

PART 1 - GENERAL

- 1.1 Description .1 This Section covers the removal or processing of existing asphaltic concrete within the project limits, as follows:
- .1 Partial depth removal means to remove a portion of existing asphaltic concrete thickness with minimal disturbance to the remaining asphaltic concrete.
 - .2 Full depth removal means to remove the full depth of existing asphaltic concrete with minimal disturbance to the underlying granular base material.
 - .3 Full depth reclamation means to process the existing asphaltic concrete and upper granular base material in-place.

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 and appropriate removal technique(s).
- .2 Prior to commencing removal operation, all debris, deleterious material, and existing windrows shall be removed from the roadway surface, including material beyond the theoretical roadway width, to provide positive drainage.
- .3 Prior to full depth removal or full depth reclamation operation, cut existing pavement vertically to full depth of asphalt surface along any lines where existing adjacent pavement will remain intact.

- 3.2 Equipment
- .1 For partial depth removal, use cold milling equipment capable of removing a portion of the existing asphaltic concrete pavement surface to depths or grades indicated. The equipment used for partial depth removal shall be automatically controlled for grade and slope during removal.
 - .2 For full depth removal, use milling equipment and/or hydraulic excavator capable of removing the full thickness of asphaltic concrete to depths or grades indicated.
 - .3 For full depth reclamation, use road reclamation equipment capable of pulverizing the full thickness of existing asphaltic concrete and a portion of the upper granular base material to sufficient depth such that the resulting blend of Reclaimed Asphalt Pavement (RAP) and granular material is approximately 50:50.
- 3.3 Removal
- .1 For partial depth removal:
 - .1 Remove the full width of the existing asphaltic concrete by milling to the depths and grades indicated.
 - .2 The surface remaining after removal shall have a constant and continuous crossfall matching the intended surface course crossfall.
 - .3 The surface remaining after removal shall have an even texture and be free of significantly different grooves and ridges in all directions.
 - .2 For full depth removal:
 - .1 Remove the full width of the existing asphaltic concrete by milling or excavation to the depths and grades indicated, with minimal disturbance to the underlying granular surface.
 - .2 The granular surface remaining after removal shall be graded and compacted to have a constant and continuous crossfall matching the intended base and/or surface course crossfall.
 - .3 For full depth reclamation:
 - .1 Pulverize the full thickness of existing asphaltic concrete and a portion of the upper granular base material to depth(s) indicated.
 - .2 The resulting blend of Reclaimed Asphalt Pavement (RAP) and granular material shall be graded and compacted to have a constant and continuous crossfall matching the intended base

and/or surface course crossfall.

- .4 Temporary transverse ramping for any process shall be as specified in the Contract Documents. If due to unforeseen circumstances, removal cannot be done full width prior to shut down at the end of the day, then temporary, longitudinal ramping shall also be provided as specified in the Contract Documents. All ramping shall be removed prior to placing adjacent hot mix asphalt pavement.
- .5 Removed asphalt pavement material shall not remain on the marshalling yard after completion of the day's operation unless authorized by the Department Representative. Placing of the material on grade other than a bituminous surface prior to hauling to a stockpile shall not be permitted.

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.

3.5 Traffic Control

- .1 Maintain operation of the marshalling yard to the satisfaction of the Department Representative at all times.

END

PART 1 - GENERAL

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| 1.1 References | .1 | American Society for Testing and Materials (ASTM) |
| | .1 | ASTM C117-95, Standard Test Methods for Material Finer Than 0.075 mm Sieve in Mineral Aggregates by Washing. |
| | .2 | ASTM C131-96, Standard Test Method for Resistance to Degradation of Small-Size Coarse Aggregate by Abrasion and Impact in the Los Angeles Machine. |
| | .3 | ASTM C136-96a, Standard Test Method for Sieve Analysis of Fine and Coarse Aggregates. |
| | .4 | ASTM D698-00a, Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Standard Effort (12,400ft-lbf/ft ³) (600kN-m/m ³). |
| | .5 | ASTM D1557-00, Test Method for Laboratory Compaction Characteristics of Soil Using Modified Effort (56,000ft-lbf/ft ³) (2,700kN-m/m ³). |
| | .6 | ASTM D1883-99, Standard Test Method for CBR (California Bearing Ratio) of Laboratory Compacted Soils. |
| | .7 | ASTM D4318-00, 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 Materials. |
| 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

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| 2.1 Materials | .1 | Granular Base: Type 1 Gravel to PEI Department of Transportation, Infrastructure and Energy General Provisions and Contract Specifications for Highway Construction (current edition). |
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PART 3 - EXECUTION

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| 3.1 Sequence of Operation | .1 | Place granular base after sub-base or subgrade surface is inspected and approved by Departmental Representative. |
| | .2 | Placing: <ul style="list-style-type: none">.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 density as follows:<ul style="list-style-type: none">.1 Parking Lot and Access: 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 Requirements

- .1 Section 31 05 17 - Aggregate Materials.
- .2 Section 01 33 00 - Submittal Procedures.

1.2 References

- .1 ASTM International, latest edition
 - .1 ASTM C117, Standard Test Methods for Material Finer Than 0.075 mm Sieve in Mineral Aggregates by Washing.
 - .2 ASTM C136, Standard Test Method for Sieve Analysis of Fine and Coarse Aggregates.
 - .3 ASTM D698, Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Standard Effort (12,400ft-lbf/ft³) (600kN-m/m³).
 - .4 ASTM D4318, Standard Test Methods for Liquid Limit, Plastic Limit and Plasticity Index of Soils.
- .2 PEI Department of Transportation, Infrastructure and Energy General Provisions and Contract Specifications for Highway Construction (current edition).

PART 2 PRODUCTS

2.1 Materials

- .1 Granular Sub-Base Material: in accordance with Section 31 05 17 - Aggregate Materials and the following requirements:
 - .1 Crushed rock.
 - .2 Granular Sub-Base shall not consist of sandstone.
 - .3 Gradations to be within limits specified in PEI Department of Transportation, Infrastructure and Energy General Provisions and Contract Specifications for Highway Construction (current edition), when tested to ASTM C136 and ASTM C117.
 - .4 Other properties as follows:
 - .1 Fractured particles, one face: to PEI Department of Transportation, Infrastructure and Energy General Provisions and Contract Specifications for Highway Construction (current edition).

- .2 Micro-Deval: to PEI Department of Transportation, Infrastructure and Energy General Provisions and Contract Specifications for Highway Construction (current edition).
- .3 L.A. Abrasion: to ASTM C131, Maximum 40%.
- .4 Plasticity Index: to ASTM D4318, Maximum 3.

PART 3 EXECUTION

3.1 Preparation

- .1 Temporary Erosion and Sedimentation Control:
 - .1 Provide temporary erosion and sedimentation control measures to prevent soil erosion and discharge of soil-bearing water runoff or airborne dust.
 - .2 Inspect, repair, and maintain erosion and sedimentation control measures during construction until permanent vegetation has been established.

3.2 Placing

- .1 Place Granular Sub-Base after subgrade is inspected and approved by Departmental Representative.
- .2 Construct Granular Sub-Base to depth and grade in areas indicated.
- .3 Ensure no frozen material is placed.
- .4 Place material only on clean unfrozen surface, free from snow or ice.
- .5 Begin spreading Granular Sub-Base material on crown line or high side of one-way slope.
- .6 Place Granular Sub-Base material using methods which do not lead to segregation or degradation.
- .7 Place Granular Sub-Base material to full width in uniform layers not exceeding 250 mm compacted thickness.
 - .1 Engineer may authorize thicker lifts if specified compaction can be achieved.

- .8 Shape each layer to smooth contours and compact to specified density before succeeding layer is placed.
- .9 Remove and replace portion of layer in which material has become segregated during spreading.

3.3 Compaction

- .1 Compaction equipment to be capable of obtaining required material densities.
- .2 Compact Granular Sub-Base to density of not less than 98% maximum dry density in accordance with ASTM D698.
- .3 Shape and roll alternately to obtain smooth, even and uniformly compacted sub-base.
- .4 Apply water as necessary during compaction to obtain specified density.
- .5 In areas not accessible to rolling equipment, compact to specified density with mechanical tampers approved by Departmental Representative.
- .6 Correct surface irregularities by loosening and adding or removing material until surface is within specified tolerance.

3.4 Site Tolerances

- .1 Finished Granular Sub-Base surface to be within ± 25 mm of established grades as indicated but not uniformly high or low.

3.5 PROTECTION

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

END

PART 1 - GENERAL

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| 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 D140-88, Practice for Sampling Bituminous Materials. |
| 1.3 Samples | .1 | Submit samples in accordance with Section 01 33 00 - Submittal Procedures. |
| | .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

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| 2.1 Materials | .1 | Anionic emulsified asphalt: to CAN/CGSB-16.2, grade SS-1. |
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PART 3 - EXECUTION

- 3.1 Equipment
- .1 Pressure distributor to be:
 - .1 Designed, equipped, maintained and operated so that asphalt material:
 - .2 Is maintained at even temperature. May be applied uniformly on variable widths of surface up to 5 metres.
 - .3 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 and multi-use trail.
- 1.2 References .1 In accordance with the following standards or most recent revisions:
- .1 ASTM C88-90, Test Method for Soundness of Aggregates by Use of Sodium Sulphate or Magnesium Sulphate.
 - .2 ASTM C117-90, Test Method for Material Finer than 0.075 mm Sieve in Mineral Aggregates by Washing.
 - .3 ASTM C123-92, Test Method for Lightweight Pieces in Aggregate.
 - .4 ASTM C127-88, Test Method for Specific Gravity and Absorption of Coarse Aggregate.
 - .5 ASTM C128-93, Test Method for Specific Gravity and Absorption of Fine Aggregate.
 - .6 ASTM C131-89, Test Method for Resistance to Degradation of Small Size Coarse Aggregate by Abrasion and Impact in the Los Angeles Machine.
 - .7 ASTM C136-92, Method for Sieve Analysis of Fine and Coarse Aggregates.
 - .8 ASTM D995-88, Specification for Requirements 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 D2419-79, Test Method for Sand Equivalent Value of Soils and Fine Aggregate.
 - .11 ASTM D2041-90, Standard Test Method for Theoretical Maximum Specific Gravity and Density of Bituminous Paving Mixtures

.12 ASTM D2950-91, Standard Test Method for Density of Bituminous Concrete in Place by Nuclear Methods.

.13 ASTM D3203-88, Test Method for Percent Air Voids in Compacted Dense and Open Bituminous Paving Mixtures.

.14 ASTM D3515-89, Standard Specifications for Hot Mixed, Hot Laid Bituminous Paving Mixtures.

.15 ASTM D4460-85, Standard Method 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.

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| 1.3 Samples | .1 | Submit samples in accordance with Section 01 33 00 - Submittal Procedures. |
| | .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 mm ² /s versus temperature range from 105° to 175°. |
| | .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/m³
- Maximum theoretical density, kg/m³
- 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 M320 Table 1 for PG 64-28.
 - .2 Aggregates:
 - .1 Coarse aggregate to be supplied for the manufacture of asphaltic concrete shall consist of crushed stone, composed of clean, sound, hard and durable particles free from a coating of silt, and/or clay and shall not contain other deleterious materials. Coarse aggregate shall conform to the physical requirements for coarse aggregate shown in Table 2.1-1 and 2.1-2.
 - .2 Irrespective of compliance with the physical requirements of Table 2.1-1 and 2.1-2, a coarse aggregate may be rejected on the basis of past field performance.
 - .3 Fine aggregate to be supplied for the manufacture of asphaltic concrete shall consist of manufactured material processed by crushing quarried rock or natural sand and gravel, the particles of which shall be clean, hard, durable and free from coatings of silt, clay or other deleterious material. Fine aggregate shall conform to the physical and gradation requirements shown in Table 2.1-3 and the fraction between any two of the following consecutive sieves (4.75 mm, 2.36 mm, 1.18 mm, 600 µm, 150 µm) shall be a minimum of 7%. A minimum of 25% fine aggregate, processed by crushing quarried rock, shall be incorporated into all asphaltic mixes.

Table 2.1-1
Gradation Requirements for Coarse Aggregate - ASTM C136

Material Size Sieve Size	9.5 mm Passing (%)	12.5 mm Passing (%)	19.0 mm Passing (%)
25.0 mm	-	-	100
19.0 mm	-	100	90-100
12.5 mm	100	90-100	50-75
9.5 mm	80-100	45-75	20-55
6.3 mm	15-50	-	-
4.75 mm	0-15	0-15	0-15

Table 2.1-2
Physical Requirements for Coarse Aggregate

Test	A Base	AL Base	B Seal	C Seal	CL Seal	ASTM
Los Angeles Abrasion, Max % Loss	35	35	35	35	35	C131
Magnesium Sulphate Soundness, Max % Loss	15	15	15	15	15	C88
Absorption, Mass %	1.7	1.7	1.7	1.7	1.7	C127
Crushed, Min %	75	60	75	75	60	(1)
Flat and Elongated, Max %	20	20	20	20	20	(2)
Petrographic Number, Max.	200	200	140	140	160	(3)
4.75 mm Sieve, Max % Passing	15	15	15	15	15	C136
75 µm Sieve with Pl<6, Max % Passing	3	3	3	3	3	C117

- (1) Crushed percentage is the fraction of particles by mass retained on the 4.75 mm sieve having two or more freshly fractured faces for Classes A, B and C, and one fractured face for A, B, and C and one fractured face for AL and CL.
- (2) Flat and elongated particles to be determined using current Department test procedures.
- (3) Petrographic number to be determined using current Department test procedures.

Table 2.1-3
Physical and Gradation Requirements for Fine Aggregate

Test	A Base	AL Base	B Seal	C Seal	CL Seal	Sand Seal	ASTM
Magnesium Sulphate Soundness, Max % Loss	15	15	15	15	15	15	C88
4.75 mm Sieve, Max % Passing	85	85	85	85	85	85	C136
75 µm Sieve, Max % Passing	9	9	9	9	9	9	C117

2.1 Materials

.3 Blending Sand:

1 Blending sand supplied for the manufacture of asphaltic concrete shall consist of clean, tough, durable particles, free from silt clay and other deleterious material.

2 The gradation of the blending sand shall be such that when incorporated into the asphaltic concrete mix, the resultant mix shall meet the requirements of Tables 2.2-4, 2.2-5 and 2.2-6.

3 The blending sand shall have 100% passing the 9.5 Sieve and a maximum of 50% passing the 300 µm Sieve.

4 The physical requirements of the blending sand shall be as specified in Table 2.1-3 with the exception of the limitation on the maximum percent passing the 75 µm Sieve.

5 The maximum mass of blending sand to be used in the total mix shall not exceed 12% for all mixes except "D" mix.

2.2 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.

.2 Requirement for Asphalt Mix Design: the asphalt mix design shall follow the Marshall method of mix design based on 75 blows and be in accordance with the latest edition of the Asphalt Institute Publication, Mix Design Methods for Asphalt Concrete Manual Series No.2(MS-2).

.1 The asphalt cement grades shall be PG 58-28, unless otherwise specified. The optimum percent of asphalt cement shall be that percent which yields design air voids of 4% +/- ½%.

.2 The approved asphalt mix design specifying the aggregate blend proportions and the design asphalt cement content shall be considered as the job mix formula.

.3 Contracts with SADT (Summer Average Daily Traffic) less than 1,000 shall have a job mix formula asphalt content yielding air voids of 3.5% +/- ½%.

.4 The percent passing the 4.75 mm Sieve size +/- 2% for the blended aggregate gradations for given mix types shall be as follows:

Mix Type	% Passing 4.75 mm Sieve Size
A, AL	50%
B	65%
C, CL	60%

.5 The asphalt mix design data and the proposed job mix formula is to be submitted by the Contractor for review and shall include for each blend the following:

.1 The name of the testing firm responsible for the mix design.

.2 The specific location(s) of the source(s) of mineral aggregate.

.3 The source and type of mineral admixture and the percentage to be used.

.4 The percentage of aggregate passing each of the specified sieves for each aggregate to be incorporated into the mixture.

.5 The proportion of each material (in percent of aggregate), including hydrated lime, if required, as an anti-stripping agent.

.6 The composite gradation based on (4) and (5) above.

.7 The composite gradation plotted on a 0.45 power graph paper.

.8 The results of all aggregate testing, determinations, etc., as defined in Tables 2.1-1, 2.1-2 and 2.1-3, including bulk specific gravity and apparent specific gravity. In

addition, aggregates shall be tested to determine if they are prone to stripping (tensile strength ratio <0.8) as well as no visual evidence of stripping. If an anti-stripping additive is required, hydrated lime or an effective liquid anti-stripping agent shall be used.

.9 The mix design with a minimum of four (4) different asphalt contents (minimum 0.5 % between each point) with at least one point above and one point below the optimum asphalt percentage that reports the following:

.1 The percentage (in units of one tenth of 1%) of asphalt cement to beaded, based on the total weight of the mixture.

.2 The Marshall test results for the individual and average bulk specific gravity, stability and flow of at least three specimens at each asphalt content.

.3 The maximum theoretical specific gravity at each asphalt content.

.4 The percent of air voids in the mixture for each asphalt content.

.5 The percent voids in mineral aggregate (VMA) at each asphalt content.

.6 The percent voids filled with asphalt (VFA) at each asphalt content.

.7 The design asphalt content as a percent of total mix.

.10 All Marshall mix design characteristics, including graphs used in arriving at the final mix design, the bulk relative density of the combined aggregates and the asphalt absorption of the combined aggregates. The Contractor shall submit the following with the asphalt mix design for verification purposes:

.1 One - 20 kg sample of each representative virgin aggregate.

.2 Thirty-two 1.2 kg samples of representative virgin aggregate blended to the design mix gradation of the asphalt mix aggregate.

.3 Four Litres of the type of performance grade asphalt cement to be used.

.3 Design Mix Approval: Design mix approval will be based on the design mix tests and the corresponding requirements detailed in Tables 603.4 and 603.5. The Department's laboratory shall require five (5) working days from the time of receipt of Contractor submitted asphalt mix design and samples to evaluate the asphalt mix design. As part of the asphalt mix design evaluation, the Department's laboratory shall determine the following properties:

.1 Combined aggregate gradation;

.2 Bulk specific gravity for the asphalt mix aggregate;

.3 Marshall density;

.4 Theoretical maximum specific gravity of the asphalt mix at the design asphalt content and at each asphalt content considered by the Contractor above and below the design asphalt content.

.5 The difference between the property values submitted by the Contractor and the property values as determined by the Department's laboratory shall not exceed the amounts shown as follows:

Property	Maximum Permissible Variation
Bulk Specific Gravity of Aggregate	± 0.015
Marshall Density	± 12 kg/m ³
Theoretical Maximum Specific Gravity	± 0.010

The asphalt mix design shall be rejected if the maximum permissible variations are exceeded.

Table 2.2-4
Blended Aggregate Gradation and Asphalt Content
For Asphaltic Concrete Mixes

Sieve Size	Passing %					
	A Base	AL Base	B Seal	C Seal	CL Seal	D Sand Seal
25.0 mm	100	100	-	-	-	-
19.0 mm	90-100	90-100	-	100	100	-
12.5 mm	71-86	71-86	100	90-100	90-100	-
9.5 mm	60-78	60-78	90-100	75-91	76-91	100
4.75 mm	39-61	39-61	55-75	49-72	49-72	85-100
2.36 mm	23-49	23-49	32-60	28-58	28-58	65-85
1.18 mm	16-34	16-34	19-45	19-40	19-40	45-70
600 µm	11-24	11-24	13-35	13-27	13-27	30-55
300 µm	7-16	7-16	8-22	9-18	9-18	15-35
150 µm	5-10	5-10	5-12	6-11	6-11	7-20
75 µm	3.3-6	3.3-6	4.5-6.5	3.7-6.5	3.7-6	5.5-8
Asphalt Cement % by Mass of Total Mixture	4.7-6.0	4.7-6.0	5.5-7.0	5.3-6.5	5.3-6.5	6.5-8.5

Table 2.2-5
Physical Requirements for Dense Graded Asphaltic Concrete

Test	A Base	AL Base	B Seal	C Seal	CL Seal	D Sand Seal
Stability at 60°C (N)	12,000	12,000	12,000	12,000	12,000	3400
Flow (0.25 mm)	8-16	8-16	8-16	8-16	8-16	8-16
Air Voids (%)	3-5	3-5	3-5	3-5	3-5	3-6
Minimum VMA (%)	13	13	15	14	14	16
VFA (%)	65-75	65-75	65-75	65-75	65-75	70-85

Table 2.2-6
Mix Control Tolerance from Job Mix Formula

Sieve Size	Allowable Variation of % Passing (±)
25.0 mm	5
19.0 mm	5
16.0 mm	5
12.5 mm	5
9.5 mm	5
4.75 mm	5
2.36 mm	4
1.18 mm	4
600 µm	3
300 µm	3
150 µm	2
75 µm	1
Asphalt Cement	0.3

.4 Physical Requirements of the Mixture:

.1 The mixture shall be uniform and shall consist of a mixture of coarse and/or fine aggregate together with any required blend sand, mineral filler or lime, and mixed with asphalt cement.

.2 The mineral constituents shall be combined in such proportions as to produce a mixture conforming to the gradation requirements of Table 2.2-4. The grading shall not show marked fluctuations from opposite extremes of the limiting sizes.

.3 Mixtures shall meet the physical requirements of the properties specified in Table 2.2-5. Current Department test procedures will be used to determine these properties.

.5 Mix Control Tolerances:

.1 Once the job mix formula has been designated by the Department Representative, the Contractor shall be required produce an asphaltic concrete mixture conforming to the mix control tolerance as specified in Table 2.2-6.

.6 Stockpile Requirements:

.1 Stockpiling sites shall be level, well drained, free of all foreign materials and of adequate bearing capacity to support the mass of the stockpiled materials. Stockpiles shall be either far enough apart or separated by substantial dividers to prevent intermingling.

.2 For all aggregates except where stockpiled on Portland cement concrete, asphaltic concrete or on otherwise acceptably stabilized areas, the bottom 150 mm of the stockpile is not to be incorporated into the Department's work.

.3 Stockpiles shall be built up in layers not exceeding 1 m in depth. Each layer shall be completed over the entire area of the stockpile before beginning the next layer. Coning of the piles or spilling of material over the edges of the pile will not be permitted. Traffic over the stockpile surface shall be limited to that required for adequate levelling or removal.

.4 The minimum size of each coarse and fine aggregate stockpile shall be 1000 tonnes. The minimum size of the stockpile(s) of blending sand shall be 150 tonnes.

.5 Before any production of asphaltic concrete mixture has commenced, aggregate stockpiles of the required size and gradation shall be provided at the asphalt plant site. Minimum stockpile requirements shall be maintained throughout the project. Aggregates brought to the site after production has commenced shall be stored in separate stockpiles.

.6 A minimum of 2 working days between the arrival of asphalt aggregate and its incorporation into the asphaltic concrete mixture will be required to facilitate complete analysis of the aggregate prior to its use.

.7 Handling, Feeding and Drying of Aggregate:

.1 Aggregate shall be loaded into the cold feed bins so as to prevent the mixing of separated sizes of aggregate. Mixing of materials on site or loading of more than one material into a single bin shall not be permitted.

.2 Where the Contractor chooses to use a batch or continuous mix operation, the aggregate shall be dried and heated in the drier and separated by screening into hot storage bins. When the aggregate is delivered to the mixer, it shall be at a temperature consistent with proper mixing and laying and shall in no case exceed 165°C. Surfaces of dried aggregate shall be free of carbon or unburnt fuel oil.

.3 The aggregate shall be sufficiently dried as evidenced by the lack of noticeable steaming, bubbling, or foaming of the asphalt mixture and the absence of visible free water on the tailgate of the truck box.

.4 If insufficient drying is evident, the Contractor shall take steps as deemed necessary to provide properly dried aggregates.

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.
 - .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 as directed by Department Representative. Do not heat asphalt cement above 165°. 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 s or more than 75 s.

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

.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.
 - .4 Vibratory Rollers:
 - .1 Minimum drum diameter: 1200 mm.
 - .2 Maximum amplitude of vibration (machine setting): 500 μ m for lifts less than 40 mm thick.
 - .5 Haul Trucks: of adequate size, speed and condition to ensure orderly and continuous operation and as follows:
 - .1 Boxes with tight metal bottoms.
 - .2 Covers (tarps) of sufficient size and weight to completely cover and protect asphalt concrete when truck fully loaded.

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

.4 Trucks which cannot be weighed in a single operation on scales supplied will not be accepted.

.5 Truck tailgate assemblies must be such that they do not strike paver hopper when emptying into the hopper.

.6 Hand Tools:

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

.2 Tamping irons having mass not less than 12 kg and a bearing area not exceeding 310 cm² for compacting material along curbs, gutters and other structures inaccessible to roller. Mechanical compaction equipment, when approved by Department Representative, may be used instead of tamping irons.

.3 Straight edges, 3 metres in length, to test finished surface.

.7 Material Transfer Vehicle: Transfer asphalt concrete from haul units to spreader with an approved Material Transfer Vehicle, i.e. Roadtec SB 2500 C or approved equal.

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 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 - Asphalt 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 type C 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.

.9 Gutters will be compacted with vibratory compactors which operate perpendicular to the direction of the gutter.

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 Temporary Markings .1 The Contractor will place temporary pavement markings before sunset following each day's work. Marking material will be approved by the Department 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. 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

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|------------------------------------|----|---|
| 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 sources 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/m ² 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 Related Requirements

- .1 Section 32 12 16 - Hot Mix Asphalt Concrete.

1.2 Standard

- .1 All work of this section shall comply with the requirement of the most recent version of PEI Department of Transportation, Infrastructure and Energy General Provisions and Contract Specifications for Highway Construction (current edition).
- .2 No separate payment for:
 - .1 Painted Arrows
 - .2 Stop Bars
 - .3 Cross-hatching
 - .4 Symbols and Letters

1.3 References

- .1 PEI Department of Transportation, Infrastructure and Energy General Provisions and Contract Specifications for Highway Construction (current edition).

PART 2 PRODUCTS

2.1 Materials

- .1 Per the most recent version of PEI Department of Transportation, Infrastructure and Energy General Provisions and Contract Specifications for Highway Construction (current edition).

Part 3 Execution

3.1 General

- .1 As per the requirements of the most recent version of PEI Department of Transportation, Infrastructure and Energy General Provisions and Contract Specifications for Highway Construction (current edition).
- .2 The Departmental Representative shall coordinate pavement pre-marking by Owner.

END

PART 1 - GENERAL

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| 1.1 Submittals | .1 | Submit sample of bollard four weeks prior to construction for approval by Departmental Representative. |
|----------------|----|--|

PART 2 - PRODUCTS

- | | | |
|---------------|----|---|
| 2.1 Materials | .1 | Plastic: 100% Post-consumer recycled. 914 mm above grade EZ Drive - green colour complete with reflective tape. as manufactured by Flexstake Inc. |
| | .2 | Footings: 300 mm long telspar pipe. bollards bolted to pipe. |

PART 3 - EXECUTION

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|--------------------------|----|---|
| 3.1 Construction Methods | .1 | Vinyl bollards to be installed plumb in locations as detailed on the dwgs and as directed by Departmental Representative. |
| 3.2 Protection | .1 | Maintain vinyl bollards in good condition until acceptance by Departmental Representative. |

END
