

## **1 GENERAL**

### **1.1 RELATED SECTIONS**

- .1 Section 01 74 21 - Construction/Demolition Waste Management and Disposal.
- .2 Section 31 05 16 - Aggregate Materials.
- .3 Section 31 23 33.01 - Excavating, Trenching and Backfilling.
- .4 Section 31 24 13 - Temporary Roadway Embankment.

### **1.2 REFERENCES**

- .1 American Society for Testing and Materials (ASTM)
  - .1 ASTM C 117-13, Standard Test Methods for Material Finer Than 75-micro m (No. 200) Sieve in Mineral Aggregates by Washing.
  - .2 ASTM D6928-10, Standard Test Method for Resistance of Coarse Aggregate to Degradation by Abrasion in the Micro-Deval Apparatus.
  - .3 ASTM C 136-06, Standard Test Method for Sieve Analysis of Fine and Coarse Aggregates.
  - .4 ASTM D 422-63 (2007), Standard Test Method for Particle-Size Analysis of Soils.
  - .5 ASTM D 698-12, Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Standard Effort (12,400ft-lbf/ft<sup>3</sup>) (600kN-m/m<sup>3</sup>).
  - .6 ASTM D 1883-07e2, Standard Test Method for CBR (California Bearing Ratio) of Laboratory Compacted Soils.
  - .7 ASTM D 4318-10, Standard Test Methods for Liquid Limit, Plastic Limit and Plasticity Index of Soils.
- .2 Canadian General Standards Board (CGSB)
  - .1 CAN/CGSB-8.1-88, Sieves, Testing, Woven Wire, Inch Series.
  - .2 CAN/CGSB-8.2-M88, Sieves, Testing, Woven Wire, Metric.
- .3 Nova Scotia Department of Transportation and Infrastructure Renewal (NSTIR)
  - .1 Standard Specification - Highway Construction and Maintenance, (latest edition).

### **1.3 WASTE MANAGEMENT AND DISPOSAL**

- .1 Separate and recycle waste materials in accordance with Section 01 74 21 - Construction/Demolition Waste Management and Disposal.
- .2 Divert unused granular material from landfill to local facility to the satisfaction of the Departmental Representative.

## **2 PRODUCTS**

### **2.1 MATERIALS**

- .1 Granular sub-base material: in accordance with Section 31 05 16 - Aggregate

Materials and following requirements:

- .1 Type 2 Gravel to Division 3, Section 2 of NSTIR Standard Specification - Highway Construction and Maintenance, (latest edition), with the following modification: the allowable percentage passing the 80  $\mu$ m sieve shall be 3 to 5%.

### **3 EXECUTION**

#### **3.1 PLACING**

- .1 Place granular sub-base after subgrade is to the satisfaction of the 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 Place granular sub-base materials using methods which do not lead to segregation or degradation.
- .6 Place material to full width in uniform layers not exceeding 200 mm compacted thickness. Departmental Representative may authorize thicker lifts (layers) if specified compaction can be achieved.
- .7 Shape each layer to smooth contour and compact to specified density before succeeding layer is placed.
- .8 Remove and replace portion of layer in which material has become segregated during spreading.

#### **3.2 COMPACTION**

- .1 Compaction equipment to be capable of obtaining required material densities.
- .2 Compact to density of not less than 100% of Maximum Dry Density in accordance with ASTM D 698.
- .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 to the satisfaction of the Departmental Representative.
- .6 Correct surface irregularities by loosening and adding or removing material until surface is within specified tolerance.

#### **3.3 SITE TOLERANCES**

- .1 Finished sub-base surface to be within 25 mm of elevation as indicated but not uniformly high or low.

### **3.4 PROTECTION**

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

**END OF SECTION**

## **1 GENERAL**

### **1.1 RELATED SECTIONS**

- .1 Section 01 74 21 - Construction/Demolition Waste Management and Disposal.
- .2 Section 31 23 33.01 - Excavating, Trenching and Backfilling.
- .3 Section 31 05 16 - Aggregate Materials.
- .4 Section 31 24 13 - Temporary Roadway Embankment.
- .5 Section 32 11 16.01 - Granular Sub-base.

### **1.2 REFERENCES**

- .1 American Society for Testing and Materials (ASTM)
  - .1 ASTM C 117-13, Standard Test Methods for Materials Finer Than 75-microm Sieve in Mineral Aggregates by Washing.
  - .2 ASTM D 6928-10, Standard Test Method for Resistance of coarse Aggregate to Degradation by Abrasion in the Micro-Deval Apparatus.
  - .3 ASTM C 136-06, Standard Test Method for Sieve Analysis of Fine and Coarse Aggregates.
  - .4 ASTM D 698-12, Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Standard Effort (12,400ft-lbf/ft<sup>3</sup>) (600kN-m/m<sup>3</sup>).
  - .5 ASTM D 1883-07e1, Standard Test Method for CBR (California Bearing Ratio) of Laboratory-Compacted Soils.
  - .6 ASTM D 4318-10, Standard Test Methods for Liquid Limit, Plastic Limit, and Plasticity Index of Soils.
- .2 Canadian General Standards Board (CGSB)
  - .1 CAN/CGSB-8.1, Sieves, Testing, Woven Wire, Inch Series.
  - .2 CAN/CGSB-8.2, Sieves, Testing, Woven Wire, Metric.
- .3 Nova Scotia Department of Transportation and Infrastructure Renewal (NSTIR)
  - .1 Standard Specification - Highway Construction and Maintenance, (latest edition).

### **1.3 WASTE MANAGEMENT AND DISPOSAL**

- .1 Divert unused granular material from landfill to local facility to satisfaction of Departmental Representative.

## **2 PRODUCTS**

### **2.1 MATERIALS**

- .1 Granular base material: in accordance with Section 31 05 16 - Aggregate Materials and following requirements:
  - .1 Type 1 Gravel to Division 3, Section 2 of NSTIR Standard Specification - Highway Construction and Maintenance (latest edition), with the following modification: the allowable percentage passing the 80 µm sieve shall be 3 to 5%.

- .2 Type 1S Gravel to Division 3, Section 2 of NSTIR Standard Specification  
- Highway Construction and Maintenance (latest edition).

### **3 EXECUTION**

#### **3.1 SEQUENCE OF OPERATION**

- .1 Place granular base after sub-base surface is inspected and approved by the 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 using methods which do not lead to segregation or degradation of aggregate.
  - .5 Place material to full width in uniform layers not exceeding 200 mm compacted thickness. Departmental Representative may authorize thicker lifts (layers) if specified compaction can be achieved.
  - .6 Shape each layer to smooth contour and compact to specified density before succeeding layer is placed.
  - .7 Remove and replace that portion of layer in which material becomes segregated during spreading.
- .3 Compacting
  - .1 Compaction equipment to be capable of obtaining required material densities.
  - .2 Compact to density not less than 100% of Maximum Dry Density in accordance with ASTM D 698.
  - .3 Shape and roll alternately to obtain smooth, even and uniformly compacted base.
  - .4 Apply water as necessary during compacting to obtain specified density.
  - .5 In areas not accessible to rolling equipment, compact to specified density with mechanical tampers to the satisfaction of the. Departmental Representative.
  - .6 Correct surface irregularities by loosening and adding or removing material until surface is within specified tolerance.

#### **3.2 SITE TOLERANCES**

- .1 Finished base surface to be within plus or minus 10 mm of established grade and cross section but not uniformly high or low.

#### **3.3 PROTECTION**

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

**END OF SECTION**

## **1 GENERAL**

### **1.1 RELATED SECTIONS**

- .1 Section 01 33 00 - Submittal Procedures.
- .2 Section 01 74 21 - Construction/Demolition Waste Management And Disposal.
- .3 Section 32 12 16.01 - Asphalt Paving.

### **1.2 REFERENCES**

- .1 American Society for Testing and Materials International, (ASTM)
  - .1 ASTM D 140-2009, Standard Practice for Sampling Bituminous Materials.
  - .2 ASTM D 244-09, Standard Test Methods and Practices for Emulsified Asphalts.
- .2 Nova Scotia Department of Transportation and Infrastructure Renewal (NSTIR)
  - .1 Standard Specifications - Highway Construction and Maintenance, (latest edition).

### **1.3 SUBMITTALS**

- .1 If requested, submit samples in accordance with Section 01 33 00 - Submittal Procedures.
- .2 If requested submit two (2) - 1 L samples of asphalt tack coat material proposed for use in new, clean, airtight, sealed, wide mouth jars, bottles made with plastic or plastic lined cans to Departmental Representative, at least two (2) weeks prior to beginning Work.
- .3 Sample asphalt tack coat material to: ASTM D 140.
- .4 As required provide access on tank truck for Departmental Representative to sample asphalt material to be incorporated into Work, in accordance with ASTM D 140.

### **1.4 QUALITY ASSURANCE**

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

### **1.5 DELIVERY, STORAGE AND HANDLING**

- .1 Deliver, store and handle materials in accordance with ASTM D 140.
- .2 Provide, maintain and restore asphalt tack coat material storage area.

### **1.6 WASTE MANAGEMENT AND DISPOSAL**

- .1 Separate waste materials for reuse and recycling in accordance with Section

01 74 21 Construction/Demolition Waste Management And Disposal.

- .2 Divert unused asphalt tack coat material from landfill to facility capable of recycling materials.

## **2 PRODUCTS**

### **2.1 MATERIALS**

- .1 Emulsified asphalt: grade RS-1 to Division 4, Section 1 of NSTIR Standard Specifications - Highway Construction and Maintenance, (latest edition).
- .2 Water: clean, potable, free from foreign matter.

### **2.2 EQUIPMENT**

- .1 Pressure distributor: in accordance with Division 4, Section 1 of NSTIR Standard Specifications - Highway Construction and Maintenance (latest edition).

## **3 EXECUTION**

### **3.1 APPLICATION**

- .1 Obtain Departmental Representative's approval of surface before applying asphalt tack coat.
- .2 Apply asphalt tack coat only on clean and dry surface.
- .3 Dilute asphalt emulsion with water at 1:1 ratio for application.
  - .1 Mix thoroughly by pumping or other method approved by Departmental Representative.
- .4 Apply asphalt tack coat evenly to pavement with a distributor at a rate of 140 mL/m<sup>2</sup> or as directed by the Departmental Representative and at a temperature not less than 20°C nor more than 70°C.
- .5 Paint contact surfaces of existing abutting asphalt surface with thin, uniform coat of asphalt tack coat material.
- .6 Do not apply asphalt tack coat when air temperature is less than 10 degrees C or when rain is forecast within 2 hours of application.
- .7 Apply asphalt tack coat only on unfrozen surface.
- .8 Evenly distribute localized excessive deposits of tack coat by brooming as directed by Departmental Representative.
- .9 Where traffic is to be maintained, treat no more than one half of width of surface in one application.
- .10 Keep traffic off tacked areas until asphalt tack coat has set.
- .11 Re-tack contaminated or disturbed areas as directed by Departmental

Representative.

- .12 Permit asphalt tack coat to set before placing asphalt pavement.
- .13 No more tack coat shall be applied than can be covered with asphalt pavement wearing surface in one day.

**END OF SECTION**



## **1 GENERAL**

### **1.1 RELATED SECTIONS**

- .1 Section 01 33 00 - Submittal Procedures.
- .2 Section 01 74 21 - Construction/Demolition Waste Management And Disposal.
- .3 Section 32 11 16.01 - Granular Sub-Base.
- .4 Section 32 11 23 - Aggregate Base Courses.
- .5 Section 32 12 13.16 - Asphalt Tack Coats.
- .6 Section 32 17 23 - Pavement Markings.

### **1.2 REFERENCES**

- .1 American Society for Testing and Materials International, (ASTM)
  - .1 ASTM D 698-12, Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Standard Effort (12,400 ft-lbf/ft<sup>3</sup> (600 kN-m/m<sup>3</sup>)).
- .2 Canadian General Standards Board (CGSB)
  - .1 CAN/CGSB-1.5-M91(March 1999), Low Flash Petroleum Spirits Thinner (Reaffirmation of December 1991).
  - .2 CAN/CGSB-1.74-2001, Alkyd Traffic Paint.
- .3 Nova Scotia Department of Transportation and Infrastructure Renewal (NSTIR)
  - .1 Standard Specifications - Highway Construction and Maintenance, (latest edition).

### **1.3 SAMPLES**

- .1 If requested, submit samples in accordance with Section 01 33 00 - Submittal Procedures.
- .2 If requested, submit to Departmental Representative, samples of material for sieve analysis at least 3 weeks before beginning Work.

### **1.4 WASTE MANAGEMENT AND DISPOSAL**

- .1 Separate and recycle waste materials in accordance with Section 01 74 21 - Construction/Demolition Waste Management And Disposal.
- .2 Remove from site and dispose of all packaging materials at appropriate recycling facilities.
- .3 Place materials defined as hazardous or toxic in designated containers.
- .4 Divert unused aggregate materials from landfill to facility for reuse to satisfaction of Departmental Representative.
- .5 Dispose of unused paint and paint thinner materials at official hazardous

material collections site in accordance with applicable federal, municipal and provincial guidelines.

- .6 Fold up metal banding, flatten and place in designated area for recycling.
- .7 Do not dispose of unused paint and paint thinner material into sewer system, into streams, lakes, onto ground or in other location where it will pose a health or environmental hazard.
- .8 Divert unused asphalt from landfill to facility capable of recycling materials in accordance with applicable federal, municipal and provincial guidelines.

## **2 PRODUCTS**

### **2.1 MATERIALS**

- .1 Granular sub-base: to Section 32 11 16.01 - Granular Sub-Base.
- .2 Granular base: to Section 32 11 23 - Aggregate Base Courses.
- .3 Tack coat: to Section 32 12 13.16 - Asphalt Tack Coats.
- .4 Asphalt cement: PG 58-28 to Division 4, Section 2 of NSTIR Standard Specification - Highway Construction and Maintenance (latest edition).
- .5 Asphalt concrete: Type C-HF mix to Division 4, Section 4 of NSTIR Standard Specification - Highway Construction and Maintenance, (latest edition).
- .6 Traffic paint: to Section 32 17 23 - Pavement Markings.
- .7 Paint thinner: to Section 32 17 23 - Pavement Markings.

## **3 EXECUTION**

### **3.1 FOUNDATIONS**

- .1 Foundations for asphalt pavement to comprise:
  - .1 300 mm compacted thickness of granular sub-base.
  - .2 150 mm compacted thickness of granular base.
- .2 Construction of granular foundations: to Section 32 11 16.01 - Granular Sub-Base and Section 32 11 23 - Aggregate Base Courses.
- .3 Compaction: compact each lift of granular material to 100% maximum dry density to ASTM D 698. Maximum lift thickness: 300 mm.

### **3.2 PAVEMENT THICKNESS**

- .1 Thicknesses for asphalt pavement:
  - .1 Base course: 50 mm Type B-HF mix.
  - .2 Wear course: 50 mm Type C-HF mix.

### **3.3 PAVEMENT CONSTRUCTION**

- .1 Construction of asphalt concrete: to Division 4, Section 4 of NSTIR Standard

Specifications - Highway Construction and Maintenance, (latest edition).

- .2 Finished asphalt surfaces to be within 6 mm of design elevation, but not uniformly high or low.
- .3 Construction of all asphalt concrete to be completed with the use of a Material Transfer Vehicle (MTV), in accordance with Division 4, Section 4 of NSTIR Standard Specifications and Maintenance (latest edition). No premium payment will be made for the use of MTV.

### **3.4 QUALITY CONTROL TESTING**

- .1 Inspection and testing shall be carried out by the Contractor.
- .2 Submit satisfactory test results to Departmental Representative showing compliance of asphalt paving with requirements of this Section.

### **3.5 TRAFFIC MARKINGS**

- .1 See Section 32 17 23 - Pavement Markings.
- .2 Paint parking space divisions and other pavement markings in accordance with manufacturers recommendations and as indicated.
- .3 Use paint thinner in accordance with manufacturer's requirements.

**END OF SECTION**

## **1 GENERAL**

### **1.1 RELATED SECTIONS**

- .1 Section 01 74 21 - Construction/Demolition Waste Management and Disposal.

### **1.2 REFERENCES**

- .1 Nova Scotia Department of Transportation and Infrastructure Renewal (NSTIR)
  - .1 Standard Specifications - Highway Construction and Maintenance (latest edition).
  - .2 Canadian General Standards Board (CGSB).
  - .3 CAN/CGSB-15.1-(92), Calcium Chloride.

### **1.3 DELIVERY STORAGE AND HANDLING**

- .1 Supply calcium chloride as required to prevent blowing dust.
- .2 Deliver calcium chloride to site in moisture-proof bags, bulk. Indicate name of manufacturer, name of product, net weight or mass, and percentage of calcium chloride guaranteed by manufacturer.
- .3 Store bags of calcium chloride in weather-proof enclosures.

### **1.4 WASTE MANAGEMENT AND DISPOSAL**

- .1 Separate and recycle waste materials in accordance with Section 01 74 21 - Construction/Demolition Waste Management and Disposal.
- .2 Collect and separate plastic, paper packaging, and corrugated cardboard in accordance with Waste Management Plan.
- .3 Place materials defined as hazardous or toxic in designated containers.
- .4 Fold up metal banding, flatten and place in designated area for recycling.

## **2 PRODUCTS**

### **2.1 MATERIALS**

- .1 Calcium chloride: to Division 6, Section 8 of NSTIR Standard Specifications - Highway Construction and Maintenance (latest edition).
- .2 Water: clean, potable, free from foreign matter.

## **3 EXECUTION**

### **3.1 APPLICATION**

- .1 Apply calcium chloride and water with equipment approved by Departmental Representative when directed by Departmental Representative.

- .2     Apply water with distributors equipped with means of shut-off and with spray system to ensure uniform application.

**END OF SECTION**

## **1 GENERAL**

### **1.1 REFERENCES**

- .1 Nova Scotia Department of Transportation and Infrastructure Renewal (NSTIR) Standard Specifications - Highway Construction and Maintenance (latest edition).
- .2 Health Canada / Workplace Hazardous Materials Information System (WHMIS)
  - .1 Material Safety Data Sheets (MSDS).
- .3 Work shall conform to and meet the requirements of NSTIR, Section 5, Non Coning Traffic Paint and to the requirements outlined below.

### **1.2 SUBMITTALS**

- .1 Submit in accordance with Section 01 33 00 - Submittal Procedures.
- .2 Submit to Departmental Representative following material sample quantities at least 4 weeks prior to commencing work.
  - .1 Two 1L samples of each type of paint.
  - .2 One 1kg sample of glass beads.
  - .3 Sampling to CGSB 1-GP-71.
- .3 Product Data:
  - .1 Mark samples with name of project and its location, paint manufacturer's name and address, name of paint, CGSB specification number and formulation number and batch number.
  - .2 Submit two copies of WHMIS MSDS in accordance with Section 01 35 29.06 - Health and Safety Requirements.
  - .3 Mark samples with name of project and its location, paint manufacturer's name and address, name of paint, CGSB specification number and formulation number and batch number.
  - .4 Notify Departmental Representative of each filling of paint spray tanks in the applicator.

### **1.3 DELIVERY, STORAGE AND HANDLING**

- .1 Deliver, store and handle materials in accordance with Section 01 61 00 - Common Product Requirements and with manufacturer's written instructions.

## **2 PRODUCTS**

### **2.1 MATERIALS**

- .1 Paint: Low Temperature
  - .1 Water-Borne, Non-Coning Traffic Paint to Division 6, Section 6 of NSTIR

Standard Specifications - Highway Construction and Maintenance (latest edition) and in accordance with Table No. 1 below:

TABLE No. 1 - WATER-BORNE NON-CONING TRAFFIC PAINT			
PROPERTY	SPECIFICATIO N		TEST METHOD
	Min.	Max.	
General			
Density	-	-	Method 2.1
Consistency, KU(2)	85	95	Method 4.5
Skinning Properties(3)	0	0	Method 10.1
Hiding Power, m²/L	8.4		Pfund cryptometer with #3.5 wedge
Contrast Ratio(8)	0.99 Coalescing Agent (2,2,4-trimethyl-1,3 - pentanediol monoisobutyrate)		
(% by weight on solid polymer)	10		
Volatile Matter, %(incl. water)	1	24	Method 17.1
VOC (g/L)		150	ASTM D3960
Pigment Content, %(mass) (6)	56	62	Method 21.3
Binder solid, %(mass) (7)	16.75	-	Method 57.1
No-pick-up time, min(4)	1	5	ASTM D711
Fineness of grind, HU	3	-	ASTM D1210
Coarse Particles			
#60 Sieve-250 m	nil	Nil	ASTM D185
#100 Sieve-150 m	-	0.01	ASTM D2205
Bleeding	4	-	ASTM D868, D969
Settling Rate	6	-	ASTM D1309
	8	-	ASTM D869
White Paint			
Titanium Dioxide, g/L	150	-	Method 2.1, 21.1 50.14
Reflectance	80	-	ASTM E1347
Colour	-	-	1-GP-12C, 513-301
Colour tolerances: L*=+2 and -1.5 max, a*=+1.5 and -1 max, b*=+4 and -4 max			
Yellow Paint			
Titanium Dioxide, g/L	75	-	Method 2.1, 21.1 50.14
Medium Chrome Yellow, g/L	100	-	Method 2.1, 21.1 50.14, 50.19
Reflectance	60	-	ASTM E1347
Colour	Nova Scotia Yellow Colour Chip		
Colour tolerances: L*=+2 and -1.5 max,a*=+3 and -1.5 max.,b*=+7 and -1.5 max			

**NOTES:**

- (1) All tests to be performed by methods as per Canadian General Standards Board (CGSB) 1-GP-71 or American Society of Testing and Materials (ASTM) or as noted herein.
- (2) Krieb units at 25°C.
- (3) Paint shall be non-skinning. (See General Requirements, 2nd paragraph).
- (4) Also, field tests on a 15 mil wet film thickness of hot spray (max. 50°C). Wait one minute, drive a passenger vehicle over the film and no visible (from 15m) deposition of paint is deposited onto the adjacent pavement at an air and pavement temperature of 10°C minimum and a relative humidity of 70%.
- (5) Medium chrome yellow pigment shall have a minimum lead chromate (PbCrO<sub>4</sub>) content of 87%.
- (6) Pigment Composition: 20% of the pigment content to be used on talc that meets ASTM D-605 with a % reflectance (photovolt green filter) of 90

minimum.

(7) Binder shall be Fastrack 3427 or equivalent.

(8) Contract ratio: apply a wet film thicknes of 381 microns on Laneta Penopac form (1B). Drying time: minimum 24 hour sat 23 +- 2 degress Celcius.

(9) Volatile Organic Compounds (VOC) (excluding water) Max: 150 g/L. Method ASTM D-3960.

(10) Titanium Dioxyde pigment shall meet ASTM D-476 gype II specification.

### **3 EXECUTION**

#### **3.1 EXAMINATION**

- .1 Pavement surface: dry, free from water, frost, ice, dust, oil, grease and other deleterious materials.
- .2 Proceed with Work only after unacceptable conditions have been rectified to the satisfaction of the Departmental Representative.

#### **3.2 EQUIPMENT REQUIREMENTS**

##### **.1 Paint truck:**

- .1 Self-propelled vehicle, highway striping truck, fitted with a paint heater capable of heating paint to any temperature of 50°C and maintaining a constant temperature during spray operations.
- .2 Paint applicator to be an approved pressure type distributor capable of applying paint in two-color application (two yellow directional dividing lines and one white edgeline).
- .3 Capable of applying markings uniformly, at rates specified, and to dimensions as indicated, and to have positive shut-off.
- .4 Capable of adjusting paint application rate from operators compartment for dashed line.
- .5 Distributor to be capable of applying reflective glass beads as an overlay on freshly applied paint.
- .6 Bead dispensers shall be electrically controlled, air operated, gravity fed with controls to adjust the bead flow.
- .7 Distributor to be capable of shutting off the flow of glass beads to permit sampling of the application rate of paint only.

##### **.2 Power Broom.**

- .1 Self-propelled pneumatic tired unit, capable of vertical and horizontal angular adjustment. Brooms which have differential wear across the width will not be permitted.

#### **3.3 PAINTING OPERATIONS**

- .1 Painting operations: to Division 6, Section 6 of NSTIR Standard Specifications - Highway Construction and Maintenance (latest edition).



### **3.4 APPLICATION**

- .1 Unless otherwise approved by Departmental Representative, apply paint only when air temperature is above 10°, wind speed is less than 30 km/h and no rain is forecast within next 8 hours.
- .2 Paint to be hot sprayed between 70° to 90°.
- .3 Apply traffic paint evenly at rate of not less than 8 mils Dry Film Thickness (16 to 18 mils Wet Film Thickness).
- .4 Pavement markings: laid out by Contractor in accordance with the Drawings.
- .5 Apply paint in accordance with NSTIR Standard Specifications, Division 6 - Section 6.
- .6 Do not thin paint.
- .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.
- .9 Apply glass beads at rate of 700 g/L immediately after application of paint.
- .10 Paint markings: within plus or minus 10 mm of dimensions indicated.
- .11 Remove incorrect markings, by methods acceptable to Departmental Representative at no cost to the Owner.

### **3.4 CLEANING**

- .1 Progress Cleaning: clean in accordance with Section 01 74 11 - Cleaning.
  - .1 Leave Work area clean at end of each day.
- .2 Final Cleaning: upon completion remove surplus materials, rubbish, tools and equipment in accordance with Section 01 74 11 - Cleaning.

### **3.5 PROTECTION OF COMPLETED WORK**

- .1 Protect pavement markings until dry (no pick up).
- .2 No pick time will be field tested.
  - .1 Field test by a hot spray at a 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 Repair damage to adjacent materials caused by pavement marking application.

### **3.6 INSPECTION**

- .1 The Contractor shall cooperate with the Departmental Representative for sampling, testing and inspection. This inspection shall not relieve the Contractor from any obligation to perform the work.

- .2 The Departmental Representative will observe each filling of paint and beads and will maintain a record of drums of paint used and bags of glass beads.
- .3 The Contractor shall advise the Departmental Representative 24 hours prior to the expected start of pavement marking operation.
- .4 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 OF SECTION**

## **1 GENERAL**

### **1.1 RELATED REQUIREMENTS**

- .1 Section 03 30 00 - Cast in Place Concrete
- .2 Section 31 32 19.01 - Geotextiles
- .3 Section 31 23 33.01 - Excavation, Trenching and Backfilling
- .4 Section 33 42 13.08 - Corrugated Metal Arch Culverts

### **1.2 REFERENCES**

- .1 Concrete Segmental Retaining Wall Units - American Society for Testing and Materials (ASTM):
  - .1 ASTM C-94 Standard Specification for Ready Mix Concrete (Table 1 and Section 7)
  - .2 ASTM C-172 Standard Specification for Sampling Freshly Mixed Concrete
- .2 Welded Wire Mesh - American Society for Testing and Materials (ASTM):
  - .1 ASTM A-82 Standard Specification for Steel Wire, Plain, for Concrete Reinforcement
  - .2 ASTM A185 Steel Welded Wire Reinforcement, Plain, for Concrete
  - .3 ASTM A123 Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products
  - .4 CAN/CSA-G164-M92 Hot Dip Galvanizing of Irregularly Shaped Articles
- .2 Drain Pipe - American Society for Testing Materials (ASTM):
  - .1 ASTM D-3034 Specifications for Polyvinyl Chloride Pipe (PVC)
  - .2 ASTM D-1248 Specification for Corrugated Plastic Pipe
- .3 Soils - American Society for Testing and Materials (ASTM):
  - .1 ASTM D-698 Laboratory Compaction Characteristics of Soil - Standard Effort
  - .2 ASTM D-4318 Liquid Limit, Plastic Limit and Plasticity Index of Soils
  - .3 ASTM D-422 Gradation of Soils

.4 ASTM D-424 Atterberg Limits of Soils

.5 ASTM D-G51 Soil pH

### 1.3 DEFINITIONS

- .1 Precast Concrete Panel Retaining Wall Unit (PCP): Concrete, segmental facing panel provided by an approved manufacturer.
- .2 Drainage Aggregate: Clean, crushed rock located within and immediately behind Precast Concrete Panel units to facilitate drainage and avoid compaction in close proximity to wall units.
- .3 Reinforced Backfill: Soil zone extending from the Drainage aggregate zone to the back of the embedded welded wire mesh.
- .4 Foundation Soil: Soil zone immediately beneath the retaining wall facing units, the wall leveling pad and the reinforced soil zone.
- .5 Welded Wire Mesh: horizontal inclusions of welded wire mesh and compacted select backfill specifically for the purpose of reinforcing and creating a structural soil mass.
- .6 Retained Soil: Soil immediately behind retaining wall facing and drainage aggregate or reinforced backfill if present.
- .7 Construction Drawings: Approved final plan for construction prepared and stamped by the wall design engineer licensed to practice in the province where the retaining wall is located.

### 1.4 DESIGN CRITERIA

- .1 Live Loading: CL-625 Truck.

### 1.5 ACTION AND INFORMATION SUBMITTALS

- .1 Submit in accordance with Section 01 33 00 - Submittal Procedures.
- .2 Submit to Departmental Representative complete working drawings, and detailed design calculations, both stamped by an engineer licensed to practice in the province of Nova Scotia, for review at least 4 weeks prior to beginning construction.
- .3 The Contractor's design responsibility shall include internal stability and all elements for a complete MSE wall system.
- .4 Construction Drawings shall include:
  - .1 The retaining wall layout and retaining wall heights.
  - .2 Proper placement, lengths and types of welded wire reinforcement where necessary.
  - .3 Typical wall sections.

- .4 Types, locations and properties of all drainage materials, appurtenances and special installation requirements not covered in this specification.
- .5 Retaining wall elevation views.
- .6 Any soils reports or testing conducted in addition to that included within the project drawings and specifications.
- .7 Design assumptions.
- .5 Submit gradation reports for aggregates used for the wall leveling pad, unit / drainage fill and for select reinforced fill if required in the final engineered wall design.
- .6 Submit mill certificates for steel material.
- .7 All submittals must be provided and reviewed prior to the start of retaining wall construction.

## **1.6 DELIVERY, STORAGE AND HANDLING**

- .1 Deliver, store and handle materials in accordance with Section 01 61 00 - Common Product Requirements and manufacturer's written instructions.
- .2 Delivery and Acceptance Requirements: deliver materials to site in original factory packaging, labelled with manufacturer's name and address.
- .3 Storage and Handling Requirements:
  - .1 Follow storage and handling recommendation of supplier of reinforced soil type retaining wall system.
  - .2 Prevent chipping and cracking of precast concrete facing panels and damage to embedded connectors for reinforcing elements.
  - .3 Prevent damage to galvanized coating of steel reinforcing elements.
  - .4 Prevent staining or other defacement of front surfaces of facing panels during storage and handling.
  - .5 Replace defective or damaged materials as directed by Departmental Representative.

## 2 PRODUCTS

### 2.1 RETAINING WALL SYSTEMS

- .1 Ensure components come from single manufactured system.
- .2 Use only one type of soil reinforcing element on each structure.
- .3 Wall units shall be made with Ready-Mixed concrete in accordance with ASTM C94, latest revision.
- .4 Concrete shall have an air content of 4.5% - 7.5%, a 28 day compressive strength of 30 MPa and slump of 130mm ± 35mm. Higher slump is allowed if achieved by use of appropriate admixtures.
- .5 All materials used in the wall units must meet applicable ASTM and local requirements for exterior concrete.
- .6 Exterior panel dimensions shall be uniform and consistent. Maximum dimensional deviations shall be 1% excluding the architectural surface. Maximum width (face to back) deviation including the architectural surface shall be 5mm. Panel squareness, as measured by the difference between the diagonals, shall not exceed 13 mm.
- .7 Exposed face shall have a textured finish. Other surfaces to be smooth form type. Dime-size bug holes on the block face may be patched and/or shake-on color stain can be used to blend into the remainder of the block face.
- .8 Defects that indicate imperfect molding, honeycombed or open texture concrete as well as physical defects such as broken or chipped concrete shall be sufficient cause for rejection.
- .9 The panel reinforcement shall be placed as shown on the reviewed manufacturers shop drawings. The reinforcement shall be either:
  - .1 10M Grade 400 reinforcing bars conforming to CAN/CSA-G30.18-M92 spaced at 250mm vertical and 250mm horizontal or
  - .2 152 x 152 MW71.0 welded wire mesh conforming to ASTM A82 and ASTM A185.
- .10 The date of manufacture, production lot number and the piece-mark shall be clearly scribed on the rear face of each panel.

## **2.2 MATERIALS**

- .1 Granular backfill: Site excavated soils approved by the Departmental Representative or Type 2 in accordance with Section 32 11 16.01 - Granular Sub-base, with following additional requirements for wall systems with galvanized steel reinforcing elements:
  - .1 pH: 6 to 10.
  - .2 Resistivity: min. 1000 ohm-cm.
  - .3 Chlorides: max. 200 ppm.
  - .4 Sulfates: max. 1000 ppm.
- .2 Concrete mixes and materials: in accordance with Section 03 30 00 - Cast-in-Place Concrete.

## **2.3 LEVELING PAD AND FREE DRAINING BACKFILL**

- .1 Leveling pad shall be non-reinforced concrete with a minimum 28-day strength of 25 MPa. The alignment of the leveling pad shall be such that the panel will be positioned on the centerline of the pad. Cast-in-place leveling pads shall be screed uniformly smooth with a maximum variation of 3 mm, and shall not vary more than 5mm from the elevation shown on the plans. The leveling pad shall be cured a minimum of 24 hours before placement of wall panels.
- .2 Free Draining Backfill material shall be clean 25mm minus stone and shall be placed to a minimum of 300mm width behind the back of the wall and shall extend vertically from the Leveling Pad to an elevation 100mm below the top of wall.
- .3 Backfill material shall be approved by the Departmental Representative. Site excavated soils may be used if approved unless otherwise specified in the drawings. Unsuitable soils with a PL>6, organic soils and frost susceptible soils shall not be used within a 1 to 1 influence area.
- .4 Non-woven geotextile cloth shall be placed between the Free Draining Backfill and retained soil if required.

## **2.4 DRAINAGE**

- .1 Where additional fill is needed, Contractor shall submit sample and specifications to the Departmental Representative for approval.

## **2.5 WELDED WIRE REINFORCEMENT**

- .1 All welded wire mesh reinforcing mats shall be shop fabricated of cold drawn steel wire conforming to the minimum requirements of ASTM A82 and ASTM A185.

- .2 All wire material exposed to the soil shall be hot-dip galvanized with 610 g/m<sup>2</sup> zinc coating as per CAN/CSA-G164-M92. Any damage done to the galvanizing prior to installation shall be repaired in an acceptable manner and provide a galvanized coating comparable to that provided by CAN/CSA-G164-M92.
- .3 The welded wire mesh for the soil reinforcement mats shall be manufactured from the wire gauges and to the minimum dimensions specified on the project drawings. Each mat shall have a pre-bent tie as shown on the project drawings to form a connection with the precast panels.
- .4 The panel anchors and connection pins shall be as shown on the project drawings. Both the panel anchors and connection pins shall be formed from MW77.4 (W12) wire. The connection pin shall be bent in the field after installation to prevent its removal.

## **2.6 WALL HARDWARE**

- .1 The alignment pins shall be manufactured to the dimensions shown on the reviewed shop drawings provided by the manufacturer. The pins shall be hot-dip galvanized with 610 g/m<sup>2</sup> zinc coating as per CAN/CSA-G164-M92. Two alignment pins shall be installed on the top of each full size precast panel and one pin on top of each half size precast panel with the exception of any top panel sections. Any dirt and debris must be removed from the alignment holes prior to placing the alignment pins.
- .2 The bearing pads shall be 51mm x 152mm x 19mm and 60 Duro Hardness. Two bearing pads shall be placed on top of each precast panel with the exception of the top panel sections.

## **2.7 DRAINAGE PIPE**

- .1 Drainage pipe shall be perforated or slotted 150 mm PVC pipe manufactured in accordance with ASTM D-3034 or corrugated HDPE pipe manufactured in accordance with ASTM D-1248. Drainage pipe shall be covered with a geotextile filter fabric.

## **3 EXECUTION**

### **3.1 EXAMINATION**

- .1 Verification of Conditions: verify conditions of substrates previously installed under other Sections or Contracts are acceptable for retaining wall installation in accordance with manufacturer's written instructions.
- .2 Visually inspect substrate in presence of Departmental Representative.
- .3 Inform Departmental Representative of unacceptable conditions immediately upon discovery.
- .4 Examine the Project site and evaluate conditions where the segmental block retaining wall will be constructed. Notify the Departmental



Representative in writing of any conditions that may interfere with the proper construction of the segmental block retaining wall or delay completion.

- .5 Promptly notify the Wall manufacturer of site conditions which may affect wall performance, soil conditions observed other than those assumed, or other conditions that may require a reevaluation of the wall design.
- .6 Proceed with installation only after unacceptable conditions have been remedied.

### **3.2 SITE PREPARATION**

- .1 Excavate, and prepare soil foundation for levelling pad, in accordance with Section 31 23 33.01 - Excavating Trenching and Backfilling.

### **3.3 FOUNDATION SOILS PREPARATION**

- .1 Foundation soils shall be evaluated by Departmental Representative to ensure that the bearing soils meet or exceed the design conditions or assumptions. Soil not meeting the required strength shall be removed and replaced with acceptable, compacted material.
- .2 Compact foundation soil zone to 95% corrected maximum dry density to ASTM D698 prior to installing base / leveling pad.

### **3.4 BASE/LEVELING PAD**

- .1 Base shall be located as indicated on the Drawings and shall have a minimum thickness of 150mm for wall height less than 2.4m and 300mm for wall height greater than 2.4m.
- .2 Width of the base pad must extend a minimum of 150mm in front and back of the base block footprint.
- .3 Base shall be prepared to ensure full contact of the wall unit with base material. Spacing or gaps between units shall not exceed 10mm.

### **3.5 UNIT INSTALLATION**

- .1 Excavation shall be in accordance with the requirements of general specifications and conform to the limits and construction stages shown on the project drawings. All excavation cuts and slopes shall be in accordance with local OSHA regulations. Vertical cuts greater than 1.5 metres and steepened slopes greater than 6.0 metres must be designed by a registered professional engineer.
- .2 The design of drainage for the structure is not included in the design of the wall. Perforated drainage pipe wrapped in filter fabric shall be installed as directed by the Departmental Representative.
- .3 The foundation for the structure shall be graded level for a width equal to or exceeding the length of the reinforcement mats or as shown on the project drawings. Prior to wall construction, the foundation, if not in

rock, shall be compacted, as directed by the Departmental Representative. Any foundation soils found to be unsuitable shall be removed and replaced with acceptable material, as directed by the Departmental Representative.

- .4 If shown on the project drawings, a 300x150mm thick cast-in-place concrete levelling pad shall be poured. The location and dimensions of this cast-in-place levelling pad shall be as shown on the project drawings.
- .5 The precast panels and soil reinforcement mats shall be placed in successive horizontal lifts as backfill placement proceeds. The panels shall be lifted using the lifting devices provided. The panels shall be placed with the aid of a light crane.
- .6 Panels shall be shimmed as required to ensure proper alignment. Shims shall not be removed until the panel is secured by adequate placement and compaction of fill on the attached reinforcing mats.
- .7 Panels will rotate away from the fill as it is placed. To counter this, panels should be inclined towards the fill 5mm (as an initial assumption, movement varies with moisture content, soil properties and compaction energy) for 1200mm of rise and allowed to rotate to vertical as the fill is placed and compacted.
- .8 Any vertical and horizontal misalignment shall not exceed 25mm when measured along a 3000mm straight edge. Overall vertical tolerance of the wall is 25mm per 3000mm of wall height.
- .9 All walls shall be installed in accordance with local building codes and requirements.

### **3.6 DRAINAGE PIPE INSTALLATION**

- .1 Drainage pipe shall be daylighted as shown on the drawings or connected to a storm sewer system with positive drainage.

### **3.8 SITE TOLERANCES**

- .1 Straight walls
  - .1 Vertical Alignment: +/- 38mm over any 3.6 m distance and no more than +/- 75 mm over the entire length of wall.
  - .2 Horizontal Alignment Control:
    - .1 Corners and radius location: +/- 0.3 m to theoretical location indicated on the Grading Plan.
    - .2 Radii: +/- 0.6m from theoretical lines indicated on the Retaining Wall Plan.
    - .3 Wall Batter at Completion of Work: +/- 2 degrees from the design batter and no batter less than 2 degrees.

### 3.9 FIELD QUALITY CONTROL

- .1 Contractor shall be responsible for proper installation and quality control of all segmental block wall components and appurtenant materials.
- .2 Owner shall, at their expense, retain a qualified professional to monitor and perform quality assurance checks of the installer's work.
- .3 Quality Assurance should include foundation soil inspection, frequent backfill compaction testing, verification of geotechnical design parameters and compliance with Construction Drawings and Project Specifications.

### 3.10 BACKFILLING

- .1 Backfill behind concrete panels in accordance with Section 31 23 33.01 - Excavating, Trenching and Backfilling and to requirements as follows:
- .2 Backfill placement shall closely follow erection of each course of reinforcement mats. Backfill shall be placed in such a manner as to avoid any damage or disturbance to the wall materials or misalignment of the facing. No compaction equipment shall be operated on the bare wire. A minimum cover of 50mm shall be maintained between the wire mesh and any compaction equipment. Any wall materials that become damaged or misaligned during the placement of backfill shall be repaired, replaced or corrected as directed by the Departmental Representative.
- .3 Backfill shall be compacted to 95% of Standard Proctor Dry Density as determined by ASTM D 698. If the wall structure is being used as a bridge abutment, the backfill immediately below the bridge abutment footing, to a depth of 1500mm, shall be compacted to 100% of Standard Proctor Dry Density as determined by ASTM D 698.
- .4 The moisture content of the backfill material prior to and during compaction shall be uniformly distributed throughout each layer and shall not exceed the optimum moisture content. Backfill material with excessive moisture content shall be removed and reworked until the moisture content is acceptable. The optimum moisture content shall be determined in accordance with ASTM D 698.
- .6 If soil compaction is tested with a nuclear densometer, care must be taken to avoid the interference of any buried wire fabric with the operating range of the densometer.
- .7 Backfill shall be placed in complete horizontal lifts. The maximum thickness in loose thickness shall not exceed 250mm. This lift thickness shall be decreased if the specifications of the compaction equipment used specify a lower compaction depth or to achieve the desired density. Only smooth drum rollers may be used, sheep's foot rollers are not permitted.
- .8 Only hand-operated compaction equipment shall be used within 1m of the back of the panel units.
- .9 At each level of soil reinforcing elements, grade and compact backfill

to same elevation as connections with facing panels, before placing reinforcing.

- .8 Ensure that backfill is in contact with soil reinforcing elements for full length of each element.
- .9 Ensure backfill occupies open spaces between solid components of wire mesh and geogrids.
- .10 At the conclusion of each days work, slope backfill at both the crest and bottom of wall away from wall face to prevent surface drainage from scouring or ponding.
- .11 During wall construction, the General Contractor shall be responsible for coordination of other project site operations so as to avoid adjacent construction site drainage from affecting wall construction area.
- .12 Upon completion of wall construction work, the General Contractor shall:
  - .1 Ensure finished grading directs normal drainage away from the finished wall.
  - .2 Ensure other trades do not operate heavy equipment or excavate near the wall and reinforced soil zone.

### 3.11 CLEANING

- .1 Progress Cleaning: clean in accordance with Section 01 74 11 - Cleaning.
- .1 Leave Work area clean at end of each day.
- .2 Final Cleaning: upon completion remove surplus materials, rubbish, tools and equipment in accordance with Section 01 74 11 - Cleaning.

**END OF SECTION**

## **1 GENERAL**

### **1.1 RELATED REQUIREMENTS**

- .1 Section 31 14 13 - Soil Stripping and Stockpiling.
- .2 Section 31 23 33.01 - Excavating, Trenching and Backfilling.
- .3 Section 32 92 19.16 - Hydraulic Seeding.

### **1.2 REFERENCES**

- .1 Agriculture and Agri-Food Canada
  - .1 The Canadian System of Soil Classification, Third Edition, 1998.
- .2 Canadian Council of Ministers of the Environment
  - .1 PN1340-2005, Guidelines for Compost Quality.

### **1.3 ACTION AND INFORMATIONAL SUBMITTALS**

- .1 Provide submittals in accordance with Section 01 33 00 - Submittal Procedures.
- .2 Quality control submittals :
  - .1 Soil testing: submit certified test reports showing compliance with specified performance characteristics and physical properties as described in PART 2 - SOURCE QUALITY CONTROL.

### **1.4 QUALITY ASSURANCE**

- .1 Pre-installation meetings: conduct pre-installation meeting to verify project requirements, installation instructions and warranty requirements in accordance with Section 01 32 16.07 - Construction Progress Schedules - Bar (GANTT) Chart.

## **2 PRODUCTS**

### **2.1 TOPSOIL**

- .1 Topsoil to come from material previously stockpiled on site.
- .2 Additional topsoil for seeded areas: mixture of particulates, micro organisms and organic matter which provides suitable medium for supporting intended plant growth.
  - .1 Soil texture based on The Canadian System of Soil Classification, to consist of 20 to 70 % sand, minimum 7 % clay, and contain 2 to 10 % organic matter by weight.
  - .2 Contain no toxic elements or growth inhibiting materials.
  - .3 Finished surface free from:
    - .1 Debris and stones over 50 mm diameter.
    - .2 Course vegetative material, 10 mm diameter and 100 mm length, occupying more than 2% of soil volume.
  - .4 Consistence: friable when moist.

## **2.2 SOURCE QUALITY CONTROL**

- .1 Contractor is responsible for amendments to supply topsoil as required.
- .2 Provide for soil testing by recognized testing facility for PH, P and K, and organic matter.
  - .1 Soil sampling, testing and analysis to be in accordance with Provincial standards.

## **3 EXECUTION**

### **3.1 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 to adjacent properties and walkways, according to requirements of authorities having jurisdiction and sediment and erosion control drawings.
- .2 Inspect, repair, and maintain erosion and sedimentation control measures during construction until permanent vegetation has been established.
- .3 Remove erosion and sedimentation controls and restore and stabilize areas disturbed during removal.

### **3.2 STRIPPING OF TOPSOIL**

- .1 Strip topsoil in accordance with Section 31 14 13 - Soil Stripping and Stockpiling.

### **3.3 PREPARATION OF EXISTING GRADE**

- .1 Verify that grades are correct.
  - .1 If discrepancies occur, notify Departmental Representative and do not commence work until instructed by Departmental Representative.
- .2 Grade soil, eliminating uneven areas and low spots, ensuring positive drainage.
- .3 Remove debris, roots, branches, stones in excess of 50 mm diameter and other deleterious materials.
  - .1 Remove soil contaminated with calcium chloride, toxic materials and petroleum products.
  - .2 Remove debris which protrudes more than 75 mm above surface.
  - .3 Dispose of removed material off site.

### **3.4 PLACING AND SPREADING OF TOPSOIL/PLANTING SOIL**

- .1 Place topsoil after Departmental Representative has accepted subgrade.
- .2 Spread topsoil in uniform layers not exceeding 100 mm.
- .3 Spread topsoil as indicated to following minimum depths after settlement.
  - .1 100 mm for seeded areas.
- .4 Manually spread topsoil/planting soil around trees, shrubs and obstacles.

### **3.5 FINISH GRADING**

- .1 Grade to eliminate rough spots and low areas and ensure positive drainage.
  - .1 Prepare loose friable bed by means of cultivation and subsequent raking.
- .2 Consolidate topsoil to required bulk density using equipment approved by Departmental Representative.
  - .1 Leave surfaces smooth, uniform and firm against deep footprinting.

### **3.6 ACCEPTANCE**

- .1 Departmental Representative will inspect and test topsoil in place and determine acceptance of material, depth of topsoil and finish grading.

### **3.7 SURPLUS MATERIAL**

- .1 Dispose of materials not required where directed by Departmental Representative off site.

### **3.8 CLEANING**

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

**END OF SECTION**

## **1 GENERAL**

### **1.1 RELATED REQUIREMENTS**

- .1 Section 01 33 00 - Submittal Procedures.
- .2 Section 31 23 33.01 - Excavating, Trenching and Backfilling.
- .3 Section 32 91 19.13 - Topsoil Placement and Grading.

### **1.2 ADMINISTRATIVE REQUIREMENTS**

- .1 Pre-Installation Meetings: conduct pre-installation meeting to verify project requirements, installation instructions and warranty requirements.
- .2 Scheduling:
  - .1 Schedule hydraulic seeding to coincide with preparation of soil surface.

### **1.3 ACTION AND INFORMATIONAL SUBMITTALS**

- .1 Submit in accordance with Section 01 33 00 - Submittal Procedures.
- .2 Product Data:
  - .1 Submit manufacturer's instructions, printed product literature and data sheets for seed, mulch, tackifier, fertilizer, liquid soil amendments and micronutrients.
  - .2 Submit 2 copies of WHMIS MSDS in accordance with Section 01 35 29.06 - Health and Safety Requirements 01 35 43 - Environmental Procedures.
- .3 Submit in writing 10 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 per hectare to apply specified slurry mixture per hectare.
  - .4 Certificates: product certificates signed by manufacturer certifying materials comply with specified performance characteristics and criteria and physical requirements.
  - .5 Test Reports: submit certified test reports showing compliance with specified performance characteristics and physical properties.



#### **1.4 QUALITY ASSURANCE**

- .1 Qualifications:
  - .1 Landscape Contractor: to be a Member in Good Standing of Nova Scotia Horticultural Trades Association.
- .2 Soils Testing:
  - .1 Contractor is responsible for soils testing to determine appropriate ratios and application rates for fertilizer, lime, and any soil amendments that may be required.
  - .2 Soil test report to prescribe ratios and rates for initial applications as well as subsequent applications during establishment and warranty period.
  - .3 Submit soil test report to Departmental Representative in accordance with Section 01 33 00 - Submittal Procedures.

#### **1.5 DELIVERY, STORAGE AND HANDLING**

- .1 Deliver, store and handle materials in accordance with Section 01 61 00 - Common Product Requirements and with manufacturer's written instructions.
- .2 Delivery and Acceptance Requirements:
  - .1 Labelled bags of fertilizer identifying mass in kg, mix components and percentages, date of bagging, supplier's name and lot number.
  - .2 Inoculant containers to be tagged with expiry date.
- .3 Storage and Handling Requirements:
  - .1 Store fertilizer off ground indoors in dry location and in accordance with manufacturer's recommendations in clean, dry, well-ventilated area.
  - .2 Replace defective or damaged materials with new.

#### **1.6 WARRANTY**

- .1 For the work of this Section 32 92 19.16 - Hydraulic Seeding, the 12 month warranty period is extended to 24 months.
- .2 End-of-warranty inspection will be conducted by Departmental Representative.

## 2 PRODUCTS

### 2.1 MATERIALS

- .1 Seed: "Canada pedigreed grade" in accordance with Government of Canada Seeds Act and Regulations.
- .2 Grass mixture: "Certified", "Canada No. 1 Lawn Grass Mixture" in accordance with Government of Canada "Seeds Act" and "Seeds Regulations".
  - .1 Mixture composition:
    - .1 40% Creeping Red Fescue.
    - .2 15% Timothy.
    - .3 15% Tall Fescue.
    - .4 10% Kentucky Blue Grass.
    - .5 10% Alsike Clover.
    - .6 5% Red Top.
    - .7 5% perennial Rye.
- .3 Mulch: 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 Type I mulch:
    - .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%.
- .4 Tackifier: water dilutable, liquid dispersion.
- .5 Water: free of impurities that would inhibit germination and growth.
- .6 Fertilizer:
  - .1 To Canada "Fertilizers Act" and Regulations.
  - .2 Complete synthetic, slow release with 35% of nitrogen content in water-insoluble form.
- .7 Lime: of agriculture source, purity and fineness suitable for growth of turf grass.

- .8 Have a representative sample of topsoil tested and determine application rate for fertilizer. Submit test results to Departmental Representative.
- .9 Inoculants: inoculant containers to be tagged with expiry date.

### **3 EXECUTION**

#### **3.1 EXAMINATION**

- .1 Verification of Conditions: verify conditions of substrate previously installed under other Sections or Contracts are acceptable for hydraulic seeding in accordance with manufacturer's written instructions.
- .2 Visually inspect substrate in presence of Departmental Representative.
- .3 Inform Departmental Representative of unacceptable conditions immediately upon discovery.
- .4 Proceed with installation only after unacceptable conditions have been remedied and after receipt of written approval to proceed from Departmental Representative.

#### **3.2 INSTALLERS**

- .1 Use installers who are members in Good Standing of Nova Scotia Horticultural Trades Association.

#### **3.3 PROTECTION OF EXISTING CONDITIONS**

- .1 Protect structures, signs, guide rails, fences, plant material, utilities and other surfaces not intended for spray.
- .2 Immediately remove any material sprayed where not intended as directed by Departmental Representative.

#### **3.4 PREPARATION OF SURFACES**

- .1 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.
- .2 Prepare surface in accordance with Section 32 91 19.13 - Topsoil Placement and Grading.
- .3 Fine grade areas to be seeded free of humps and hollows.
- .4 Ensure areas are free of deleterious and refuse materials.
- .5 Cultivated areas identified as requiring cultivation to depth of 25 mm.

- .6 Ensure areas to be seeded are moist to depth of 150 mm before seeding.
- .7 Obtain Departmental Representative's approval of grade and topsoil depth before starting to seed.

### 3.5 FERTILIZING PROGRAM

- .1 Fertilize prior to fine grading applying fertilizer equally distributed in accordance with the rate and ratio determined from soils tests.
- .2 Fertilize during establishment and warranty periods applying fertilizer equally distributed in accordance with the rate and ratio determined from soils tests.

### 3.6 PREPARATION OF SLURRY

- .1 Measure quantities of materials by weight or weight-calibrated volume measurement satisfactory to Departmental Representative. 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 materials are in seeder and well mixed, charge tackifier into seeder and mix thoroughly to complete slurry.

### 3.7 SLURRY APPLICATION

- .1 Ensure seed is placed under supervision of certified Landscape Planting Supervisor.
- .2 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.
- .3 Slurry mixture applied per 100 m<sup>2</sup>.
  - .1 Seed: 2.0kg or as recommended by seed supplier.
  - .2 Mulch: 10kg.
  - .3 Tackifier: as recommended by manufacturer.
  - .4 Water: Minimum 100 L.
  - .5 Fertilizer: in accordance with rate and ratio determined from soils tests.

- .4 Apply slurry uniformly, at optimum angle of application for adherence to surfaces and germination of seed.
  - .1 Using correct nozzle for application.
  - .2 Using hoses for surfaces difficult to reach and to control application.
- .5 Blend application 300 mm into adjacent grass areas or sodded areas or previous applications to form uniform surfaces.
- .6 Re-apply where application is not uniform.
- .7 Remove slurry from items and areas not designated to be sprayed.

### **3.8 CLEANING**

- .1 Progress Cleaning: leave Work area clean at end of each day.
- .2 Keep pavement and area adjacent to site clean and free from mud, dirt, and debris at all times.
- .3 Final Cleaning: upon completion remove surplus materials, rubbish, tools and equipment.
- .4 Clean and reinstate areas affected by Work.

### **3.9 PROTECTION**

- .1 Protect seeded areas from trespass until plants are established.
- .2 Remove protection devices as directed by Departmental Representative.

### **3.10 MAINTENANCE DURING ESTABLISHMENT PERIOD**

- .1 Ensure maintenance is carried out under supervision of certified Landscape Maintenance Supervisor.
- .2 Perform following operations from time of seed application until acceptance by Departmental Representative.
- .3 Grass Mixture:
  - .1 Repair and reseed dead or bare spots to allow establishment of seed prior to acceptance.
  - .2 Fertilize seeded areas after 10 weeks after germination provided plants have mature true leaves. Spread half of required amount of fertilizer in one direction and remainder at right angles; water in well.
  - .3 Control weeds by mechanical or chemical means utilizing acceptable integrated pest management practices.

- .4 Water seeded area to maintain optimum soil moisture level for germination and continued growth of grass. Control watering to prevent washouts.

### **3.11 ACCEPTANCE**

- .1 Seeded areas will be accepted by Departmental Representative provided that:
  - .1 Plants are uniformly established and seeded areas are free of rutted, eroded, bare or dead spots.
  - .2 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.

### **3.12 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 Departmental Representative.
  - .2 Fertilize seeded areas as required. Spread half of required amount of fertilizer in one direction and remainder at right angles and water in well.

**END OF SECTION**