

PART 1 - GENERAL

- 1.1 Description .1 This Section covers the removal of existing asphalt within the project limits.

PART 2 - PRODUCTS

- 2.1 Not Applicable .1 Not Applicable.

PART 3 - EXECUTION

- 3.1 Preparation .1 Prior to commencing removal operation, inspect and verify with Department Representative areas, depths and lines of asphalt concrete pavement to be removed.
- .2 For full depth pavement removal cut existing pavement vertically to full depth of asphalt surface.
- 3.2 Equipment .1 Use milling equipment and other equipment capable of removing part of asphalt concrete pavement surface to depths or grades indicated.
- 3.3 Removal .1 Remove the full width of existing asphalt by milling to a depth of 150mm. The milled material is to be pulverized (mixed) thoroughly with 200 mm of virgin gravel to form a gravel/milled asphalt mixture (57% virgin gravel and 43% millings). The new pulverized mix is to be spread to a uniform thickness over the required width in accordance with the specifications and drawings. Additional gravel may be required to achieve a total compacted sub-base thickness.
- .2 Remove the remaining existing asphalt pavement to top of existing granular base (sand mix) and dispose of materials outside of park boundaries.
- 3.4 Tolerance .1 Compacted surface shall be within plus or minus 5 mm of elevations established by the engineer, but not uniformly high or uniformly low.

PART 1 - GENERAL

- 1.1 SECTION INCLUDES .1 Materials and installation for fertilizing and preserving root systems of plants affected by changing grades or excavation.
- 1.2 RELATED SECTIONS .1 Section 01 33 00 - Submittal Procedures.
.2 Section 32 92 22 - Hydraulic Seeding
- 1.3 REFERENCES .1 Health Canada - Pest Management Regulatory Agency (PMRA)
.1 National Standard for Pesticide Education, Training and Certification in Canada.
.2 Department of Justice Canada
.1 Fertilizers Act (R.S. 1985, c. F-10).
.2 Fertilizers Regulations (C.R.C., c. 666)
- 1.4 SUBMITTALS .1 Submittals in accordance with 01 33 00 - Submittal Procedures.
- 1.5 WASTE MANAGEMENT AND DISPOSAL .1 Separate waste materials for reuse and recycling in accordance with Section 01 74 22 - Construction Demolition Waste Management and Disposal.
.2 Remove from site and dispose of all packaging materials at appropriate recycling facilities.
.3 Collect and separate for disposal paper, plastic, polystyrene and corrugated cardboard packaging material for recycling in accordance with Waste Management Plan.
.4 Divert unused metal and wiring materials from landfill to metal recycling facility as approved by Departmental Representative.
.5 Divert unused wood materials from landfill by alternative disposal, composting and mulching as approved by Departmental Representative.

- .6 Divert unused stone aggregate materials from landfill to local facility approved by Departmental Representative.
- .7 Divert unused plastic materials from landfill to local recycling facility approved by Departmental Representative.
- .8 Dispose of unused fertilizer material at official hazardous material collection site approved by Departmental Representative.
- .9 Do not dispose of unused fertilizer material into sewer system, into streams, lakes, onto ground or in any other location where they will pose health or environmental hazard.
- .10 Fold up metal banding, flatten and place in designated area for recycling.

1.6 SCHEDULING

- .1 Obtain approval from Departmental Representative of schedule indicating beginning of work.

PART 2 - PRODUCTS

2.1 MATERIALS

- .1 Fill:
 - .1 Type (A): clean, natural river sand and gravel material, free from silt, clay, loam, friable or soluble materials and organic matter.
 - .2 Type (B): excavated soil, free from roots, rocks larger than 75 mm, building debris, and toxic ingredients (salt, oil, etc.). Excavated material shall be approved by Departmental Representative before use as fill.
- .2 Coarse washed stones: 35-75 mm diameter clean round hard stones.

- .3 Peat moss:
 - .1 Derived from partially decomposed species of Sphagnum Mosses.
 - .2 Elastic and homogeneous.
 - .3 Free of wood and deleterious material which could prohibit growth.
 - .4 Shredded minimum particle size: 5 mm.
- .4 Fertilizer:
 - .1 To Canada Fertilizer Act and Fertilizer Regulations.
 - .2 Complete, commercial, slow release with 35% of nitrogen content in water in-soluble form.
- .5 Anti-desiccant: commercial, wax-like emulsion.
- .6 Filter Cloth:
 - .1 Type 1: 100% non-woven needle punched polyester, 2.75 mm thick, 240 g/m² mass.
 - .2 Type 2: biodegradable burlap.
- .7 Wood posts: 38 x 89 x 2400 mm length, untreated wood.

PART 3- EXECUTION

- 3.1 IDENTIFICATION AND PROTECTION
 - .1 Identify plants and limits of root systems to be preserved as approved by Departmental Representative.
 - .2 Protect plant and root systems from damage, compaction and contamination resulting from construction as approved by Departmental Representative.
 - .3 Ensure no pruning is done inside drip line. If pruning inside drip line is required consult an arborist or Canadian Certified Horticultural Technician (CCHT) as approved by Departmental Representative.

- 3.2 ROOT CURTAIN SYSTEM
- .1 Identify limits for required construction excavation as approved by Departmental Representative.
 - .2 Prior to construction excavation, dig trench minimum 500 mm wide x 1500 mm deep, along perimeter of excavation limits.
 - .3 Prune exposed roots cleanly at side of trench nearest plants to be preserved. Pruned ends to point obliquely downwards.
 - .4 Install wooden posts, recycled composite posts, and welded wire fabric against construction edge of trench.
 - .5 Securely attach Type 2 filter fabric on plant side of wire mesh.
 - .6 Prepare homogeneous mixture of fertilizer, parent material and organic matter.
 - .1 Add organic matter to mixture to achieve 7-9% organic matter content by weight.
 - .2 Incorporate with mixture grade 2:12:8 ratio fertilizer (dry) at rate of 1.5 kg/m³.
 - .7 Backfill with homogeneous mixture between curtain wall and plants to be preserved in layers not exceeding 150 mm in depth. Compact each layer to 85% Standard Proctor Density.
 - .8 Protect root curtain from damage during construction operations.
 - .9 Water plants and root curtain sufficiently during construction to maintain optimum soil moisture condition until backfill operations are complete.
 - .10 Protect root curtain before and during backfill operations. Ensure root curtain is cut down to 300 mm below finished grade and remove cut material.

- 3.3 LOWERING
GRADE AROUND
EXISTING TREE
- .1 Begin work in accordance with schedule approved by Departmental Representative.
 - .2 Cut slope not less than 500 mm from tree trunk to new grade level.
 - .3 Excavate to depths as indicated. Protect from damage root zone which is to remain.
 - .4 When severing roots at excavation level, cut roots with sharp tools.
 - .5 Cultivate excavated surface manually to 15 mm depth.
 - .6 Prepare homogeneous soil mixture consisting by volume of:
 - .1 60% excavated soil cleaned of roots, plant matter, stones, debris.
 - .2 25% coarse, clean sand.
 - .3 15% organic matter.
 - .4 Grade 2:12:8 fertilizer at rate of 1.5 kg/m³.
 - .7 Place soil mixture over area of excavation to finished grade level. Compact to 85% Standard Proctor Density.
 - .8 Water entire root zone to optimum soil moisture level.
 - .9 Install surface cover of seeding in accordance with Section 32 92 22 - Hydraulic Seeding.
- 3.4 MEASUREMENT
FOR PAYMENT
- .1 All trees and shrubs to be preserved will be considered incidental to the work.

PART 1 - GENERAL

- 1.1 References .1 American Society for Testing and Materials (ASTM)
- .1 ASTM C117-13, Standard Test Methods for Material Finer Than 0.075 mm Sieve in Mineral Aggregates by Washing.
 - .2 ASTM C131/C131M-14, Standard Test Method for Resistance to Degradation of Small-Size Coarse Aggregate by Abrasion and Impact in the Los Angeles Machine.
 - .3 ASTM C136-06, Standard Test Method for Sieve Analysis of Fine and Coarse Aggregates.
 - .4 ASTM D698-12e1, Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Standard Effort (12,400ft-lbf/ft³ (600kN-m/m³)).
 - .5 ASTM D1557-12, Test Method for Laboratory Compaction Characteristics of Soil Using Modified Effort (56,000ft-lbf/ft³ (2,700kN-m/m³)).
 - .6 ASTM D1883-14, Standard Test Method for California Bearing Ratio (CBR) of Laboratory Compacted Soils.
 - .7 ASTM D4318-10e1, Standard Test Methods for Liquid Limit, Plastic Limit and Plasticity Index of Soils.
- .2 Canadian General Standards Board (CGSB)
- .1 CAN/CGSB-8.2-M88, Sieves, Testing, Woven Wire, Metric.
- 1.2 Delivery, Storage, and Handling .1 Deliver and stockpile aggregates in accordance with Section 31 05 17 - Aggregate: General.
- 1.3 Waste Management and Disposal .1 Separate and recycle waste materials.
- .2 Divert unused granular material from landfill to local facility as approved by Departmental Representative.

PART 2 - PRODUCTS

- 2.1 Materials .1 Granular Base: Aggregate base materials to NBDI Standard Specifications 2101 - Production of Highway Aggregates.

PART 3 - EXECUTION

- 3.1 Sequence of Operation .1 Place granular base after sub-base or subgrade surface is inspected and approved by Departmental Representative.
- .2 Placing:
- .1 Construct granular base to depth and grade in areas indicated.
- .2 Ensure no frozen material is placed.
- .3 Place material only on clean unfrozen surface, free from snow and ice.
- .4 Place material to full width in uniform layers not exceeding 150 mm compacted thickness. Compact to not less than 98% maximum dry density in accordance with ASTM D1557.
- .5 Shape each layer to smooth contour and compact to specified density before succeeding layer is placed.
- .6 Remove and replace that portion of layer in which material becomes segregated during spreading.
- .7 Finished granular base surface to be within 10 mm of elevation as indicated but not uniformly high or low.
- 3.2 Protection .1 Maintain finished base in condition conforming to this Section until succeeding material is applied or until acceptance by Departmental Representative.

- 3.3 Field Quality Control
- .1 Inspection and testing of aggregate base courses will be carried out by designated testing laboratory.
 - .2 Contractor shall pay cost of sampling and testing of aggregate base courses which fail to meet specified requirements.

END

PART 1 - GENERAL

- 1.1 Related Work
- .1 Section 31 05 17 - Aggregate General
 - .2 Section 31 23 13 - Rough Grading
- 1.2 References
- .1 ASTM C117-13, Test Method for Material Finer Than 0.075 mm Sieve in Mineral Aggregates by Washing.
 - .2 ASTM C131/C131M-14, Test Method for Resistance to Degradation of Small Size Coarse Aggregate by Abrasion and Impact in the Los Angeles Machine.
 - .3 ASTM C136-06, Method for Sieve Analysis of Fine and Coarse Aggregates.
 - .4 ASTM D698-12e1, Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Standard Effort (12,400ft-lbf/ft³ (600kN-m/m<sup>3 - .5 ASTM D4318-10e1, Test Method for Liquid Limit, Plastic Limit and Plasticity Index of Soils.
 - .6 CAN/CGSB-8.2-M88 (R10/3), Sieves Testing, Woven Wire, Metric.
 - .7 ASTM D1557-12, Test Method for Laboratory Compaction Characteristics of Soil Using Modified Effort (56,000ft-lbf/ft³ (2,700kN-m/m<sup>3 - .8 ASTM D1883-14, Test Method for California Bearing Ratio (CBR) of Laboratory Compacted Soils.
 - .9 ASTM D6938-10, Standard Test Method for In-Place Density and Water Content of Soil and Soil-Aggregate by Nuclear Methods (Shallow Depth).</sup></sup>

PART 2 - PRODUCTS

2.1 Materials

- .1 Granular base: to meet NBDTI Standard Specifications for 75 mm Sub-Base: Crushed quarried rock

Sieve Size	Aggregate Base		Aggregate Subbase	
	25 mm % passing	31.5 mm % passing	50 mm % passing	75 mm % passing
90.0 mm				100
75.0 mm				95-100
63.0 mm			100	85-100
50.0 mm			95-100	73-95
37.5 mm		100	76-100	53-87
31.5 mm	100	95-100		
25.0 mm	95-100	81-100	60-84	
19.0 mm	71-10	66-90	50-76	35-69
12.5 mm	56-82	50-77		
9.50 mm	47-74	41-70	32-61	25-54
4.75 mm	31-59	27-54	21-49	17-43
2.36 mm	21-46	17-43	15-40	12-35
1.18 mm	13-34	11-32	10-32	8-28
300 µm	5-18	4-19	4-18	4-16
75 µm	0-8	0-8	0-9	0-9

PART 3 - EXECUTION

3.1 Inspection of Underlying Sub-Base

- .1 Place granular base after surface is inspected and approved by Department Representative.
- .2 Underlying material to be compacted to 100% of Standard Proctor Density to ASTM D698.

3.2 Placing

- .1 Granular base will be used for shouldering and other areas indicated on plans or as directed by Engineer.
- .2 Ensure no frozen material is used in placing.

- .3 Place material only on clean unfrozen surface, properly shaped and compacted and free from snow and ice.
 - .4 Shape each layer to smooth contour and compact to specified density before succeeding layer is placed.
 - .5 Remove and replace that portion of layer in which material becomes segregated during spreading.
 - .6 Place and compact shouldering to 2% cross slope in reconstruction areas. In overlay sections, feather new shoulder material from top of new asphalt to existing hinge point of shoulder slope.
 - .7 Compacted shouldering to be flushed with asphalt concrete surface.
 - .8 Place, hand rake and compact new shoulder material under and behind guiderail.
- 3.3 Compaction Equipment
- .1 Vibratory compaction equipment must be used and capable of obtaining required densities on aggregates on project.
- 3.4 Compacting
- .1 Compact to density not less than 95% corrected maximum dry density.
 - .2 Shape and roll alternately to obtain smooth, even and uniformly compacted base.
 - .3 Apply water as necessary during compacting to obtain specified density. If aggregate is excessively moist, aerate by scarifying with suitable equipment until moisture content is corrected.
 - .4 In areas not accessible to rolling equipment, compact to specified density with vibratory mechanical tampers approved by Department Representative.
- 3.5 Finish
- .5 Density will be determined according to ASTM D6938.
 - .1 Finished base surface to be within plus or minus 10 mm of established grade and cross section but not uniformly high or low.

- .2 Correct surface irregularities by loosening and adding or removing material until surface is within specified tolerance.
- .3 Shouldering to have 2% cross slope.

3.6 Maintenance

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

END

PART 1 - GENERAL

- 1.1 Related Work
- .1 Section 31 05 17 - Aggregate General
 - .2 Section 31 23 13 - Rough Grading
- 1.2 References
- .1 ASTM C117-13, Test Method for Material Finer Than 0.075 mm Sieve in Mineral Aggregates by Washing.
 - .2 ASTM C131/C131M-14, Test Method for Resistance to Degradation of Small Size Coarse Aggregate by Abrasion and Impact in the Los Angeles Machine.
 - .3 ASTM C136-06, Method for Sieve Analysis of Fine and Coarse Aggregates.
 - .4 ASTM D698-12e1, Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Standard Effort (12,400ft-lbf/ft³ (600kN-m/m³)).
 - .5 ASTM D4318-10e1, Test Method for Liquid Limit, Plastic Limit and Plasticity Index of Soils.
 - .6 CAN/CGSB-8.2-M88 (R10/3), Sieves Testing, Woven Wire, Metric.
 - .7 ASTM D1557-12, Test Method for Laboratory Compaction Characteristics of Soil Using Modified Effort (56,000ft-lbf/ft³ (2,700kN-m/m³)).
 - .8 ASTM D1883-14, Test Method for California Bearing Ratio (CBR) of Laboratory Compacted Soils.
 - .9 ASTM D6938-10, Standard Test Method for In-Place Density and Water Content of Soil and Soil-Aggregate by Nuclear Methods (Shallow Depth).

PART 2 - PRODUCTS

2.1 Materials

- .1 Granular base: to meet NBDTI Standard Specifications for 31.5 mm Base: Crushed quarried rock

Sieve Size	Aggregate Base		Aggregate Subbase	
	25 mm % passing	31.5 mm % passing	50 mm % passing	75 mm % passing
90.0 mm				100
75.0 mm				95-100
63.0 mm			100	85-100
50.0 mm			95-100	73-95
37.5 mm		100	76-100	53-87
31.5 mm	100	95-100		
25.0 mm	95-100	81-100	60-84	
19.0 mm	71-10	66-90	50-76	35-69
12.5 mm	56-82	50-77		
9.50 mm	47-74	41-70	32-61	25-54
4.75 mm	31-59	27-54	21-49	17-43
2.36 mm	21-46	17-43	15-40	12-35
1.18 mm	13-34	11-32	10-32	8-28
300 µm	5-18	4-19	4-18	4-16
75 µm	0-8	0-8	0-9	0-9

PART 3 - EXECUTION

3.1 Inspection of Underlying Sub-Base

- .1 Place granular base after surface is inspected and approved by Department Representative.
- .2 Underlying material to be compacted to 100% of Standard Proctor Density to ASTM D698.

3.2 Placing

- .1 Granular base will be used for shouldering and other areas indicated on plans or as directed by Engineer.
- .2 Ensure no frozen material is used in placing.

- .3 Place material only on clean unfrozen surface, properly shaped and compacted and free from snow and ice.
 - .4 Shape each layer to smooth contour and compact to specified density before succeeding layer is placed.
 - .5 Remove and replace that portion of layer in which material becomes segregated during spreading.
 - .6 Place and compact shouldering to 2% cross slope in reconstruction areas. In overlay sections, feather new shoulder material from top of new asphalt to existing hinge point of shoulder slope.
 - .7 Compacted shouldering to be flushed with asphalt concrete surface.
 - .8 Place, hand rake and compact new shoulder material under and behind guiderail.
- 3.3 Compaction Equipment
- .1 Vibratory compaction equipment must be used and capable of obtaining required densities on aggregates on project.
- 3.4 Compacting
- .1 Compact to density not less than 95% corrected maximum dry density.
 - .2 Shape and roll alternately to obtain smooth, even and uniformly compacted base.
 - .3 Apply water as necessary during compacting to obtain specified density. If aggregate is excessively moist, aerate by scarifying with suitable equipment until moisture content is corrected.
 - .4 In areas not accessible to rolling equipment, compact to specified density with vibratory mechanical tampers approved by Department Representative.
- 3.5 Finish
- .5 Density will be determined according to ASTM D6938.
 - .1 Finished base surface to be within plus or minus 10 mm of established grade and cross section but not uniformly high or low.

- .2 Correct surface irregularities by loosening and adding or removing material until surface is within specified tolerance.
- .3 Shouldering to have 2% cross slope.

3.6 Maintenance

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

END

PART 1 - GENERAL

- 1.1 Description .1 This section covers asphalt tack coat between layers/lifts of asphalt. (Include tack coat in tendered price. Offer Owner/Department Representative credit if not used.)
- 1.2 References .1 CAN/CGSB-16.2-M89, Emulsified Asphalts, Anionic Type, for Road Purposes.
.2 ASTM D140/D140M-14, Practice for Sampling Bituminous Materials.
- 1.3 Samples .1 Submit samples in accordance with Section 01 33 00 - Submissions / Shop Drawings, Product Data, Samples and Mock-ups.
.2 Submit, in plastic containers to Department Representative, two - 4L samples of asphalt tack coat material proposed for use at least 2 weeks prior to commencing work.
.3 Provide access on tank truck for Department Representative to sample asphalt material to be incorporated into work, in accordance with ASTM D140.
- 1.4 Asphalt Material Certification .1 Upon request by Department Representative, submit manufacturer's test data and certification that asphalt tack coat material meets requirements of this section.

PART 2 - PRODUCTS

- 2.1 Materials .1 Anionic emulsified asphalt: to CAN/CGSB-16.2, grade SS-1.

PART 3 - EXECUTION

- 3.1 Equipment .1 Pressure distributor to be:
- .1 Designed, equipped, maintained and operated so that asphalt material:
 - .1 Is maintained at even temperature. May be applied uniformly on variable widths of surface up to 5 metres.
 - .2 May be applied at readily determined and controlled rate of 0.14 L/m² with uniform pressure, and with an allowable variation from any specified rate not exceeding 0.04 L/m².
 - .2 Capable of distributing asphalt material in uniform spray without atomization at temperature required.
 - .3 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.
 - .4 Equipped with pump having flow meter graduated in units of 5L or less per minute passing through nozzles and readily visible to operator. Pump power unit to be independent of truck power unit.
 - .5 Equipped with an easily read, accurate and sensitive device which registers temperature of liquid in reservoir.
 - .6 Equipped with accurate volume measuring device or calibrated tank.
 - .7 Equipped with nozzles of same make and dimensions, adjustable for fan width and orientation.
- 3.2 Application .1 Apply tack coat only on clean and dry surface. Obtain Department Representative's approval of surface before applying asphalt tack coat.
- .2 Dilute asphalt emulsion with water at 1:1 ratio for application. Mix thoroughly by pumping or other method approved by Department Representative.

- .3 Apply tack coat evenly to pavement surface at rate as directed by Department Representative but do not exceed 0.7 L/m².
- .4 Paint contact surfaces of curbs, gutters, headers, manholes and like structures with thin, uniform coat of asphalt tack coat material.
- .5 Do not apply asphalt tack coat when air temperature is less than 5°C or when rain is forecast within 2 hours of application.
- .6 Apply tack coat only to base coarse surfaces that are expected to be overlaid on same day.
- .7 Evenly distribute localized excessive deposits of tack coat by brooming as directed by Department Representative.
- .8 Where traffic is to be maintained, treat no more than one half of width of surface in one application.
- .9 Keep traffic off tacked areas until tack coat has set as directed by Department Representative.
- .10 Re-tack contaminated or disturbed areas as directed by Department Representative.
- .11 Permit tack coat to set before placing asphalt paving.

END

PART 1 - GENERAL

- 1.1 Description .1 This section covers asphalt concrete on reconstructed roadbed for the roadway.
- 1.2 References .1 In accordance with the following standards or most recent revisions:
- .1 ASTM C88-13, Test Method for Soundness of Aggregates by Use of Sodium Sulphate or Magnesium Sulphate.
 - .2 ASTM C117-13, Test Method for Material Finer than 0.075 mm Sieve in Mineral Aggregates by Washing.
 - .3 ASTM C123/C123M-14, Test Method for Lightweight Particles in Aggregate.
 - .4 ASTM C127-12, Test Method for Density, Relative Density (Specific Gravity), and Absorption of Coarse Aggregate.
 - .5 ASTM C128-12, Test Method for Density, Relative Density (Specific Gravity), and Absorption of Fine Aggregate.
 - .6 ASTM C131/C131M-14, Test Method for Resistance to Degradation of Small Size Coarse Aggregate by Abrasion and Impact in the Los Angeles Machine.
 - .7 ASTM C136-06, Method for Sieve Analysis of Fine and Coarse Aggregates.
 - .8 ASTM D995-95b(2002), Specification for Mixing Plants for Hot-Mixed, Hot-Laid Bituminous Paving Mixtures.
 - .9 ASTM D1559-89, Test Method for Resistance to Plastic flow of Bituminous Mixtures Using Marshall Apparatus.
 - .10 ASTM D2419-14, Test Method for Sand Equivalent Value of Soils and Fine Aggregate.
 - .11 ASTM D2041/D2041M-11, Standard Test Method for Theoretical Maximum Specific Gravity and Density of Bituminous Paving Mixtures

.12 ASTM D2950/D2950M-14, Standard Test Method for Density of Bituminous Concrete in Place by Nuclear Methods.

.13 ASTM D3203/D3203M-11, Test Method for Percent Air Voids in Compacted Dense and Open Bituminous Paving Mixtures.

.14 ASTM D3515-01, Standard Specifications for Hot-Mixed, Hot-Laid Bituminous Paving Mixtures.

.15 ASTM D4469-11, Standard Practice for Calculating Percent Asphalt Absorption by the Aggregate in an Asphalt Pavement Mixture.

.16 CAN/CGSB-8.2-M88 (R10/3 Series), Sieves Testing, Woven Wire, Metric.

.17 CAN/CGSB-16.3-M90, Asphalt Cements for Road Purposes.

.18 AASHTO T-283 with Lottman Conditioning.

- 1.3 Samples
- .1 Submit samples in accordance with Section 01 33 00 - Submissions/Shop Drawings.
 - .2 At least 4 weeks prior to commencing work submit samples of following materials proposed for use:
 - .1 One 4L container of asphalt cement.
- 1.4 Material Certification
- .1 At least 4 weeks prior to commencing work submit viscosity-temperature chart for asphalt cement to be supplied showing kinematic viscosity in mm²/s versus temperature range from 105°C to 175°C.
 - .2 At least 4 weeks before commencing work, submit refinery's test data and certification that asphalt cement meets requirements of this section which also includes the specific gravity of the asphalt cement.
- 1.5 Submission of Mix Design
- .1 Samples of aggregate for mix design shall be derived from stockpiles not less than 1000 tonnes of each of fine and course aggregate.

.2 The Contractor will submit, in writing, asphalt concrete mix design and trial mix test results to Department Representative for review at least 4 weeks prior to commencing work. The mix design shall contain the job mix formula which shall include the following:

- Asphalt cement content
- Specific gravity and absorption of each aggregate
- Percentage of each aggregate
- Gradation of Job Mix Formula
- Marshall Stability and flow, kN
- Bulk Specific Gravity, kg/m^3
- Maximum theoretical density, kg/m^3
- Percentage voids in mineral aggregate
- Percentage air voids
- Percentage voids filled
- Percentage of absorbed asphalt cement
- Long term TSR (AASHTO T283)

1.6 Delivery and Storage

- .1 Deliver and stockpile aggregates. Stockpile outside of park boundaries, a minimum 50% of total amount of aggregate required before commencing asphalt concrete operations.
- .2 Coarse aggregate stockpile shall contain no more than 15% passing 5000 sieve.
- .3 Fine aggregate stockpile shall contain no more than 15% retained on 5000 sieve.
- .4 When necessary to blend aggregates from one or more sources to produce required gradation, do not blend in stockpiles.
- .5 When dryer drum mixing plant is used, stockpile fine aggregate separately from coarse aggregate.
- .6 Provide approved storage, heating tanks and pumping facilities for asphalt cement.

1.7 Measurement for Payment

- .1 See Section 01 29 00 Project Particulars and Measurement.

PART 2 - PRODUCTS

- 2.1 Materials
- .1 Asphalt Cement: to NBDTI 260.2.1.1, Grade: 200. For Asphalt D, use PG 58-28. For Asphalt B use PG 58-28.
 - .2 Aggregates: In accordance with 31 05 17 Aggregates: General and following requirements:
 - .1 Crushed stone
 - .2 Gradations: within limits specified when tested to ASTM C136 and ASTM C177. Sieve sizes to CAN/CGSB-8.2.
 - .3 Gradations
 - .1 Coarse Aggregate: to NBDTI 260.2.1.2 and Table 260-1.
 - .2 Fine Aggregate: to NBDTI 260.2.1.3 and Table 260-2.
 - .3 Blending Sand: to NBDTI 260.2.1.5 and Table 260-3.
 - .4 Coarse Aggregate: aggregate retained on 4.75 mm sieve and Fine aggregate is: aggregate passing 4.75 mm sieve when tested to ASTM C136.
 - .5 When dryer drum plant or plant without hot screening is used, process fine aggregate through 4.75 mm sieve and stockpile separately from coarse aggregate.
 - .6 Separate stockpiles for coarse and fine aggregate not required for sheet asphalt.
 - .7 Do not use aggregates having known polishing characteristics in mixes for surface courses.
 - .8 Aggregate grading and physical requirements and mix design shall conform to NBDTI 260.2.
 - .9 Regardless of compliance with specified physical requirements, fine aggregate may be accepted or rejected on the basis of past performance.
 - .4 Anti-stripping agent: to NBDTI 260.2.1.6.

.5 Water: to approval of Departmental Representative.

2.2 Equipment

.1 In general, provide equipment acceptable to the Departmental Representative and in conformance with NBDTI 260.4.2 and as specified in this section.

.2 Mixing Plant and Components: to NBDTI 240.4.2.

.3 Placing Equipment: mechanical grade controlled equipment capable of spreading mix within specified tolerances, true to line, grade, and crown as indicated. Conform to NBDTI 240.2.12.

.4 Compaction Equipment: sufficient number of type and weight to obtain specified density of compacted mix. Conform to NBDTI 260.4.2.13.

.5 Vibratory rollers:

.1 Minimum drum diameter: 1200 mm.

.2 Maximum amplitude of vibration (machine setting): 0.5 mm for lifts less than 40 mm thick.

.6 Haul Trucks: sufficient number and of adequate size, speed and condition to ensure orderly and continuous operation as follows:

.1 Boxes with tight metal bottoms.

.2 Covers of sufficient size and weight to completely cover and protect asphalt mix when truck is fully loaded.

.3 In cool weather or for long hauls, insulate entire contact area of each truck box.

.7 Hand Tools:

.1 Lutes or rakes with covered teeth for spreading and finishing operations.

.2 Tamping irons having mass less than 12 kg and bearing area not exceeding 310 cm² for compacting material along curbs, gutters and other structures

inaccessible to roller. Mechanical compaction equipment, when approved by Departmental Representative, may be used instead of tamping irons.

.3 Straight edges, 4.5 m in length, to test finished surface.

.8 Plant testing facility: provide laboratory space at plant site for exclusive use of Departmental Representative, for performing tests, keeping records and making reports.

2.3 Mix Design and
Job Mix Formula

.1 Contractor Mix Design: The contractor shall use professional engineering services and a qualified testing laboratory to assess the performance grade asphalt cement and aggregate materials proposed for use and to carry out the design of the asphalt mix. Job mix formula to be approved by Departmental Representative.

.2 Mix design to be developed by testing laboratory approved by Departmental Representative.

.3 Asphalt Base Mix to contain maximum 50% by mass RAP. Departmental Representative may approve higher proportion of RAP if Contractor demonstrates ability to produce mix meeting requirements of specification.

.4 Design of mix: by Superpave method to NBDTI Item 260.2.3.2 and requirements below.

.1 Mix physical requirements: to NBDTI 260.2.3 and Table 260-7.

.2 Do not change job-mix without prior approval of Departmental Representative. When change in material source proposed, new job-mix formula to be approved by Departmental Representative.

PART 3 - EXECUTION

3.1 Plant and Mixing
Requirements

.1 Location: The hot mix plant shall be located within a 95 km haul distance of the project limits. The plant shall not be located within the Park boundaries.

.2 Feeder lines for loading asphalt cement to the

asphalt tanks shall be elevated and drained and the use of diesel fuel to clean asphalt cement pump feeder lines is not permitted. When necessary to use diesel to flush lines and pump, all flushed material shall be collected and not permitted to enter asphalt cement tanks or dumped on the ground.

.3 Batch and Continuous Mixing Plants:

.1 To ASTM D995.

.2 Heat asphalt cement and aggregate to mixing temperature directed by Department Representative. Do not heat asphalt cement above 165°C. Before mixing, dry aggregates to a moisture content not greater than 0.5% by mass or to a lesser moisture content if required to meet mix design requirements.

.3 Make available current asphalt cement viscosity and specific gravity data at plant. With information relative to viscosity of asphalt cement being used, Department Representative will direct temperature of completed asphalt concrete at plant and at paver after considering hauling and placing conditions.

.4 Feed aggregates from individual stockpiles through separate bins to cold elevator feeders. Aggregate will not be fed directly to the plant from the crusher.

.5 Feed cold aggregates to plant in proportions that will ensure continuous operations.

.6 Immediately after drying, screen aggregates into hot storage bins in sizes to permit recombining into gradation meeting job- mix requirements.

.7 Store hot screened aggregates in a manner to minimize segregation and temperature loss.

.8 Maintain temperature of materials within plus or minus 5°C of specified mix temperature during mixing.

.9 Mixing time:

.1 In batch plants, both dry and wet mixing times as directed by Department Representative.

Continue wet mixing as long as necessary to obtain a thoroughly blended asphalt concrete but not less than 30 sec or more than 75 sec.

.2 In continuous mixing plants, mixing time as directed by Department Representative but not less than 45 sec.

.3 Do not alter mixing time unless directed by Department Representative.

.4 Dryer Drum Mixing Plant:

.1 Feed aggregates to burner end of dryer drum by means of a multi-bin cold feed unit and blend to meet job-mix requirements by adjustments of variable speed feed belts and gates on each bin.

.2 Meter total flow of aggregate by an electronic weigh belt system with an indicator that can be monitored by plant operator and which is interlocked with asphalt pump so that proportions of aggregate and asphalt cement entering mixer remain constant.

.3 Provide for easy calibration of weighing systems for aggregates without having material enter drum.

.4 Make provision for conveniently sampling the full flow of aggregate from the cold feed.

.5 Provide screens or other suitable devices to reject oversize particles or lumps of aggregate from cold feed prior to entering drum.

.6 Provide a system interlock which will stop all feed components if either asphalt or aggregate from any bin stops flowing.

.7 Accomplish heating and mixing of asphalt concrete in an approved parallel flow dryer-mixer in which aggregate and asphalt cement enter drum at burner end and travel parallel to flame and exhaust gas stream. Control heating to prevent fracture of aggregate or excessive oxidation of asphalt cement. Equip system with automatic burner controls and provide for continuous temperature sensing of asphalt

concrete at discharge, with a printing recorder that can be monitored by plant operator. Submit printed record of mix temperatures at end of each week.

.8 Mixing period and temperature to produce a uniform mixture in which particles are thoroughly coated, and moisture content of material as it leaves plant to be less than 0.5 %.

.5 Temporary storage of hot asphalt concrete:

.1 Provide storage of sufficient capacity to permit continuous operation and designed to prevent segregation.

.2 Do not store in storage bins in excess of 3 h.

.6 While producing asphalt concrete for this project, do not produce it for other users unless separate storage and pumping facilities are provided for materials supplied to this project.

.7 Mixing tolerances:

.1 Permissible variation in aggregate gradation from job mix (percent of total mass):

Sieve, μm	Allowable Variation, %
>5000	5.0
5000	5.0
2500	4.0
315	3.0
160	2.0
80	2.0

.2 Permissible variation of asphalt cement from job mix, 0.25%.

.3 Permissible variation of asphalt concrete temperature at discharge from plant, 5°.

- 3.2 Equipment
- .1 General: All equipment used on this project shall be in top operating condition because the project is located on a roadway with very steep grades and sharp curves.
 - .2 Pavers: Mechanical grade controlled self powered pavers capable of spreading asphalt concrete within specified tolerances, true to line, grade and crown indicated.
 - .1 Pavers to be equipped with automatic screed controls, as recommended by manufacturer for control of longitudinal grade and transverse slope.
 - .2 Pavers to be equipped with joint matching shoe to operate with longitudinal grade control.
 - .3 Transverse slope control shall be capable of operating from either side of paver.
 - .4 Pavers to be equipped with an approved 12 metre ski. Where such ski is a flexible unit, it shall be equipped with a spring tensioned wire extending between brackets fitted on and slightly above each end of ski. Sensing grid shall ride on wire and not on ski.
 - .3 Rollers: sufficient number of rollers of type and mass to obtain specified density of compacted mix.
- 3.3 Preparation
- .1 Pavement sites indicated by the Department Representative for pulverizing will be prepared in accordance with Section 32 01 16 - Removal of Existing Asphalt.
 - .2 Where indicated by Department Representative, apply tack coat in accordance with Section 32 12 15 - Asphalt Tack Coat prior to paving.
 - .3 Pavement sites indicated by the Department Representative for overlay and skin patching shall be free of loose and foreign material and tack coat shall be applied in accordance with Section 32 12 15 - Tack Coat.

- 3.4 Transportation of Asphalt Concrete
- .1 Transport asphalt concrete to job site in vehicles cleaned of foreign material.
 - .2 Paint or spray truck beds with limewater, soap or detergent solution, at least once a day or as required. Elevate truck bed and thoroughly drain. No excess solution will be permitted. **Diesel fuel is not permitted.**
 - .3 Schedule delivery of asphalt concrete for placing in daylight, unless Department Representative approves artificial light.
 - .4 Deliver asphalt concrete to paver at a uniform rate and in an amount within capacity of paving and compacting equipment.
 - .5 Deliver loads continuously in covered vehicles and immediately spread and compact. Deliver and place asphalt concrete at temperature within range as directed by Department Representative, but not less than 135°.
 - .6 Tarpaulins or other coverings for trucks must be of sufficient mass to prevent rapid cooling of asphalt concrete surface.
- 3.5 Placing
- .1 Obtain Department Representative's approval of base and existing surface and tack coat and prime coat prior to placing asphalt.
 - .2 Place asphalt concrete to thicknesses, grades and lines as indicated or as directed by Department Representative.
 - .3 Use asphalt material transfer vehicle (MTU) when placing asphalt seal surface course to transfer hot asphaltic concrete from and unloading truck to the paving insert hopper and remixing the asphalt concrete before it is transferred.
 - .4 Placing Conditions:

- .1 Place asphalt concrete only when air temperature is above 5°.
- .2 When temperature of surface on which asphalt concrete is to be placed falls below 10°C, provide extra rollers as necessary to obtain required compaction before cooling.
- .3 Do not place asphalt concrete when pools of standing water exist on surface to be paved, or during rain, or when surface is damp, or if ambient temperature is below 5°C .
- .5 Place asphalt concrete in compacted lifts of thickness as follows:
 - .1 On overlay section in two compacted lifts each with a spread rate of 120 kg/m² or as directed by the Department Representative.
 - .2 In lift of 70 mm to construct drainage gutters to the plans and specifications as directed by the Department Representative.
- .6 Spread and strike off asphalt concrete overlay with self propelled mechanical finisher.
 - .1 Place individual strips no longer than 500 m.
 - .2 Construct longitudinal joints and edges true to line markings. Lines for paver to follow will be established by Department Representative parallel to centreline of proposed pavement. Position and operate paver to follow established line closely.
 - .3 If segregation occurs, immediately suspend spreading operation until cause is determined and corrected.
 - .4 Correct irregularities in alignment left by paver by trimming directly behind machine.
 - .5 Correct irregularities in surface of pavement course directly behind paver. Remove by shovel or lute access asphalt concrete forming high posts. Fill and smooth dips with asphalt concrete.

.6 Do not broadcast asphalt concrete over surface.

.7 The forward speed of the paver shall be regulated by capacity of the plant and the rollers but shall not exceed a forward speed of 10 m/min.

.7 When hand spreading is used:

.1 Approved wood or steel forms, rigidly supported to assure correct grade and cross section, may be used. Use measuring blocks and intermediate strips to aid in obtaining required cross-section.

.2 Distribute material uniformly. Do not broadcast material.

.3 During spreading operation, thoroughly loosen and uniformly distribute asphalt concrete by lutes or covered rakes. Reject asphalt concrete that has formed into lumps and does not break down readily.

.4 After placing and before rolling, check surface with templates and straightedges and correct irregularities.

.5 Provide heating equipment to keep hand tools free from asphalt. Avoid high temperatures which may burn asphalt concrete. Do not use tools at a higher temperature than temperature of asphalt concrete being placed.

3.6 Compacting

.1 Compact asphalt concrete continuously using established rolling pattern.

.2 Do not change rolling pattern unless asphalt concrete changes or lift thickness changes. Change rolling pattern only as directed by Department Representative.

.3 General:

.1 Provide at least three rollers or as many additional rollers as necessary to achieve specified pavement density.

.2 Start rolling operations as soon as asphalt concrete can bear mass of roller without undue

displacement of asphalt concrete or cracking of surface.

.3 Operate roller slowly initially to avoid displacement of asphalt concrete. For subsequent rolling do not exceed 5 km/h for static steel-wheeled rollers and 8 km/h for pneumatic-tired rollers.

.4 For lifts 50 mm thick and greater, adjust speed and vibration frequency of vibratory rollers to produce minimum of 20 impacts per metre of travel.

.5 Overlap successive passes of roller by at least one half width of roller and vary pass lengths.

.6 Keep wheels of roller slightly moistened with water to prevent pick-up of asphalt concrete but do not over-water and do not use diesel fuel.

.7 Do not stop vibratory rollers on pavement that is being compacted with vibratory mechanism operating.

.8 Do not permit heavy equipment or rollers to stand on finished surface before it has been compacted and has thoroughly cooled.

.9 After traverse and longitudinal joints and outside edge have been compacted, start rolling longitudinally at low side and progress to high side.

.10 Where rolling causes displacement of asphalt concrete, loosen affected areas at once with lutes or shovels and restore to original grade of loose asphalt concrete before re-rolling.

.11 Do not refuel rollers on fresh asphalt concrete.

.4 Breakdown Rolling:

.1 Commence breakdown rolling with static steel wheeled roller vibratory roller immediately following rolling of transverse and longitudinal joint and edges.

.2 Operate rollers as close to paver as necessary

to obtain the specified density without causing undue displacement.

.3 Operate breakdown roller with drive roll or wheel nearest finishing machine. Exceptions may be made when working on steep slopes or super-elevated sections.

.4 Use only experienced roller operators for this work.

.5 Second Rolling:

.1 Use pneumatic-tired, steel wheel or vibratory rollers and follow breakdown rolling as closely as possible and while paving asphalt concrete temperature allows maximum density from this operation.

.2 Rolling shall be continuous after initial rolling until asphalt concrete placed has been thoroughly compacted.

.6 Dusting: If required by Department Representative, dust entire area of sheet asphalt concrete with hydrated lime immediately after rolling to eliminate tendency to pick-up under traffic.

.7 All asphalt concrete shall be compacted to 93% of Theoretical Maximum Relative Density (TMRD) in accordance with ASTM D3203.

.8 The Contractor will supply additional compaction equipment if required density is not achieved.

3.7 Joints

.1 General:

.1 Trim vertical face to provide true surface and cross section against which new pavement may be laid. Remove loose particles.

.2 Paint joint face with coat of tack coat emulsified asphalt cement or preheat joint face with approved heater, prior to placing of fresh asphalt concrete.

.3 Overlap previously laid strip with spreader by

100 mm.

.4 Rake fresh asphalt concrete against joint and thoroughly tamp and roll.

.5 Remove surplus material from surface of previously laid strip. Dispose of surplus material as directed by Department Representative.

.6 Do not throw surplus material on freshly screened mat surface.

.2 Transverse Joints:

.1 Carefully construct and thoroughly compact transverse joints to provide a smooth riding surface.

.2 Hold transverse joints to a minimum. When paving single width and maintaining traffic, construct one lane no farther than one-half total paving day.

.3 Stagger joint locations 1.5 to 3.0 metres. Schedule each day's paving operation to terminate adjacent lanes in any one area to within above specified joint location.

.4 Offset transverse joint in succeeding course by at least 600 mm.

.3 Longitudinal Joints:

.1 Before rolling, carefully remove with a lute or rake and discard coarse aggregate in asphalt concrete overlapping joint.

.2 Roll longitudinal joints directly behind paving operation.

.3 When rolling with static roller, shift roller over onto previously placed lane in order that no more than 150 mm of roll rides on edge of newly laid lane, then operate roller to pinch and press fines gradually across joint. Continue rolling until a thoroughly compacted neat joint is obtained.

.4 When rolling with vibratory roller, have most of drum width ride on newly placed lane with remaining 100 to 150 mm extending onto previously placed and compacted lane.

.5 When abutting lane is not placed in same day, or when joint is distorted during day's work by traffic or other means, carefully trim edge of lane to line and paint with a thin coating of asphalt before abutting lane is placed.

.6 Ensure joints are offset at least 150 to 200 mm from those in lower layers.

- 3.8 Finish Tolerances
- .1 Finished asphalt concrete to be within 6 mm of design elevation but not uniformly high or low.
 - .2 Finished asphalt concrete not to have irregularities exceeding 6 mm when checked with a 3 metre straight edge placed in any direction.
- 3.9 Defective Work
- .1 Correct irregularities which develop before completion of rolling by loosening surface mix and removing or adding material as required. If irregularities or defects remain after final compaction, remove surface course promptly and lay new material to form a true and even surface and compact immediately to specified density.
 - .2 Repair areas showing checking or rippling.
 - .3 Adjust roller operation and screed settings on paver to prevent further defects such as rippling and checking of pavement.

END

PART 1 - GENERAL

- 1.1 References .1 CGSB 15-GP-1M-80, Calcium Chloride.
- 1.2 Measurement for Payment .1 Supply and application of water for dust control is incidental to the work, to be included in overall tendered price.
- 1.3 Delivery, Storage and Handling .1 Supply water from outside National Park Boundaries in quantities and at times as directed by Department Representative.

PART 2 - PRODUCTS

- 2.1 Materials .1 Water: potable to Department Representative's approval.

PART 3 - EXECUTION

- 3.1 Application .1 Apply water with equipment approved by Department Representative at rate of 0.5 to 5.0 l/m² as appropriate when directed by Department Representative.
- .2 Apply water with distributors equipped with spray system to ensure uniform application and with means of shut-off.

END

PART 1 - GENERAL

- 1.1 DESCRIPTION** .1 This section specifies the supply and application of 100 mm wide lines of white and yellow traffic paint with reflective glass beads used for pavement markings.
- 1.2 RELATED WORK** .1 Section 01 35 44 - Environmental Protection Procedures.
.2 Section 32 12 16 - Hot-mix Asphalt Concrete.
- 1.3 REFERENCES** .1 CAN/CGSB-1.5-M91, Low Flash Petroleum.
.2 CGSB 1-GP-12c-68, Standard Paint Colours.
.3 CGSB 1-GP-71-83, Method of Testing Paints and Pigments.
.4 CGSB 1-GP-74M-79, Paint, Traffic, Alkyd.
- 1.4 SAMPLES** .1 Submit samples in accordance with Section 01 33 00 - Submittal Procedures.
.2 Submit to Department Representative following material sample quantities at least 4 weeks prior to commencing work:
.1 Two 1L samples of each type of paint.
.2 One 1 kg sample of glass beads.
.3 Sampling to CGSB 1-GP-71.

**1.5 MEASUREMENT FOR
PAYMENT**

- .1 Supply and application of pavement marking including reflective glass beads will be measured in lumps sum.
- .2 Price will include price for any painting required to be done upon completion of paving.
- .3 Glass beads required in all pavement markings.

PART 2 - PRODUCTS

2.1 MATERIALS

- .1 Paint:
 - .1 To CGSB 1-Gp-74M, alkyd traffic paint.
 - .2 Colour: to CGSB 1-GP-12c, yellow 505-308 and white 513-301.
 - .3 Upon request, Departmental Representative will supply a qualified product list of paints applicable to work. Qualified paints may be used but Departmental Representative reserves right to perform further tests.
- .2 Thinner: to CAN/CGSB-1.5.
- .3 Glass beads:
 - .1 Overlay type: to CGSB 1-GP-74M.
- .4 Contractor will supply, at pre-construction meeting, a duly signed certificate from the paint manufacturer showing recent test values for all the properties noted in standards.

PART 3 - EXECUTION

**3.1 EQUIPMENT
REQUIREMENTS**

- .1 Paint applicator to be an approved pressure type mobile distributor mounted on a self-propelled vehicle. Applicator to be capable of applying marking components uniformly, at rates specified, and to have dimensions as indicated, and to have positive shut-off.

- .2 Distributor to be capable of applying reflective glass beads as an overlay on freshly applied paint.
- .3 Bead dispensers shall be electrically controlled, air operated, gravity fed with controls to adjust bead flow.

3.2 CONDITION OF SURFACES

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

3.3 APPLICATION

- .1 Lay out pavement markings.
- .2 Apply paint lines in 100 mm width unless otherwise noted.
- .3 Unless otherwise approved by Departmental Representative, apply paint only when air temperature is above 10°C, wind speed is less than 60km/h and no rain is forecast within next 4h.
- .4 Do not thin paint unless approved by Departmental Representative.
- .5 Paint to be hot sprayed between 70° and 90°.
- .6 Symbols and letters to conform to dimensions indicated.
- .7 Paint lines to be of uniform colour and density with sharp edges.
- .8 Thoroughly clean distributor tank before refilling with paint of different colour.

3.4 TOLERANCE

- .1 Paint markings to be within plus or minus 5 mm of dimensions indicated.
- .2 Remove incorrect markings by method acceptable to Departmental Representative.

3.5 PROTECTION OF COMPLETED WORK

- .1 Protect pavement markings until dry.
- .2 No pick time will be field tested:

- .1 Field test by a hot spray at 250 μm wet film thickness.
- .2 Wait one minute and drive a passenger car over the film.
- .3 Verify that no visible (from 15 m) deposition of paint is deposited onto the adjacent pavement.

3.6 INSPECTION

- .1 The Departmental Representative will observe each filling of paint and beads and will maintain record of drums of paint used and bags of glass beads.
- .2 The Contractor shall advise the Departmental Representative 24 hours prior to the expected start of pavement marking operation.
- .3 Inspection shall include, but is not limited to, the following:
 - .1 Verify and record quantity of glass beads used.
 - .2 Verify and record quantity of white paint used.
 - .3 Verify and record quantity of yellow paint used.
 - .4 Steel plates will be used to verify the spray quantities of paint and glass beads at random sites.

END

PART 1 - GENERAL

- 1.1 Scope of Work .1 This section specifies topsoil, topsoil amendments, the stripping of topsoil, the preparation of existing grades, the placement of topsoil, and finish grading.
- 1.2 Related Sections .1 Section 01 35 44 - Environmental Protection
.2 Section 31 11 00 - Clearing and Grubbing
.3 Section 31 23 13 - Rough Grading
- 1.3 Quality Assurance .1 Test Reports: certified test reports showing compliance with specified performance characteristics and physical properties.
.2 Certificates: product certificates signed by manufacturer certifying materials comply with specified performance characteristics and criteria and physical requirements.
.3 Pre-Installation Meetings: conduct pre-installation meeting to verify project requirements, installation instructions and warranty requirements.
- 1.4 Testing .1 All soil and sand used in this project shall be tested for compliance with texture specification by a laboratory designated by the owner. Soil sampling, testing and analysis to be in accordance with Provincial regulations and standards. Contractor will arrange and pay for cost of tests.
- 1.5 Waste Management and Disposal .1 Separate and recycle waste materials.
.2 Divert unused soil amendments from landfill to official hazardous material collections site approved by Municipality.
.3 Do not dispose of unused soil amendments into sewer systems, into lakes, streams, onto ground or in locations where it will pose health or environmental hazard.

PART 2 - PRODUCTS

2.1 Topsoil

- .1 Topsoil for this project to consist of topsoil stripped from site and imported topsoil to be supplied by the Contractor.
- .2 Topsoil: mixture of mineral particulates, micro organisms and organic matter which provides suitable medium for supporting intended plant growth, free of debris, weeds, foreign objects, toxic materials and stones and roots greater than 20 mm length.
- .3 Soil Texture: sandy loam, based on The Canadian System of Soil Classification, to the following particle distribution and gradation:

Particle Type	Distribution by Volume	Acceptable Range
Very coarse sand	10%	10% or less
Coarse and medium sand	45%	42-47%
Fine sand	15%	13-17%
Very fine sand	10%	8-12%
Clay	20%	18-23%

Particle Type	Gradation
Very coarse sand	2.0-1.0 mm
Coarse sand	1.0-0.5 mm
Medium sand	0.5-0.25 mm
Fine sand	0.25-0.15 mm
Very fine sand	0.15-0.106 mm
Clay	Less than 0.06 mm

- .4 Organic Matter: 4-20% by dry weight volume, well decomposed and stable. Organic material measuring 20 mm will not exceed 2% by volume.
- .5 pH range: 6.0-7.0
- .6 Consistency: friable when moist.

.7 Fertility: major soil nutrients present in following ratios:

.1 Nitrogen (N): 20 to 40 micrograms of available N per gram of topsoil

.2 Phosphorus (P): 10 to 20 micrograms of phosphate per gram of topsoil.

.3 Potassium (K): 80 to 120 micrograms of potash per gram of topsoil.

.4 Calcium, magnesium, sulphur and/or establishment of intended vegetation.

2.2 Source Quality Control

.1 Advise Department Representative of sources of topsoil to be utilized with sufficient lead time for testing.

.2 Contractor is responsible for amendments to supply topsoil as specified.

PART 3 - EXECUTION

3.1 Stripping of Topsoil

.1 Commence topsoil stripping of areas after all wood, brush and grasses have been removed from site.

.2 Strip and pulverize topsoil to depths as indicated. Avoid mixing topsoil with subsoil where textural quality will be moved outside acceptable range of intended application.

.3 Stockpile in locations as directed by Department Representative. Stockpile height not to exceed 2 metres.

.4 Unused topsoil is to remain on site.

.5 Protect stockpiles from contamination and compaction.

-
- 3.2 Preparation of Existing Grade
- .1 Verify that grades are correct. If discrepancies occur, notify Department Representative and do not commence work until instructed by Department Representative.
 - .2 Grade soil, eliminating uneven areas and low spots, ensuring positive drainage.
 - .3 Remove debris, roots, branches, stones in excess of 25 mm diameter and other deleterious materials. Remove soil contaminated with calcium chloride, toxic materials and petroleum products. Remove debris which protrudes more than 75 mm above surface. Dispose of removed material off site.
 - .4 Cultivate entire area which is to receive topsoil to minimum depth of 100 mm. Cross cultivate those areas where equipment used for hauling and spreading has compacted soil.
- 3.3 Placing and Spreading of Topsoil/Planting Soil
- .1 Place topsoil after Department Representative has accepted subgrade.
 - .2 Spread topsoil in uniform layers not exceeding 150 mm.
 - .3 Spread topsoil/planting soil to following minimum depths after settlement.
 - .1 100 mm for seeded areas
 - .2 500 mm for shrub beds
 - .4 Manually spread topsoil/planting soil around trees, shrubs and obstacles.
- 3.4 Finish Grading
- .1 Grade to eliminate rough spots and low areas and ensure positive drainage. Prepare loose friable bed by means of cultivation and subsequent raking.
 - .2 Consolidate topsoil to required bulk density using equipment approved by Department Representative. Leave surfaces smooth, uniform and firm against deep footprinting.

-
- 3.5 Acceptance
- .1 Department Representative will inspect and test topsoil in place and determine acceptance of material, depth of topsoil and finish grading.
 - .2 Department Representative will inspect all rock walls and boulder placements to ensure secure installation and neat finished appearance.
- 3.6 Surplus Material
- .1 Dispose of surplus materials off site.
- 3.7 Cleaning
- .1 Upon completion of installation, remove surplus materials, rubbish, tools and equipment barriers.
 - .2 Clean all exposed rock and boulder surfaces to approval of Department Representative.

END

PART 1 - GENERAL

- 1.1 Scope of Work .1 This Section specifies seed, mulch, slurry preparation and application, and maintenance for hydraulic seeding.
- 1.2 Related Sections .1 Section 01 35 44 - Environmental Protection
 .2 Section 31 23 13 - Rough Grading
 .3 Section 32 91 21 - Topsoil and Finish Grading
- 1.3 Submittals .1 Provide product data for:
 .1 Seed
 .2 Mulch
 .3 Tackifier
 .4 Fertilizer
 .2 Submit in writing to Consultant 7 days prior to commencing work:
 .1 Volume capacity of hydraulic seeder in litres.
 .2 Amount of material to be used per tank based on volume.
 .3 Number of tank loads required to apply specified slurry mixture.
- 1.4 Quality Assurance .1 Test Reports: certified test reports showing compliance with specified performance characteristics and physical properties.
 .2 Certificates: product certificates signed by manufacturer certifying materials comply with specified performance characteristics and criteria and physical requirements.
 .3 Pre-Installation Meetings: conduct pre-installation meeting to verify project requirements, installation instructions and warranty requirements.

- 1.5 Scheduling
- .1 Schedule hydraulic seeding to coincide with preparation of soil surface.
 - .2 Schedule hydraulic seeding to be completed not later than September 30 without written approved from Consultant.
- 1.6 Waste Management and Disposal
- .1 Separate and recycle waste materials.
 - .2 Divert unused fertilizer from landfill to official hazardous material collections site approved by Municipality.
 - .3 Do not dispose of unused fertilizer into sewer systems, into lakes, streams, onto ground or in locations where it will pose health or environmental hazard.

PART 2 - PRODUCTS

- 2.1 Seed
- .1 "Canada pedigreed grade" in accordance with Government of Canada Seeds Act and Regulations.
 - .2 Mixture composition: to NBDTI 614.2.2 and Table 614-1 for Roadside Mix.
 - .1 40% Creeping Red Fescue
 - .2 20% Hard Fescue
 - .3 15% Canada Bluegrass
 - .4 10% Annual Ryegrass
 - .5 10% Alsike or White Clover
 - .6 5% Red Top
 - .3 Bags of seed shall be clearly labelled identifying mass, mix components and percentages, date of bagging, supplier's name, and lot number.
 - .4 Protect seed from moisture and direct sunlight until time of application.
- 2.2 Mulch
- .1 Specially manufactured for use in hydraulic seeding equipment, non-toxic, water activated, green colouring, free of germination and growth inhibiting factors with following properties:

- .1 Made from wood cellulose fibre
- .2 Organic matter content: 95% plus or minus 0.5%
- .3 Value of pH: 6.0
- .4 Potential water absorption: 900%

2.3 Tackifier .1 Water soluble vegetable carbohydrate powder.

2.4 Water .1 Free of impurities that would inhibit germination and growth.

.2 Obtain water from outside Park Boundaries.

2.5 Fertilizer .1 To Canada "Fertilizers Act" and "Fertilizers Regulations". Complete synthetic, slow release with 35% of nitrogen content in water-insoluble form.

2.6 Inoculants .1 Inoculant containers to be tagged with expiry date.

PART 3 - EXECUTION

- 3.1 Workmanship
- .1 Do not spray onto structures, signs, guiderails, fences, plant material, utilities and other than surfaces intended.
 - .2 Clean-up immediately, any material sprayed where not intended, to satisfaction of Consultant.
 - .3 Do not perform work under adverse field conditions such as wind speeds over 10 km/h, frozen ground or ground covered with snow, ice or standing water.
 - .4 Protect seeded areas from trespass until plants are established.

-
- 3.2 Preparation of Surfaces
- .1 Fine grade areas to be seeded free of humps and hollows. Ensure areas are free of deleterious and refuse materials.
 - .2 Cultivated areas identified as requiring cultivation to depth of 25 mm.
 - .3 Ensure areas to be seeded are moist to depth of 150 mm before seeding.
 - .4 Obtain Consultant's approval of grade and topsoil depth before starting to seed.
- 3.3 Fertilizing Program
- .1 Fertilize prior to fine grading incorporating fertilizer equally distributed in accordance with the following program.
 - .2 Following germination, all seeded areas to receive an application of fertilizer at rate specified by fertilizer manufacturer after one cut.
 - .3 Apply additional soil supplements as determined necessary by soils analysis conducted during establishment period.
- 3.4 Preparation of Slurry
- .1 Measure quantities of materials by weight or weight-calibrated volume measurement satisfactory to Consultant. Supply equipment required for this work.
 - .2 Charge required water into seeder. Add material into hydraulic seeder under agitation. Pulverize mulch and charge slowly into seeder.
 - .3 After all materials are in the seeder and well mixed, charge tackifier into seeder and mix thoroughly to complete slurry.
- 3.5 Slurry Application
- .1 Hydraulic seeding equipment:
 - .1 Slurry tank.
 - .2 Agitation system for slurry to be capable of operating during charging of tank and during seeding, consisting of recirculation of slurry and/or mechanical agitation method.

.3 Capable of seeding by 50 m hand operated hoses and appropriate nozzles.

- .4 Slurry mixture applied per 100 square metres:
- .1 Seed: Grass mixture 1.25 kg
 - .2 Mulch: 15 kg
 - .3 Tackifier: as recommended by manufacturer
 - .4 Water: Minimum 100 litres
 - .5 Fertilizer: 3.75 kg.

.2 Apply slurry uniformly, at optimum angle of application for adherence to surfaces and germination of seed.

.3 Using correct nozzle for application.

.4 Using hoses for surfaces difficult to reach and to control application.

5 Blend application 300 mm into adjacent grass areas or sodded areas to form uniform surfaces.

.6 Re-apply where application is not uniform.

.7 Remove slurry from items and areas not designated to be sprayed.

.8 Protect seeded areas from trespass satisfactory to Consultant.

.9 Remove protection devices as directed by Consultant.

3.6 Maintenance
During Establishment
Period

.1 Perform following operations from time of seed application until acceptance by Consultant.

.1 Repair and reseed dead or bare spots to allow establishment of seed prior to acceptance.

.2 Mow grass once whenever it reaches height of 90 mm. Remove clippings which will smother grass.

.3 Fertilize seeded areas after first cutting in accordance with fertilizing program. Spread half

of required amount of fertilizer in one direction and remainder at right angles; water in well.

- .4 Control weeds by mechanical or chemical means utilizing integrated pest management practices approved by the PWGSC.
- .5 Water seeded area to maintain optimum soil moisture level for germination and continued growth of grass. Control watering to prevent washouts.

3.7 Acceptance

- .1 Seeded areas will be accepted by Consultant provided that:
 - .1 Plants are uniformly established. Seeded areas are free of rutted, eroded, bare or dead spots.
 - .2 Areas have been mown at least twice.
 - .3 Areas have been fertilized.
- .2 Areas seeded in fall will achieve final acceptance in following spring, one month after start of growing season provided acceptance conditions are fulfilled.

3.8 Maintenance During Warranty Period

- .1 Perform following operations from time of acceptance until end of warranty period.
 - .1 Repair and reseed dead or bare spots to satisfaction of Consultant.
 - .2 Fertilize seeded areas in accordance with fertilizing program. Spread half of required amount of fertilizer in one direction and remainder at right angles and water in well.

3.9 Cleaning

- .1 Upon completion of installation, remove surplus materials, rubbish, tools and equipment barriers.

END
