a depth of 150 mm, moisture conditioned and compacted to 98% of the Maximum Dry Density.
- .2 New base material:
  - .1 Each layer of granular base course shall be compacted near the optimum moisture content to not less than 100% of the maximum dry density corrected for the stone content as determined by ASTM D698 for the material used.
  - .2 During compaction, the moisture content shall be maintained at the optimum moisture content as determined by ASTM D698. If the moisture content exceeds the optimum moisture content the material shall be aerated by mechanical means until the material has dried sufficiently to reach the optimum moisture content. Water shall be added if the moisture content is below optimum.

#### 3.4 Testing Compaction

- .1 Testing of materials and compaction testing will be carried out by an independent testing company and paid for by the contractor.
- .2 Compaction results shall be based on a minimum of one density test per 1500 square metres of road. Additional tests may be called for by the Departmental Representative as deemed necessary.

- .3 Field density tests shall conform to ASTM D1556, ASTM D2167, or ASTM D2922 for comparison with a maximum density determined according to ASTM D698.

3.5 Tolerances

- .1 The finished surface of the granular base course shall conform to grades approved by the Departmental Representative, and shall show no depression more than 5 mm under a straight edge 3.0 m long placed parallel to the road centreline. Granular base course higher than the approved grades shall be cut to the required grades.

3.6 Inspection

- .1 Before acceptance by the Departmental Representative the granular base course surface shall be true to cross-section and grade, shall conform to the density and bearing ratio requirements specified.

3.7 Protection

- .1 Maintain finished base in condition conforming to this Section until succeeding material is applied or until acceptance by Departmental Representative.

END OF SECTION

PART 1      GENERAL

1.1          Measurement for Payment

- .1          No separate payment shall be made for Asphalt Tack Coating. Asphalt Tack Coating shall be considered incidental to Asphalt pavement work and shall be incorporated into the unit price for Bid Item 7 Asphalt Paving with Tack Coat and Prime Coat.

1.2          Quality Assurance

- .1          Upon request from Departmental Representative, submit manufacturer's test data and certification that asphalt tack coat material meets requirements of this Section.

PART 2      PRODUCTS

2.1          Material

- .1          Asphalt material: to CAN/CGSB-16.1, grade: MC-30/70
- .2          Anionic emulsified asphalt: to CAN/CGSB-16.1, grade: SS-1
- .3          Water: clean, potable, free from foreign matter.

2.2          Equipment

- .1          Pressure distributor to be:
  - .1          Designed, equipped, maintained, and operated so that asphalt material can be:
    - .1          Maintained at even temperature
    - .2          Applied uniformly on variable widths of surface up to 5 m
    - .3          Applied at readily determined and controlled rates from 0.2 to 5.4 L/m<sup>2</sup> with uniform pressure and with an allowable variation from any specified rate not exceeding 0.1 L/m<sup>2</sup>
    - .4          Distributed in uniform spray without atomization at temperature required.
  - .2          Equipped with meter registering metres of travel per minute, visibly located to enable truck driver to maintain constant speed required for application at specified rate.
  - .3          Equipped with pump having flow metre graduated in units of 5 L or less per minute passing through nozzles and readily visible to operator. Pump power unit to be independent of truck power unit.
  - .4          Equipped with easily read, accurate, and sensitive device which registers temperature of liquid in reservoir.
  - .5          Equipped with accurate volume measuring device or calibrated tank.
  - .6          Equipped with nozzles of same make and dimensions, adjustable for fan width and orientation.
  - .7          Equipped with nozzle spray bar, with operational height adjustment.

- .8 Cleaned if previously used with incompatible asphalt material.

PART 3 EXECUTION

3.1 Application

- .1 Obtain Departmental Representative approval of surface before applying asphalt tack coat.
- .2 Apply asphalt tack coat only on clean and dry surface.
- .3 Dilute asphalt emulsion with water at a 1:1 ratio for application.
- .1 Mix thoroughly by pumping or other method approved by Departmental Representative.
- .4 Apply asphalt tack coat evenly to pavement surface as shown in the Table below:

Material	Liquid Asphalt Type and Grade	Application rate (L/m <sup>2</sup> )	Concentration
Tack Coat	SS-1	0.5 ± 0.2	50%
	RC-30/70	0.3 ± 0.1	100%

- .5 Paint contact surfaces of curbs, gutters, headers, manholes, and like structures with thin, uniform coat of asphalt tack coat material.
- .6 Do not apply asphalt tack coat when air temperature is less than 10°C or when rain is forecast within 2 hours of application.
- .7 Apply asphalt tack coat only on unfrozen surface.
- .8 Evenly distribute localized excessive deposits of tack coat by brooming as directed by Departmental Representative.
- .9 Where traffic is to be maintained, treat no more than on half of width of surface in one application.
- .10 Keep traffic off tacked areas until asphalt tack coat has set.
- .11 Re-tack contaminated or disturbed areas as directed by Departmental Representative.
- .12 Permit asphalt tack coat to set before placing asphalt pavement.

END OF SECTION

PART 1 GENERAL

1.1 Measurement for Payment

- .1 No separate payment shall be made for Asphalt Prime Coating. Asphalt Prime Coating shall be considered incidental to Asphalt paving work and shall be incorporated into the unit price for bid item 7 Asphalt Paving with Tack Coat and Prime Coat.

1.2 Quality Assurance

- .1 Upon request from Departmental Representative, submit manufacturer's test data and certification that asphalt prime material meets requirements of this Section in accordance with Section 01 33 00 - Submittal Procedures.

PART 2 PRODUCTS

2.1 Material

- .1 Asphalt material: to CAN/CGSB-16.1 grade: MC-30/70.
- .2 Sand blotter: clean granular material passing 4.75 mm sieve and free from organic matter or other deleterious materials.
- .3 Water: clean, potable, free from foreign matter.

2.2 Equipment

- .1 Pressure distributor to be:
  - .1 Designed, equipped, maintained, and operated so that asphalt material can be:
    - .1 Maintained at even temperature.
    - .2 Applied uniformly on variable widths of surface up to 4 m.
    - .3 Applied at controlled rates from 0.2 to 5.4 L/m<sup>2</sup> with uniform pressure and allowable variation from any specified rate not exceeding 0.1 L/m<sup>2</sup>.
    - .4 Distributed in uniform spray without atomization at temperature required.
  - .2 Equipped with meter registering metres of travel per minute, visibly located to enable truck driver to maintain constant speed required for application at specified rate.
  - .3 Equipped with pump having flow metre graduated in units of 5 L or less per minute passing through nozzles and readily visible to operator. Pump power unit to be independent of truck power unit.
  - .4 Equipped with easily read, accurate, and sensitive device which registers temperature of liquid in reservoir.
  - .5 Equipped with accurate volume measuring device or calibrated tank.
  - .6 Equipped with nozzles of same make and dimensions, adjustable for fan width and orientation.

- .7 Equipped with nozzle spray bar, with operational height adjustment.
- .8 Cleaned if previously used with incompatible asphalt material.

### PART 3 EXECUTION

#### 3.1 Application

- .1 Obtain inspection of granular base surface before applying asphalt prime.
- .2 Cutback asphalt:
  - .1 Heat asphalt prime to between 40 and 95°C for pumping and spraying.
  - .2 Apply asphalt prime to granular base at a rate of  $1.5 \pm 0.5 \text{ L/m}^2$ .
  - .3 Apply on dry surface unless otherwise directed by Departmental Representative.
- .3 Apply asphalt prime only on unfrozen surface.
- .4 Do not apply prime when air temperature is less than 10°C or when rain is forecast within 2 hours.
- .5 Paint contact surfaces of curbs, gutters, headers, manholes, and like structures with thin, uniform coat of asphalt prime material.
- .6 Where traffic is to be maintained, treat no more than one half width of surface in one application.
- .7 Prevent overlap at junction of applications.
- .8 Do not prime surfaces that will be visible when paving is complete.
- .9 Apply additional material to areas not sufficiently covered as directed by Department Representative.
- .10 Keep traffic off primed areas until asphalt prime has set.
- .11 Permit prime to set before placing asphalt paving.

#### 3.2 Use of Sand Blotter

- .1 If asphalt prime fails to penetrate within 24 hours, spread sand blotter material in amounts required to absorb excess material.
- .2 Allow sufficient time for excess prime to be absorbed, as directed by the Departmental Representative.
- .3 Apply second application of sand blotter as required.
- .4 Sweep and remove excess blotter material.

END OF SECTION

PART 1      GENERAL

1.1          Samples

- .1          At least 2 weeks prior to commencing work, inform Departmental Representative of proposed source of aggregate materials.
- .2          Contractor will submit asphalt concrete mix design based on the Marshall Method and trial mix test results to the Departmental Representative for review at least 2 weeks prior to commencing work. Contractor will provide a sieve analysis of the aggregate material for the Departmental Representative's review.

1.2          Submissions

- .1          Asphalt concrete mix design and aggregate material shall be submitted to the Departmental Representative before being used. Aggregate shall be tested for detrimental matter in coarse aggregate.
- .2          Preliminary review of the aggregate as represented by the samples shall not constitute general acceptance of all material in the deposit or source of supply. Materials may be considered unsuitable even though particle sizes are within the limits of the gradation sizes required, if particle shapes are thin or elongated or any other characteristic precludes satisfactory compaction or if the material fails to provide a pavement suitable for traffic. Rejected material will not be paid for. The Departmental Representative has the right to request additional testing if there are any concerns with the proposed aggregate mix design.

1.3          Measurement for Payment

- .1          The work includes:
  - .1          Furnishing all labour, equipment and materials for execution of all works specified within Section 32 12 16 - Asphalt Paving, Section 32 12 13.16 – Asphalt Tack Coats, and Section 32 12 13.23 - Asphalt Prime Coats
  - .2          Supply, transport, mixing, placing and rolling, testing and disposal of excess material.
  - .3          All other incidental work.
  - .4          Testing of materials and compaction related to all Work will be carried out and paid for by the Contractor.
- .2          Payment shall be made per tonne of asphalt as measured by the department Representative and paid for under bid item 7 – Asphalt Paving with Tack Coat and Prime Coat.

1.4          Definitions

- .1          Overlay: Paving over an existing pavement for rehabilitation purposes and not as part of new paving.
- .2          New Paving: Paving where a lift or lifts form part of the total pavement structure.
- .3          Mix Types: Mixes are designated according to use as follows:
  - .1          Asphalt Concrete Overlay [ACO]: Thin overlay on arterial and collector streets.

PART 2      PRODUCTS

2.1      Mix Type

- .1      Mix type shall be an ACO with a required minimum density of 98% Marshall Density.

2.2      Aggregate

- .1      Aggregate shall consist of hard, durable, uniformly graded crushed gravel and shall not contain organic or soft materials that break up when alternately frozen and thawed or wetted and dried, nor other deleterious materials.
- .2      Aggregate shall meet the following gradation when tested to ASTM C136 and ASTM C117, and give a smooth curve without sharp breaks when plotted on semi-log grading chart:

Sieve Size (mm)	Percent Passing (by weight)
	ACO
25	--
20	--
12.5	100
10	75-90
5	50-70
2.5	35-50
1.25	25-40
0.63	20-30
0.315	14-23
0.16	7-14
0.08	4 - 8

- .1      The Liquid Limit shall not exceed 25 and the Plasticity Index shall not exceed 6 for the portion of material passing the 0.4 mm sieve.
- .2      Los Angeles Abrasion  
 Maximum % loss by weight: 40%
- .3      Crushed Fragments: For each mix type, the minimum percentage, by mass retained down to the 4.75 mm sieve of fragments having at least two freshly fractured faces shall be as follows:

Mix Type	ACO
Crushed Face Count (%):	75 min.

- .4      Maximum of 3.0% total deleterious matter by total mass of combined aggregate.
- .3      Should the grading of the mineral aggregates supplied to the plant not meet the gradation above, mineral filler shall be added in the weight hopper of the asphalt plant in such quantities as will be required to meet the specifications.

2.3      Mineral Filler

- .1      Mineral filler shall consist of Portland Cement, Pozzolan, commercially ground stone

dust or other mineral dust approved by the Departmental Representative. Mineral filler shall have a Plasticity Index of Zero and when tested by means of laboratory sieves, it shall meet the following gradation:

Sieve Size (mm)	Percent Passing (by weight)
0.4	100
0.16	not less than 90
0.08	not less than 70
0.045	not less than 62

- .2 Mineral filler to be dry and free flowing when added to aggregate.

2.4 Asphaltic Binder

- .1 The asphaltic binder shall be uniform in character, shall not foam when heated to 175°C and shall meet the following requirements:

- .1 Designation ..... A/C 150/200
- .2 Penetration (ASTM D5) under 100 g for 5 sec. at 25°C..... 150 to 200
- .3 Flash Point (ASTM D92) filled or unfilled greater than..... 190°C
- .4 Ductility (ASTM D113) strain rate of 5 cm.sec.  
at 25°C greater than ..... 100(+) cm
- .5 Solubility in CCl4 (unfilled) ..... 99.0(+)%
- .6 Kinematic Viscosity in Centistokes at 135°C..... 150(+)
- .7 Thin Film Oven Test Penetration under 100 g for 5 sec. at 25°C ... 45(+)%

2.5 Mix Design

- .1 From the aggregate and asphalt cement samples, the testing laboratory shall prepare a design mix to produce the following criteria:

Mix Type	ACO
Max. Aggregate Size, mm	12.5
No. of Blows	75
Minimum Stability, N	6,700
Minimum Retained Stability, %	75
Flow Value, 0.254 mm Unit	6 - 12

- .2 The Marshall Stability Value and the Flow Index shall be tested in accordance with the current issue of ASTM D1559 for Resistance to Plastic Flows of Bituminous Mixtures.
- .3 The Percentage Voids and Percentage Aggregate Voids Filled with Asphalt shall be determined according to the Marshall Method of Mix Design for Hot Mix Asphalt Paving, as set out in the latest edition of the Asphalt Institute Manual Series.

PART 3 EXECUTION

3.1 Preparation

- .1 Removal of the full depth or partial depth of existing pavement in areas exhibiting deterioration at surface and if required correcting the subgrade. Patch and correct depressions and other irregularities to be inspected by the Departmental

Representative before beginning paving operations. Prior to laying mix, clean surfaces of loose and foreign material and apply primer coat or tack coat in accordance with Section 32 12 13.23 - Asphalt Prime Coat or Section 32 12 13.16 - Asphalt Tack Coat. Applying tack coat, and placing and compacting asphalt concrete should be approved by the Departmental Representative before beginning pavement operations.

3.2 Mix Tolerances

.1 All mixture furnished shall conform to the job mix formula within the range of tolerance specified:

.1	<u>Aggregate Material Passing (mm)</u>	<u>Percent by Weight</u>
	5 Sieve	+6
	0.8 Sieve	+4
	0.08 Sieve	±1.5

.2 The amount of bituminous material designated for the job mix shall be maintained within the tolerance of 0.3 percentage points.

.3 The temperature of mixing asphaltic mixtures shall not vary from those specified in the job mix formula by more than 9°C.

.4 Air voids in mix:

Mix Type	ACO
Air Voids, %:	4.0 ± 0.4

.5 Film thickness in mix:

Mix Type	ACO
Min. Film Thickness:	7.0 µm

.6 Voids filled in mix:

Mix Type	ACO
Voids Filled, %:	68 - 80

3.3 Mixing Plant

.1 The mixing plant and auxiliary equipment shall be such as to combine, dry and heat the mineral aggregate, heat the asphalt and accurately proportion the asphalt and aggregate to produce a uniform mixture in accordance with these specifications.

3.4 Transportation of Mix

1 Transport mix to job site in vehicles cleaned of foreign material.

.2 Paint or spray truck beds with limewater, soap or detergent solution, or non petroleum based commercial product, at least daily or as required.

.1 Raise truck bed and thoroughly drain, and ensure no excess solution remains in truck bed.

.3 Schedule delivery of material for placing in daylight, unless Departmental Representative approves artificial light for night placing.

.4 Deposit mix from surge or storage silo to trucks in multiple drops to reduce segregation.

.1 Do not dribble mix into trucks.

.5 Deliver material to paver at uniform rate and in an amount within capacity of paving

and compacting equipment.

- .6 Deliver loads continuously in covered vehicles and immediately spread and compact.
  - .1 Deliver and place mixes at temperature within range as directed by Departmental Representative, but not less than 135 degrees C.
- .7 The vehicle shall be suitably insulated and each load shall be covered with canvas or other suitable material of sufficient size to protect it from weather conditions.
- .8 The inside surface of all vehicles may be lightly lubricated with a thin oil or soap solution prior to loading but excess lubricating will not be permitted.
- .9 Any accumulation of asphaltic material which was collected in the box shall be thoroughly cleaned before loading with hot mix.

### 3.5 Equipment

- .1 Pavers:
  - .1 Mechanical grade controlled self-powered pavers capable of spreading mix within specified tolerances, true to line, grade and crown indicated.
- .2 Roller:
  - .1 The rollers used for compaction shall be self-propelled steel-wheeled or rubber-tired rollers, providing at least 35 Newtons per millimetre width of tread. The size of the roller used for base repair sections shall be of a width to allow the machine to perform the proper compaction requirements within the base repair trench. The roller shall be in good condition without backlash when reversed and shall be operated by competent rollermen. The wheels shall be kept properly moistened, but excess water or oil will not be permitted.
- .3 Hand Tools:
  - .1 Lutes or rakes with covered teeth for spreading and finishing operations.

### 3.6 Placing

- .1 Obtain inspection of base and existing surface and tack coat and prime coat prior to placing asphalt.
- .2 Place asphalt concrete to thicknesses, grades and lines indicated or directed by Departmental Representative.
- .3 Placing Conditions:
  - .1 Place asphalt mixtures only when air temperature is above 2°C.
  - .2 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.
  - .3 Do not place hot mix asphalt when pools of standing water exist on surface to be paved, during rain, or when surface is damp.

- .4 Mixtures shall be spread at temperatures which, when measured in the hopper of the spreader, are not lower than 125°C or higher than 150°C.
- .5 In small areas where the use of mechanical finishing equipment is not practical, the mix may be spread and finished by hand, if so directed by the Departmental Representative. The material shall be distributed uniformly to avoid segregation of the coarse and fine aggregates. Broadcasting of material shall not be permitted. During the spreading operation, all material shall be thoroughly loosened and uniformly distributed by lutes or rakes. Material that has formed into lumps and does not break down readily shall be rejected.

3.7 Rolling and Compaction

- .1 Before rolling is started, the surface shall be checked, inequalities in depth adjusted and fat spots or sandy accumulations replaced and irregularities in alignment or grade along the outside edge shall be corrected.
- .2 Do not change rolling pattern unless mix changes or lift thickness changes.
  - .1 Change rolling pattern only as directed by Departmental Representative.
- .3 Required Density: Each mat of hot mix placed shall be compacted to the following minimum density (% of Marshall density) for the type of paving, or as indicated in Special Provisions.

Minimum Density	Type of Paving
98%	New paving
97%	Lane paving.
97%	Overlay more than 40 mm thick.
96%	Overlay 40 mm thick or less.

.3 General

- .1 At least one roller shall be used for every 40 tonnes of asphaltic concrete laid per hour. Provide at least 2 rollers and as many additional rollers as necessary to achieve specified pavement density. When more than 2 rollers are required, 1 roller must be pneumatic tired type.
- .2 Rolling shall start as soon as the pavement will bear the roller without checking, undue displacement of material, or cracking of surface.
- .3 Overlap successive passes of roller by minimum of 200 mm and vary pass lengths.
- .4 Keep wheels of roller slightly moistened with water to prevent pick-up of material but do not over-water.
- .5 Do not permit heavy equipment or rollers to stand on finished surface before it has been compacted and has thoroughly cooled.
- .6 After traverse and longitudinal joints and outside edge have been compacted, start rolling longitudinally at low side and progress to high side until no roller marks are left in the finished surface and no further compaction is possible.

- .7 The rollers must be kept in continuous operation as nearly as practicable and all parts of the pavement shall receive substantially the same compaction. Rolling shall be done at a maximum speed of 5 km per hour.
- .8 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.
- .9 Where width permits the pavement shall be rolled diagonally in two directions.
- .10 At all curbs, manholes and other appurtenances, and at all locations not accessible to the rollers, hand tampers shall be used to produce the same density as provided by the roller.
- .11 Where the asphaltic concrete is laid in more than one lift, each lift shall be so compacted.
- .12 Dust entire area of sheet asphalt pavements [with hydrated lime] immediately after rolling to eliminate tendency to pick-up under traffic.

### 3.8 Joints

- .1 General:
  - .1 Remove surplus material from surface of previously laid strip.
    - .1 Do not deposit on surface of freshly laid strip.
  - .2 Paint contact surfaces of existing structures such as manholes, curbs or gutters with bituminous material prior to placing adjacent pavement.
- .2 Transverse joints:
  - .1 Offset transverse joint in succeeding lifts by at least [1000] mm.
  - .2 Transverse joints shall be straight, have a vertical face painted with tack coat before placement of the adjacent mat, be thoroughly compacted, and meet surface tolerances.
- .3 Longitudinal joints:
  - .1 Location: Plan mats so that the surface longitudinal joint will be offset by not more than 150 mm from the centre of an indicated marking line between travel lanes. If permitted by the City, the joint may be located at the centre of travel lane.
  - .2 Plan width of spread to provide for a minimum 150 mm offsetting (in a dovetail pattern) of longitudinal joints in successive lifts.
  - .3 Create a longitudinal joint while the edge temperature of the first of two adjacent mats is above 80°C. This may be accomplished by multiple pavers in staggered formation, or by limiting paver advance.
  - .4 Allow a 25 mm to 50 mm overlap between mats.

- .5 Do not roll a 150 mm wide strip along the edge of first mat until the adjoining mat is placed. Roll the joined mat immediately to insure bonding while the joint temperature is above 80°C.
- .6 For all lifts on freeways, arterial roadways, industrial/commercial roadways and collector roadways carefully roll off the edge of a mat if a minimum joint temperature of 80°C can not be maintained prior to the placement of the adjacent mat. Trim off the rolled asphalt to a width of 150 mm resulting in a clean vertical face to the full depth of the mat. Paint the exposed face with tack coat to Section 02963 – Liquid Asphalt Coats prior to placing the adjacent mat.
- .7 Should this longitudinal joint treatment not be performed where required, the area of asphalt pavement will be assessed a pay factor of 95%. This pay factor will be applied to the price of the total quantity of asphalt placed in the mat area.
- .8 A longitudinal joint shall be thoroughly compacted and shall meet surface tolerances.

### 3.9 Finish

- .1 Finished asphalt surface to be within 5 mm of design elevation but not uniformly high or low and shall be true to the required profile and cross-section.
- .2 Maximum variation under 3 m straightedge as follows:  
Longitudinal in direction of travel: 3 mm  
Transverse to direction of travel: 6 mm  
(straight crossfall)
- .3 Grade: ±5 mm maximum variation from designated grade elevations.
- .4 Tests of pavement profile and thickness shall be made after the first layer of asphalt has been placed, and depressions or bumps in excess of 5 mm shall be corrected.
- .5 Finished surface shall have a tightly knit texture free of visible signs of poor workmanship such as, but not limited to:
  - .1 Segregation;
  - .2 Areas exhibiting excess or insufficient asphalt;
  - .3 Improper matching of longitudinal and transverse joints;
  - .4 Roller marks, cracking, or tearing;

If surface and grade tolerances are exceeded, or if surface texture is not met, grind down and resurface defective areas as required by the Departmental Representative.

### 3.10 Defective Work

- .1 Correct irregularities which develop before completion of rolling by loosening surface mix and removing or adding material as required.
  - .1 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.

- .2 Repair areas showing checking, rippling, segregation or hairline cracking.

3.11 Testing and Inspection

- .1 Contractor will retain core samples from the completed pavement, from which depth of pavement and density tests shall be made.
- .2 A minimum of one core shall be taken for every 1,000 m<sup>2</sup> of asphalt or at least once each day during placing operations. The following tests shall be carried out:
  - .1 Marshall stability (test for resistance of plastic flow of bituminous mixtures) using Marshall Apparatus as per ASTM D1559.
  - .2 Sieve analysis of extracted aggregates in accordance with ASTM C136 and entire washed sample in accordance with ASTM C117.
  - .3 Bulk specific gravity of compacted mixtures in accordance with ASTM D2726.
  - .4 Bitumen content of paving mixtures in accordance with ASTM D2172.
  - .5 Percent voids in the mineral aggregates (VMA) is to be calculated on the basis of ASTM D2726 Bulk Specific Gravity of the aggregate.
  - .6 Air voids in compacted mix in accordance with ASTM D3203.
  - .7 Mat thickness.
- .3 Contractor will repair all test holes with fresh, hot mix asphaltic concrete mixture, and thoroughly compact it to the required density with no additional compensation.

3.12 Acceptance

- .1 Locations shall be cleared of all excess material resulting from the paving operation and any damage caused by the Contractor will be repaired to the Departmental Representative's satisfaction within three days of the date of completion of the street or lane.
- .2 No traffic shall be allowed on the finished surface until it has cooled to atmospheric temperature.

END OF SECTION

PART 1 GENERAL

1.1 Measurement for Payment

- .1 Payment for asphalt slurry seal coat will be made in square metres as measured by the Departmental Representative and paid for under bid item 14 – Asphalt Seal Coat.

1.2 Quality Assurance

- .1 Upon request from Departmental Representative, submit manufacturer's test data and certification that materials used in the asphalt slurry seal mix meet requirements of this Section.

PART 2 PRODUCTS

2.1 Material

- .1 The mix design shall follow ASTM D3910, Standard Practice for Design, Testing, and Construction of Slurry Seal. The wet track abrasion test loss shall not exceed 800 g/m<sup>2</sup>. The residual asphalt content shall be between 7.5% and 13.5%. The mix design shall also contain the following information:
  - .1 gradation of aggregate to be used,
  - .2 the design proportions of each component including additives,
  - .3 other characteristics of the aggregate specified in Specification 3.2, Aggregate Production and Stockpiling,
  - .4 all test results used in producing the mix design.

2.2 Equipment

- .1 Slurry seal mixing and spreading equipment: in accordance with ASTM D 3910 and to approval of the Departmental Representative.
  - .1 Use rubber tired vehicle capable of maintaining uniform speed.
- .2 Rolling equipment: smooth pneumatic-tired, self-propelled type. Wobble-wheel types not permitted.
  - .1 Rollers to exert force of at least 3.0 tonnes/m of rolling width.
  - .2 Minimum contact pressure: 345 kPa.
  - .3 Rollers to be equipped with water sprinkling apparatus to keep wheels damp to prevent adherence of slurry material.

PART 3 EXECUTION

3.1 General

- .1 All asphalt slurry seal work to be performed in accordance with ASTM D 3910.

3.2 Preparation of Pavement Surface

- .1 Prepare surface in accordance with ASTM D 3910 .
- .2 Protect manholes and other service entrances to approval of Departmental Representative.

- .3 Pre-wet pavement surface with water as directed by Departmental Representative.
- .4 Apply tack coat in accordance with Section 32 12 13.16 - Asphalt Tack Coat.

### 3.3 Preparation of Slurry Mix

- .1 Charge mixer with materials in following order:
  - .1 Water,
  - .2 Aggregate in unfrozen condition,
  - .3 Asphalt emulsion,
  - .4 Additives.
- .2 Mix to produce a uniform coating of aggregate and continue mixing until discharged to spreader box.
- .3 Discard batch if Departmental Representative determines that emulsion has broken.

### 3.4 Application

- .1 Obtain Departmental Representative's approval of existing surface prior to applying slurry seal.
- .2 Discharge slurry mix into moving spreader box at a rate to maintain ample supply of mix across width of strike-off squeegee.
- .3 Adjust strike-off squeegee to provide average slurry thickness of 5 mm but not exceed 10mm.
- .4 Use hand squeegees, approved by Departmental Representative to spread mix in areas not accessible to spreader. Dampen surfaces prior to handwork.
- .5 Avoid excessive build-up of slurry material on longitudinal or transverse joints.
- .6 Place slurry seal only when temperature of pavement surface is 10 degrees C or above.
- .7 Place slurry only when freezing conditions or rain is not expected within 24 hours.
- .8 Immediately correct cause of surface irregularities including; streaking, segregation and lumping.

### 3.5 Patching

- .1 Repair designated areas by removing and replacing as approved by Departmental Representative.
- .2 Hand patch slurry seal coat, using limited squeegee action, only as approved by Departmental Representative.

### 3.6 Curing

- .1 Keep traffic off slurry seal until cured to firm condition.
- .2 Where two applications of slurry mix are required, cure initial treatment thoroughly before placing succeeding application.

3.7 Rolling

- .1 Where indicated, roll each application with minimum 5 passes of pneumatic tired roller when slurry has cured sufficiently that clear water can be squeezed from mix.
- .2 Increase operating contact pressure if directed by Departmental Representative.

END OF SECTION

PART 1 GENERAL

1.1 Samples

- .1 If requested by the Departmental Representative, submit the following material sample quantities at least 4 weeks prior to commencing work.
  - .1 Two 1 L samples of each type of paint.
  - .2 One 1 kg sample of glass beads.
  - .3 Sampling to CGSB 1-GP-71.
- .2 Mark samples with name of project and its location, paint manufacturer's name and address, name of paint, CGSB specification number and formulation number and batch number.

1.2 Measurement for Payment

- .1 Payment shall be made as a lump sum for all pavement marking work for the project and charged under bid item 11 – Pavement Markings. Payment for all Wheel Stops shall be made per unit and charged under the bid item 12 – Parking Curb Wheel Stops – 180mm x 180mm.

PART 2 PRODUCTS

2.1 Painted Markings

- .1 To CGSB 1-GP-74M, alkyd traffic paint.
- .2 Colour: White - to CGSB 1-GP-12.1C, white 513-301.  
Yellow – to CGSB 1-GP-12.1C, Yellow 505-308
- .3 Products supplied to meet Alberta Transportation Standard Specifications for Highway Construction.

2.2 Parking Curb Wheel Stops

- .1 to be standard 180 mm by 180 mm curb wheel stop supplied and installed with all necessary hardware including install pins
- .2 1 parking curb wheel stop is to be installed per parking stall in the new visitor parking lot and the existing resurfaced employee parking lot. Curb stops are to be installed as per manufacturer instruction.

PART 3 EXECUTION

3.1 Equipment Requirements

- .1 Paint applicator to be an approved pressure type distributor capable of applying paint in single, double and dashed lines. Applicator to be capable of applying marking components uniformly, at rates specified, and to dimensions as indicated, and to have positive shut-off distributor.

3.2 Condition of Surfaces

- .1 Pavement surface to be dry, free from ponded water, frost, ice, dust, oil, grease and other foreign materials.
- .2 Remove conflicting markings.

3.3 Traffic Control

- .1 Conduct all traffic control to the requirements as specified.

3.4 Paint Application

- .1 Lay out pavement markings for approval by Departmental Representative.
- .2 Apply paint only when air temperature is above 10°C, wind speed is less than 60 km/h and no rain is forecast within next 4 hours.
- .3 Apply traffic paint evenly at rate of 3.0 Sq.m/L.
- .4 Apply beads uniformly at a rate of 600g/l of paint.
- .5 Paint lines to be of uniform colour and density with sharp edges, free of tire tracks, splatter, excessive overspray, or other defect.
- .6 Thoroughly clean distributor tank before refilling with paint of different colour.

3.5 Parking Curb Wheel Stops

- .1 Parking Curb Wheel Stops shall be placed 500mm into each parking stall. Parking Curb Wheel Stops shall be centered within paint lines to the approval of the Department Representative and anchored as per manufacturers instruction.

3.6 Protection and Cleanup

- .1 Do not permit traffic over applied markings until they have adequately hardened.
- .2 Protect surrounding areas and structures from disfiguration and damage. Repair any damage as directed by the Departmental Representative.
- .3 On completion of work, clean up and leave site free of debris and waste matter.

3.7 Tolerance

.1 Painted Marking

- .1 Paint markings to be a maximum of 12mm wider than specified. A dimension less than specified is not acceptable.
- .2 Remove incorrect markings. The method and equipment used to remove lines is to be approved by the Departmental Representative.

3.8 Quality Assurance

- .1 The Departmental Representative will reject paint lines that are not straight, are oversprayed, have insufficient thickness, are painted on dirty surface, or are tracked.
- .2 Repair, or remove and repaint, faulty paint lines as directed by the Departmental Representative.

3.9 Protection of Completed Work

- .1 Protect pavement markings until dry.
- .2 Repair damage to adjacent materials caused by pavement marking application.

END OF SECTION

PART 1      GENERAL

1.1          Definitions

.1          Topsoil:

- .1          The top layer of soil containing organic material capable of supporting good vegetative growth and suitable for use in top dressing, landscaping and seeding.

1.2          Measurement for Payment

- .1          Topsoil and seeding will be measured and paid for per square meter as measured by the Departmental Representative under bid item 21 – Topsoil and Seeding.

The work includes:

- .1          Survey and staking of areas to be topsoiled and seeded.  
.2          Loading, hauling, placing, levelling, fine grading of topsoil materials.  
.3          Supply and application of grass seed and fertilizer.  
.4          All incidental work for which payment is not specified elsewhere.

1.3          Product Delivery, Storage and Handling

- .1          Delivery grass seed in the original containers, tagged with identification as to the analysis of seed mixture, percentages of seed, year of seed production, net weight and date.  
.2          Deliver seed to site only when required.

PART 2      PRODUCTS

2.1          Topsoil

- .1          Topsoil to be obtained from on site stripping operations as per Section 31 14 13 – Soil Stripping and Stockpiling and not from undisturbed areas, unless indicated by Departmental Representative.  
.2          Topsoil must be free of subsoil, clay lumps, stones, live plants, roots, sticks or other extraneous matter.

2.2          Seed Mixture

- .1          Seed shall be Canada No.1 Grade quality seed free of impurities and disease and consisting of the following, or equivalent equal:

Argyll Kentucky Bluegrass	30%
Kentucky Bluegrass	30%
Creeping Red Fescue	30%
Annual Rye Grass	10%

- .2          Seed shall be applied by mechanical dry spread in two equal passes at a rate of 12kg per 1000m<sup>2</sup> and at 90 degrees to each other.

2.3 Fertilizer

- .1 Fertilizers shall be clearly labelled and furnished in unopened moistureproof containers.
- .2 Fertilizer shall be granular water soluble type suitable for seed mix.
- .3 Fertilizer shall meet City of Edmonton Specification Section 02920 – Seed and Sod type 3 fertilizer and shall be applied at a rate of 3.5kg per 100m<sup>2</sup>.

PART 3 EXECUTION

3.1 Topsoil

- .1 Scarify existing ground prior to placing topsoil. A 150 mm layer of topsoil shall be placed on all areas as shown on the drawings, or as required by the Departmental Representative. After placement, disc and harrow topsoil thoroughly.
- .2 Do not perform work under adverse field conditions, such as frozen soil. Excessively wet or dry soil or soil covered with snow, ice or standing water.
- .3 Verify that grades are correct. If discrepancies occur, notify the Departmental Representative and do not commence work until instructed by the Departmental Representative.
- .4 Fine grade surface free of humps and hollows to smooth, even grade.
- .5 Cultivate fine grade to be inspected by the Departmental Representative immediately prior to seeding.

3.2 Seeding

- .1 Advise Departmental Representative prior to start of seeding operations on the method of seed placement.
- .2 Seeding and initial fertilizing shall be done upon completion of topsoil placement.
- .3 Seeding shall be done to ensure that a catch satisfactory to the Departmental Representative's approval is obtained. In areas where seed fails to germinate for whatever reason, the Contractor shall recultivate, reseed and refertilize until acceptable germination takes place.
- .4 The Contractor shall carry out whatever waterings and maintenance are necessary to achieve a uniform dense turf.

3.3 Final Acceptance

- .1 Seeded areas will be accepted by the Departmental Representative, provided that areas are uniformly established and turf is free of rutted, eroded, bare or dead spots.
- .2 Areas seeded in fall will be accepted in following spring, one month after start of growing season provided acceptance conditions are fulfilled.

END OF SECTION