

PART 1 - GENERAL

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| <u>1.1 RELATED SECTIONS</u> | <ul style="list-style-type: none"><li>.1 Section 31 05 16 - Aggregate Materials</li><li>.2 Section 31 23 10 - Excavating, Trenching and Backfilling</li><li>.3 Section 31 23 13 - Roadway Embankment</li><li>.4 Section 32 11 23 - Aggregate Base Courses</li></ul>   |
| <u>1.2 REFERENCES</u>       | <ul style="list-style-type: none"><li>.1 American Society for Testing and Materials (ASTM)<ul style="list-style-type: none"><li>.1 ASTM C117-04, Standard Test Methods for Material Finer Than 75-<math>\mu</math>m (No. 200) Sieve in Mineral Aggregates by Washing.</li><li>.2 ASTM C131-06, Standard Test Method for Resistance to Degradation of Small-Size Coarse Aggregate by Abrasion and Impact in the Los Angeles Machine.</li><li>.3 ASTM C136-06, Standard Test Method for Sieve Analysis of Fine and Coarse Aggregates.</li><li>.4 ASTM D422-63(2007), Standard Test Method for Particle-Size Analysis of Soils.</li><li>.5 ASTM D698-2012, Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Standard Effort 600kN-m/m<sup>3</sup>.</li><li>.6 ASTM D1883-03(R2008), Standard Test Method for CBR (California Bearing Ratio) of Laboratory Compacted Soils.</li><li>.7 ASTM D4318-2010, Standard Test Methods for Liquid Limit, Plastic Limit and Plasticity Index of Soils.</li><li>.8 ASTM D1557-2012, Standard Test Method for Laboratory Compaction Characteristics of Soil Using Modified Effort 27,000 kN-m/m<sup>3</sup>.</li></ul></li><li>.2 Canadian General Standard Board (CGSB)<ul style="list-style-type: none"><li>.1 CGSB 8.1-88, Sieves, Testing, Woven Wire, Inch Series.</li><li>.2 CGSB 8.2-M88, Sieves, Testing, Woven Wire, Metric Series.</li></ul></li></ul> |
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PART 2 - PRODUCTS

- 2.1 MATERIALS .1 Granular sub-base material: in accordance with the following requirements:
- .1 Crushed and screended pit gravel or crushed and screened rock. Material to consist of hard and durable stone particles.
  - .2 Graduations shall be dense, well-graded and as follows (NSTIR Type 2):

<u>Sieve Size, <math>\mu</math>m</u>	<u>Percent Passing</u>
80 000	100
56 000	70-100
28 000	50-80
14 000	35-65
5 000	20-50
160	5-12
80	0-5

PART 3 - EXECUTION

- 3.1 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 Confirm no frozen material is placed.
  - .4 Place material only on clean unfrozen surface, free from snow or ice.
  - .5 Begin spreading sub-base material on crown line or high side of one-way slope.
  - .6 Place granular sub-base materials using methods which do not lead to segregation or degradation.
  - .7 For spreading and shaping material, use spreader boxes having adjustable templates or screeds which will place material in uniform layers of required thickness.
  - .8 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.

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| <u>3.1 PLACING</u><br>(Cont'd) | <ul style="list-style-type: none"><li>.9 Shape each layer to smooth contour and compact to specified density before succeeding layer is placed.</li><li>.10 Remove and replace portion of layer in which material has become segregated during spreading.</li></ul>  |
| <br>                           |  |
| <u>3.2 COMPACTION</u>          | <ul style="list-style-type: none"><li>.1 Compaction equipment to be capable of obtaining required material densities.</li><li>.2 Compact to density of not less than 100% corrected maximum dry density maximum dry density in accordance with ASTM D 698.</li><li>.3 Shape and roll alternately to obtain smooth, even and uniformly compacted sub-base.</li><li>.4 Apply water as necessary during compaction to obtain specified density.</li><li>.5 In areas not accessible to rolling equipment, compact to specified density with mechanical tampers approved by Departmental Representative.</li><li>.6 Correct surface irregularities by loosening and adding or removing material until surface is within specified tolerance.</li></ul>  |
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| <u>3.3 PROOF ROLLING</u>       | <ul style="list-style-type: none"><li>.1 For proof rolling use standard roller of 45400 kg gross mass with four pneumatic tires each carrying 11350 kg and inflated to 620 kPa. Four tires arranged abreast with centre to centre spacing of 730 mm maximum.</li><li>.2 Obtain approval from Departmental Representative to use non standard proof rolling equipment.</li><li>.3 Proof roll at level in sub-base as indicated. If non standard proof rolling equipment is approved, Design Departmental Representative to determine level of proof rolling.</li><li>.4 Make sufficient passes with proof roller to subject every point on surface to three separate passes of loaded tire.</li><li>.5 Where proof rolling reveals areas of defective subgrade:<ul style="list-style-type: none"><li>.1 Remove sub-base and subgrade material to depth and extent as directed by Departmental Representative.</li></ul></li></ul> |
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- 3.3 PROOF ROLLING .5 (Cont'd)  
(Cont'd)
- .2 Backfill excavated subgrade with common material and compact to 98% corrected maximum dry density.
- .6 Where proof rolling reveals areas of defective sub-base, remove and replace in accordance with this section at no extra cost.
- 3.4 SITE TOLERANCES .1 Finished sub-base surface to be within 10 mm of dimensions as indicated but not uniformly high or low.
- 3.5 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 Design Departmental Representative.

PART 1 - GENERAL

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| <u>1.1 RELATED<br/>SECTIONS</u>                        | <ul style="list-style-type: none"><li>.1 Section 01 56 00 - Temporary Barriers and Enclosures</li><li>.2 Section 31 11 00 - Clearing and Grubbing</li><li>.3 Section 31 23 10 - Excavating, Trenching and Backfilling</li><li>.4 Section 31 23 13 - Roadway Embankments</li><li>.5 Section 32 11 16 - Granular Sub-base</li><li>.6 Section 32 11 23 - Aggregate Base Courses</li><li>.7 Section 32 91 19 - Topsoil Placement and Grading</li></ul>  |
| <u>1.2 REFERENCES</u>                                  | <ul style="list-style-type: none"><li>.1 American Society for Testing and Materials International (ASTM):<ul style="list-style-type: none"><li>.1 ASTM C117-04, Test Method for Materials Finer than 75-<math>\mu</math>m Sieve in Mineral Aggregates by Washing.</li><li>.2 ASTM C131-06, Test Method for Resistance to Degradation of Small-Size Coarse Aggregate by Abrasion and Impact in the Los Angeles Machine.</li><li>.3 ASTM C136-06, Method for Sieve Analysis of Fine and Coarse Aggregates.</li><li>.4 ASTM D698-2012, Test Method for Laboratory Compaction Characteristics of Soil Using Standard Effort 600kN-m/m<sup>3</sup>.</li><li>.5 ASTM D4318-2010, Test Method for Liquid Limit, Plastic Limit, and Plasticity Index of Soils.</li></ul></li><li>.2 Canadian General Standards Board (CGSB).<ul style="list-style-type: none"><li>.1 CAN/CGSB-8.1-88, Sieves Testing, Woven Wire, Inch Series.</li><li>.2 CAN/CGSB-8.2-M88, Sieves Testing, Woven Wire, Metric.</li></ul></li></ul> |
| <u>1.3 WASTE<br/>MANAGEMENT AND<br/>WASTE DISPOSAL</u> | <ul style="list-style-type: none"><li>.1 Separate and recycle waste materials.</li><li>.2 Excess materials are to be diverted from landfill to site approved by Departmental Representative.</li></ul>  |
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- .1 Scarifying and reshaping:
  - .1 Scarify roadbed to width as indicated unless directed otherwise by Departmental Representative and to minimum depth of 150mm.
  - .2 Blade and trim specified material to elevation and cross section dimensions as indicated unless directed otherwise by Departmental Representative.
  - .3 Where deficiency of material exists, add and blend in new granular base material as directed by Departmental Representative. Confirm no frozen material is used.
- .2 Compaction equipment:
  - .1 Compaction equipment capable of obtaining required material densities.
- .3 Compacting:
  - .1 Compact to 100% corrected maximum dry density in accordance with ASTM D698.
  - .2 Shape and roll alternately to obtain smooth, even and uniformly compacted base.
  - .3 Apply water as necessary during compaction to obtain specified density.
  - .4 Use mechanical tampers, approved by Departmental Representative to compact areas not accessible to rolling equipment to specified density.

3.1 SEQUENCE OF  
OPERATION  
(Cont'd)

- .4 Repair of soft areas:  
.1 Correct soft areas by removing defective material to depth and extent directed by Departmental Representative. Replace with material acceptable to Departmental Representative shape and compact to specified density.  
.2 Maintain reshaped surface in condition conforming to this section until succeeding material is applied or until acceptance by Departmental Representative.

3.2 SITE TOLERANCES

- .1 Reshaped compacted surface within plus or minus 10mm of elevation as indicated.

PART 1 - GENERAL

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| <u>1.1 RELATED SECTIONS</u>                | <ul style="list-style-type: none"><li>.1 Section 31 05 16 - Aggregate Materials</li><li>.2 Section 31 23 10 - Excavating, Trenching and Backfilling</li><li>.3 Section 32 11 16 - Granular Sub-base</li></ul>  |
| <u>1.2 REFERENCES</u>                      | <ul style="list-style-type: none"><li>.1 American Society for Testing and Materials (ASTM)<ul style="list-style-type: none"><li>.1 ASTM C117-04, Standard Test Methods for Material Finer Than 75 <math>\mu\text{m}</math> Sieve in Mineral Aggregates by Washing.</li><li>.2 ASTM C131-06, Standard Test Method for Resistance to Degradation of Small-Size Coarse Aggregate by Abrasion and Impact in the Los Angeles Machine.</li><li>.3 ASTM C136-06, Standard Test Method for Sieve Analysis of Fine and Coarse Aggregates.</li><li>.4 ASTM D698-2012, Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Standard Effort (600kN-m/m<sup>3</sup>).</li><li>.5 ASTM D1557-2012, Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Modified Effort (2,700 kN-m/m<sup>3</sup>).</li><li>.6 ASTM D1883-07e2, Standard Test Method for CBR (California Bearing Ratio) of Laboratory Compacted Soils.</li><li>.7 ASTM D4318-2010, Standard Test Methods for Liquid Limit, Plastic Limit and Plasticity Index of Soils.</li></ul></li><li>.2 Canadian General Standard Board (CGSB)<ul style="list-style-type: none"><li>.1 CGSB 8.1-88, Sieves, Testing, Woven Wire, Inch series.</li><li>.2 CGSB 8.2-M88, Sieves, Testing, Woven Wire, Metric Series.</li></ul></li></ul> |
| <u>1.3 DELIVERY, STORAGE, AND HANDLING</u> | <ul style="list-style-type: none"><li>.1 Deliver and stockpile aggregates in accordance with Section 31 05 16. Stockpile minimum 20% of total aggregate required prior to beginning operation.</li></ul>   |
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1.4 WASTE  
MANAGEMENT AND  
DISPOSAL

- .1 Separate and recycle waste materials.

PART 2 - PRODUCTS

2.1 MATERIALS

- .1 Crushed and screened pit gravel or crushed and screened rock. Material shall consist of hard and durable stone particles.
- .2 Gradation shall be dense, well-graded and as follows (NSTIR Type 1):

<u>Sieve Size</u>	<u>Percent Passing</u>
20 000	100
14 000	50-85
5 000	20-50
160	5-12
80	3-5

PART 3 - EXECUTION

3.1 SEQUENCE OF  
OPERATION

- .1 Place granular base after sub-base subgrade surface is inspected and approved by Departmental Representative.
- .2 Placing:
- .1 Construct granular base to depth and grade in areas indicated.
  - .2 Ensure no frozen material is placed.
  - .3 Place material only on clean unfrozen surface, free from snow and ice.
  - .4 Begin spreading base material on crown line or on high side of one-way slope.
  - .5 Place material using methods which do not lead to segregation or degradation of aggregate.
  - .6 Place material to full width in uniform layers not exceeding 200 mm compacted thickness. Design 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 that portion of layer in which material becomes segregated during spreading.

3.1 SEQUENCE OF  
OPERATION  
(Cont'd)

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- .3 Compaction Equipment:
  - .1 Compaction equipment to be capable of obtaining required material densities.
- .4 Compacting:
  - .1 Compact to density not less than 100% corrected maximum dry density in accordance with ASTM D698.
  - .2 Shape and roll alternately to obtain smooth, even and uniformly compacted base.
  - .3 Apply water as necessary during compacting to obtain specified density.
  - .4 In areas not accessible to rolling equipment, compact to specified density with mechanical tampers approved by Departmental Representative.
  - .5 Correct surface irregularities by loosening and adding or removing material until surface is within specified tolerance.
- .5 Proof rolling:
  - .1 For proof rolling use standard roller of 45400 kg gross mass with four pneumatic tires each carrying 11350 kg and inflated to 620 kPa. Four (4) tires arranged abreast with centre to centre spacing of 730 mm.
  - .2 Obtain approval from Departmental Representative to use non standard proof rolling equipment.
  - .3 Proof roll at level in granular base as indicated. If use of non standard proof rolling equipment is approved, Departmental Representative to determine level of proof rolling.
  - .4 Make sufficient passes with proof roller to subject every point on surface to three separate passes of loaded tire.
  - .5 Where proof rolling reveals areas of defective subgrade:
    - .1 Remove base, sub-base and subgrade material to depth and extent as directed by Departmental Representative.
    - .2 Backfill excavated subgrade with common material and compact in accordance with Section 31 23 10.
    - .3 Replace sub-base material and compact in accordance with Section 32 11 16.
    - .4 Replace base material and compact in accordance with this Section.
  - .6 Where proof rolling reveals defective base or sub-base, remove defective materials to depth and extent as directed by Departmental Representative and replace with new materials in accordance with Section 32 11 16 and this section at no extra cost.

- 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 Departmental Representative.

PART 1 - GENERAL

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| <u>1.1 RELATED SECTIONS</u> | .1 | Section 01 33 00 - Submittal Procedures   |
| <br>                        |    |   |
| <u>1.2 REFERENCES</u>       | .1 | Nova Scotia Department of Transportation and Infrastructure Renewal Standard Specification.   |
| <br>                        |    |   |
| <u>1.3 PRODUCT DATA</u>     | .1 | Submittals in accordance with Section 01 33 00.   |
|                             | .2 | Submit viscosity-temperature chart for asphalt cement to be supplied showing either Saybolt Furol viscosity in seconds or Kinematic Viscosity in centistokes, temperature range 105 to 175 degrees C at least four (4) weeks prior to beginning Work. |
|                             | .3 | Submit manufacturer's test data and certification that asphalt cement meets requirements of this Section.   |
|                             | .4 | Submit manufacturer's test data and certification that hydrated lime meets requirements of this Section.  |
|                             | .5 | Submit asphalt concrete mix design and trial mix test results to Departmental Representative for review at least four (4) weeks prior to beginning Work.  |
| <br>                        |    |   |
| <u>1.4 SAMPLES</u>          | .1 | Submit samples in accordance with Section 01 33 00.   |
|                             | .2 | Inform Departmental Representative of proposed source of aggregates and provide access for sampling at least four (4) weeks prior to beginning Work.  |
|                             | .3 | Submit samples of following materials proposed for use at least four (4) weeks prior to beginning Work.   |
|                             | .1 | One (1) 5L container of asphalt cement.   |
|                             | .2 | 90kg of hydrated lime.  |
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1.5 WASTE  
MANAGEMENT AND  
DISPOSAL

- .1 Divert unused asphalt from landfill to facility capable of recycling materials.

PART 2 - PRODUCTS

2.1 MATERIALS

- .1 Asphalt material: hot mixed, hot-laid combination of mineral aggregates, uniformly coated and mixed with an asphaltic binder in a suitable mixing plant. Asphalt materials and aggregates shall meet the requirements of Division 4, Section 4 of NSDTIR Standard Specification.
- .2 Composition of asphalt mixture: to grading and asphalt content requirements in Table 1, Division 4, Section 4 of the NSDTIR Standard Specification, type C-HF as indicated. Due to small quantity of pavement, surface course asphalt mix may be substituted for base course asphalt mix.

2.2 EQUIPMENT

- .1 Pavers: mechanical grade controlled self-powered pavers capable of spreading mix within specified tolerances, true to line, grade and crown indicated.
  - .2 Rollers: sufficient number of type and weight to obtain specified density of compacted mix.
  - .3 Vibratory rollers:
    - .1 Minimum drum diameter: 1200mm.
    - .2 Maximum amplitude of vibration (machine setting): 0.5mm for lifts less than 40 mm thick.
  - .4 Haul trucks: sufficient number and of adequate size, speed and condition to ensure orderly and continuous operation and as follows:
    - .1 Boxes with tight metal bottoms.
    - .2 Covers of sufficient size and weight to completely cover and protect asphalt mix when truck fully loaded.
    - .3 In cool weather or for long hauls, insulate entire contact area of each truck box.
    - .4 Use only trucks which can be weighed in single operation on scales supplied.
  - .5 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 bearing area not exceeding 310 cm<sup>2</sup> for compacting material along curbs, gutters and other structures
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| <u>2.2 EQUIPMENT<br/>(Cont'd)</u> | <p>.5 Hand tools:(Cont'd)<br/>.2 (Cont'd)<br/>inaccessible to roller. Mechanical compaction equipment, when approved by Departmental Representative, may be used instead of tamping irons.<br/>.3 Straight edges, 4.5 m in length, to test finished surface.</p> <p>.6 Plant testing facility: provide laboratory space at plant site for exclusive use of Departmental Representative, for performing tests, keeping records and making reports.</p> <p>.7 Material transfer vehicle: capable of transferring while doing some reblending of the paving material to allow for non-contact continuous paving.</p> |
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PART 3 - EXECUTION

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| <u>3.1 PREPARATION</u>               | <p>.1 Reshape granular roadbed and asphalt pavement in accordance with Section 32 11 17.</p> <p>.2 When paving over existing asphalt surface, clean pavement surface to approval of Departmental Representative. When levelling course is not required, patch and correct depressions and other irregularities to approval of Departmental Representative before beginning paving operations.</p> <p>.3 Prior to laying mix, clean surfaces of loose and foreign material.</p>   |
| <u>3.2 TRANSPORTATION<br/>OF MIX</u> | <p>.1 Transport mix to job site in vehicles cleaned of foreign material.</p> <p>.2 Paint or spray truck beds with limewater, soap or detergent solution, or non petroleum based commercial product, at least daily or as required. Elevate truck bed and thoroughly drain. No excess solution to remain in truck bed.</p> <p>.3 Schedule delivery of material for placing in daylight, unless Departmental Representative approves artificial light.</p> <p>.4 Deposit mix from surge or storage silo to trucks in multiple drops to reduce segregation. Do not dribble mix into trucks.</p> |
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- 3.2 TRANSPORTATION OF MIX (Cont'd)
- .5 Deliver material to paver at uniform rate and in an amount within capacity of paving and compacting equipment.
  - .6 Deliver loads continuously in covered vehicles and immediately spread and compact. Deliver and place mixes at temperature within range as directed by Departmental Representative, but not less than 135 degrees C.
- 3.3 TEST STRIP
- .1 Construct and test test strip to approval of Departmental Representative.
  - .2 Construct test strip in consultation with Departmental Representative.
  - .3 During construction of test strip, Departmental Representative will establish optimum rolling pattern by taking nuclear densometer readings and observations to:
    - .1 Determine sequence and number of passes.
    - .2 Determine correct operating characteristics of vibratory rollers.
    - .3 Determine maximum density of asphalt mix.
    - .4 Ensure smooth surface finish.
    - .5 Establish actual density achieved by coring in order to determine if additional or other rolling equipment is required to achieve density of not less than 98% of density obtained with Marshall specimens prepared from samples of mix being used.
- 3.4 PLACING
- .1 Obtain Departmental Representative's approval of base prior to placing asphalt.
  - .2 Place asphalt concrete to thicknesses, grades and lines as indicated in accordance with Division 4, Section 4 of NSDTIR Standard Specifications and as herein specified.
  - .3 Placing conditions:
    - .1 Place asphalt mixtures only when air temperature is above 5 degrees C and rising.
    - .2 When temperature of surface on which material is to be placed falls below 10 degrees C, provide extra rollers as necessary to obtain required compaction before cooling.
    - .3 Do not place hot-mix asphalt when pools of standing water exist on surface to be paved, during rain, or when surface is damp.
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3.4 PLACING  
(Cont'd)

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- .4 Where possible do tapering and levelling where required in lower lifts. Overlap joints by not less than 300 mm.
  - .5 Place individual strips no longer than 500m.
  - .6 Spread and strike off mixture with self propelled mechanical finisher.
    - .1 Construct longitudinal joints and edges true to line markings. Departmental Representative to establish lines for paver to follow parallel to centerline of proposed pavement. Position and operate paver to follow established line closely.
    - .2 When using pavers in echelon, have first paver follow marks or lines, and second paver follow edge of material placed by first paver. Work pavers as close together as possible and in no case permit them to be more than 30m apart.
    - .3 Maintain constant head of mix in auger chamber of paver during placing.
    - .4 If segregation occurs, immediately suspend spreading operation until cause is determined and corrected.
    - .5 Correct irregularities in alignment left by paver by trimming directly behind machine.
    - .6 Correct irregularities in surface of pavement course directly behind paver. Remove by shovel or lute excess material forming high spots. Fill and smooth indented areas with hot mix. Do not broadcast material over such areas.
    - .7 Do not throw surplus material on freshly screeded surfaces.
  - .7 When hand spreading is used:
    - .1 Use approved wood or steel forms, rigidly supported to assure correct grade and cross section. 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 material by lutes or covered rakes. Reject material 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. Control temperature to avoid burning material. Do not use tools at higher temperature than temperature of mix being placed.
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- 3.5 COMPACTING .1 Compact asphalt concrete in accordance with Division 4, Section 4 of NSDTIR Standard Specifications.
- 3.6 JOINTS .1 General:  
.1 Remove surplus material from surface of previously laid strip. Do not deposit on surface of freshly laid strip.  
.2 Transverse joints:  
.1 Offset transverse joint in succeeding lifts by at least 600mm.  
.2 Cut back to full depth vertical face and tack face with thin coat of hot asphalt prior to continuing paving.  
.3 Compact transverse joints to provide smooth riding surface. Use methods to prevent rounding of compacted surface at joints.  
.3 Longitudinal joints:  
.1 Offset longitudinal joints in succeeding lifts by at least 150mm.  
.2 Cold joint is defined as joint where asphalt mix is placed, compacted and left to cool below 100 degrees C prior to paving of adjacent lane.  
.1 If cold joint can not be avoided, cut back by saw cutting previously laid lane, by at least 150 mm, to full depth vertical face, and tack face with thin coat of hot asphalt of adjacent lane.  
.3 Overlap previously laid strip with spreader by 25 to 50mm.  
.4 Before rolling, carefully remove and discard coarse aggregate in material overlapping joint with lute or rake.  
.5 Roll longitudinal joints directly behind paving operation.  
.6 When rolling with static or vibratory rollers, have most of drum width ride on newly placed lane with remaining 150 mm extending onto previously placed and compacted lane.  
.4 Construct asphalt transitions as indicated.
- 3.7 FINISH TOLERANCES .1 Finished asphalt surface to be within 6 mm of design elevation but not uniformly high or low.  
.2 Finished asphalt surface not to have irregularities exceeding 6 mm when checked with 4.5m straight edge placed in any direction.
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- 3.8 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 true and even surface and compact immediately to specified density.
  - .2 Repair areas showing checking, rippling, or segregation.
  - .3 Adjust roller operation and screed settings on paver to prevent further defects such as rippling and checking of pavement.

PART 1 - GENERAL

- 1.1 REFERENCES .1 NSDTIR Standard Specifications.

PART 2 - PRODUCTS

- 2.1 MATERIALS .1 Water: to Departmental Representative's approval.

PART 3 - EXECUTION

- 3.1 APPLICATION .1 Apply water with equipment approved by Design  
Departmental Representative at rate of 1L/m<sup>2</sup> for  
liquid when directed by Departmental Representative.
- .2 Failure to provide adequate dust control measures  
resulting in suspension of the Work will be the  
responsibility of the Contactor.

PART 1 - GENERAL

- 1.1 RELATED WORK
- .1 Section 01 33 00 - Submittal Procedures
  - .2 Section 01 35 00 - Traffic Regulation
  - .3 Section 32 12 16 - Asphalt Paving
- 1.2 REFERENCES
- .1 Work shall conform to and meet the requirements of NSTIR, Section 5, Non Coning Traffic Paint and to the requirements outlined below.
  - .2 ASTM D185-07(R2012), Standard Test Methods for Coarse Particles in Pigments.
  - .3 ASTM D476-00(R2011), Standard Classification for Dry Pigmenting Titanium Dioxide Products.
  - .4 ASTM D605-82(R2012), Standard Specification for Magnesium Silicate Pigment.
  - .5 ASTM D711-10, Standard Test Method for No Pic-up Time of Traffic Paint.
  - .6 ASTM D868-2010, Standard Practice for Determination of Degree of Bleeding of Traffic Paint.
  - .7 ASTM D869-85(R2011), Standard Test Method for Evaluating Degree of Settling of Paint.
  - .8 ASTM D1210-05(R2010), Standard Test Method for Fineness of Dispersion of Pigment Vehicle Systems by Hegman-type Gauge.
  - .9 ASTM D1309-93(R2010), Standard Test Method for Settling Properties of Traffic Paints During Storage.
  - .10 ASTM D2205-85(R2010), Standard Guide for Selection of Tests for Traffic Paint.
  - .11 ASTM D3960-05, Standard Practice for Determining Volatile Organic Compound (VOC) Content of Paints and Related Coatings.
  - .12 ASTM F1347-06(R2011), Standard Test Method for Colour and Colour Difference Measurement by Tristimulus Colorimetry.
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- 1.3 SAMPLES
- .1 Submit samples in accordance with Section 01 33 00.
  - .2 Submit to Departmental Representative following material sample quantities at least four (4) weeks prior to commencing work.
    - .1 Two (2) 1L samples of each type of paint.
    - .2 One (1) 1kg sample of glass beads.
    - .3 Sampling to CGSB 1-GP-71.
  - .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.

PART 2 - PRODUCTS

- 2.1 MATERIALS
- .1 Paint:

TABLE NO. 1  
WATER-BORNE NON-CONING TRAFFIC PAINT

PROPERTY	SPECIFICATION		TEST METHOD
General	Min	Max	
Density	-	-	Method 2.1
Consistency, KU(2)	85	95	Method 4.5
Skinning Properties(3)	0	0	Method 10.1
Hiding Power, m <sup>2</sup> /L	8.4		Pfund cryptometer with #3.5 wedge
Contrast Ratio(8)	0.99 Coalescing Agent (2,2,4-trimethyl-1,3-pentenediol 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
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			

2.1 MATERIALS .1 Paint:(Cont'd)  
(Cont'd)

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

- (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) Kreb 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 D605 with a % reflectance (photovolt green filter) of 90 minimum.
- (7) Binder shall be Fastrack 3427 or equivalent.
- (8) Contract ratio: apply a wet film thickness of 381 microns on Laneta Penopac form (1B). Drying time: minimum 24 hour sat 23 +/- 2 degrees Celcius.
- (9) Volatile Organic Compounds (VOC) (excluding water) Max: 150 g/L. Method ASTM D3960.
- (10) Titanium Dioxypigment to meet ASTM D476 Type II specification.

PART 3 - EXECUTION

3.1 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 Deg.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.

3.1 EQUIPMENT  
REQUIREMENTS  
(Cont'd)

- .1 Paint truck:(Cont'd)
  - .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.

3.2 CONDITION OF  
SURFACES

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

3.3 EXISTING  
MARKINGS

- .1 Note the location of existing pavement markings and and pavement gutters before removal.
- .2 Reinstate the pavement markings with the same patterns as used previously (e.g., center line passing markings to have similar meaning and not compromise traffic safety).

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 eight (8) hours.
- .2 Apply traffic paint evenly at rate of not less than 8 mils Dry Film Thickness (16 to 18 mils Wet Film Thickness).
- .3 Paint to be hot sprayed between 70° to 90°.
- .4 Do not thin paint unless approved by Departmental Representative.
- .5 Symbols and letters to conform to dimensions indicated.
- .6 Paint lines to be of uniform colour and density with sharp edges.
- .7 Thoroughly clean distributor tank before refilling with paint of different colour.

- |   |    |   |
|---|----|---|
| <u>3.4 APPLICATION</u><br>(Cont'd)      | .8 | Apply glass beads at rate of 700 g/L immediately after application of paint.  |
| <br>                                    |    |   |
| <u>3.5 TOLERANCE</u>                    | .1 | Paint markings to be within plus or minus 10mm of dimensions indicated.   |
|   | .2 | Remove incorrect markings by methods acceptable to Departmental Representative.   |
| <br>                                    |    |   |
| <u>3.6 PROTECTION OF COMPLETED WORK</u> | .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 (1) 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.   |
| <br>                                    |    |   |
| <u>3.7 INSPECTION</u>                   | .1 | Cooperate with the Departmental Representative for sampling, testing and inspection. This inspection will 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 | 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.  |

PART 1 - GENERAL

- |                                 |  |
|---------------------------------|--|
| <u>1.1 RELATED SECTIONS</u>     | <ul style="list-style-type: none"><li>.1 Section 03 30 00 - Cast-in-Place Concrete</li><li>.2 Section 31 23 10 - Excavating, Trenching and Backfilling</li><li>.3 Section 31 32 19 - Geotextile</li></ul>  |
| <u>1.2 REFERENCES</u>           | <ul style="list-style-type: none"><li>.1 American Society for Testing and Materials (ASTM International)<ul style="list-style-type: none"><li>.1 ASTM C1372-2011, Standard Specification for Dry-Cast Segmental Retaining Wall Units.</li></ul></li><li>.2 Canadian Standards Association (CSA International)<ul style="list-style-type: none"><li>.1 CSA A23-09, Concrete Materials and Methods of Concrete Construction/Test Methods and Standard Practices for Concrete.</li><li>.2 CSA S6-10, Canadian Highway Bridge Design Code.</li></ul></li></ul> |
| <u>1.3 STORAGE AND HANDLING</u> | <ul style="list-style-type: none"><li>.1 Follow storage and handling instructions of supplier of retaining wall system.</li><li>.2 Prevent chipping and cracking of segmental retaining wall units. Replace damaged units as directed by Departmental Representative.</li><li>.3 Prevent staining or other defacement of front surfaces of facing panels during storage and handling. Repair or replace as directed by Departmental Representative.</li></ul>  |

PART 2 - PRODUCTS

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|----------------------------|--|
| <u>2.1 DESIGN CRITERIA</u> | <ul style="list-style-type: none"><li>.1 Design code: CSA-S6.</li><li>.2 Design of the segmental retaining wall system will be the responsibility of the Contractor in association with the manufacturer.</li><li>.3 Consider both internal and external stability of wall system in design. External stability to include safety against sliding, overturning, bearing failure and slip circle failure.</li></ul> |
|----------------------------|--|

- 2.1 DESIGN CRITERIA (Cont'd)
- .4 Minimum factors of safety for working stress design:
    - .1 Pullout resistance: 1.5.
    - .2 Sliding: 1.5.
    - .3 Overturning: 1.5.
    - .4 Bearing capacity: 2.0.
    - .5 Overall slope stability: 1.5.
  - .5 Required geometry:
    - .1 Elevation top of wall as indicated on the drawings.
    - .2 Elevation top of levelling pad as indicated on the drawings.
    - .3 Finished slope of wall facing: near vertical with nominal setback per course.
    - .4 Embedment depth of levelling pad: as indicated on drawings.
  - .6 Segmental retaining wall units: solid concrete construction (i.e., not hollow construction with granular infill) using knob and groove interlocking construction.
- 2.2 WALL SYSTEMS
- .1 Only proprietary wall systems are acceptable.
  - .2 Provide Departmental Representative with six (6) sets of complete working drawings, and one copy of detailed design calculations, for review at least 4 weeks prior to beginning construction. Drawings shall indicate dimensions of segmental retaining wall units, wall elevations, sections and grade profile. Drawings and design calculations to bear signature and stamp of qualified professional engineer registered or licensed in Province of Nova Scotia in Canada.
  - .3 Verify existing site conditions and ground elevations before preparing working drawings.
  - .4 Use only one type of proprietary wall system for the structure. Do not substitute for any component normally supplied by supplier of proprietary wall system.
  - .5 Exposed face of segmental wall units must have a cut stone finish. Finish to be approved by Departmental Representative.
- 2.3 MATERIALS
- .1 Granular backfill: refer to Section 31 23 10.
-

2.3 MATERIALS  
(Cont'd)

- .2 Concrete mixes and materials:
  - .1 Concrete shall have a minimum compressive strength of 35 MPa at 28 days.
  - .2 The maximum nominal coarse aggregate size to be 20mm.
  - .3 The aggregates used in the wall units to be non-reactive as determined by CSA-A23.2.
  - .4 The maximum water to cementing materials ratio shall be 0.40.
  - .5 The limits for slump and total air content shall be 80 mm  $\pm$  20 mm and 6%  $\pm$  1% respectively.
  - .6 The minimum cementitious content shall be 320 kg. per cubic metre of concrete.
  - .7 Any additives including retarding agents or accelerating agents containing chlorides are not to be used.
- .3 Wall units:
  - .1 Exterior block dimensions to be uniform and consistent. Maximum dimensional deviations to be 1% excluding the architectural surface. Maximum width (face to back) deviation including the architectural surface to be 25mm.
  - .2 Exposed face to be finished as specified. Other surfaces to be smooth form type. Dime-size bug holes on the block face are to be patched and/or shake-on color stain can be used to blend into the remainder of the block face
- .4 Leveling pad and free draining backfill:
  - .1 Leveling pad to be crushed stone. See drawings defining drain placement in the bottom of the foundation leveling pad.
  - .2 Free Draining Backfill material is to be washed stone and 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 to be approved by the Departmental Representative. Site excavated soils may be used if accepted by the Departmental Representative, unless otherwise shown on the drawings. Unsuitable soils, organic soils and frost susceptible soils will not be used within a 1 to 1 influence area.
  - .4 Place non-woven geotextile cloth between the Free Draining Backfill and retained soil if required.
  - .5 Where additional fill is needed, submit sample and specifications to the Departmental Representative for approval.
- .5 Drainage:
  - .1 Evaluate internal and external drainage and be responsible for the final wall design.

PART 3 - EXECUTION

- |  |    |   |
|--|----|---|
| <u>3.1 EXCAVATION</u>                      | .1 | Excavate to the lines and grades shown on the construction drawings.  |
|  |    |   |
| <u>3.2 FOUNDATION<br/>SOIL PREPARATION</u> | .1 | Compact native foundation soil to 95% of standard proctor or 90% of modified proctor prior to placement of the Leveling Pad material.   |
|  | .2 | Examine in-situ foundation soil to ensure that the actual foundation soil strength meets or exceeds assumed design strength. Remove soil not meeting the required strength and replace with acceptable, compacted material.   |
|  |    |   |
| <u>3.3 LEVELING PAD<br/>PLACEMENT</u>      | .1 | Place leveling pad as shown on the construction drawings.   |
|  | .2 | Place leveling pad on undisturbed native soils or suitable replacement fills.   |
|  | .3 | Compact leveling pad to 95% of standard proctor or 90% of modified proctor to ensure a level, hard surface on which to place the first course blocks. Pad shall be constructed to the proper elevation to ensure the final elevation shown on the plans.                |
|  | .4 | Leveling pad to have a 150mm minimum depth for walls under 2.5m in height and a 300mm minimum depth for walls over 2.5m. Extend pad dimensions beyond the blocks in all directions to a distance at least equal to the depth of the pad or as determined by the design. |
|  |    |   |
| <u>3.4 UNIT<br/>INSTALLATION</u>           | .1 | Place the first course of wall units on the prepared Leveling Pad with the aesthetic surface facing out and the front edges tight together. Check all units for level and alignment as they are placed.   |
|  | .2 | Confirm that units are in full contact with Leveling Pad. Take proper care to develop straight lines and smooth curves on base course as per wall layout.   |
|  | .3 | Place the backfill in front and back of entire base row and compacted to firmly lock them in place. Check all units again for level and alignment. Sweep all excess material from top of units.   |

3.4 UNIT  
INSTALLATION  
(Cont'd)

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- .4 Install next course of wall units on top of base row. Position blocks to be offset from seams of blocks below. Place blocks fully forward so knob and groove are engaged. Check each block for proper alignment and level. Backfill to 300mm width behind block with Free Draining Backfill. Spread backfill in uniform lifts not exceeding 230mm. Employ methods using lightweight compaction equipment that will not disrupt the stability or batter of the wall. Hand-operated plate compaction equipment shall be used around the block and within 1m of the wall to achieve consolidation. Compact backfill to 95% of standard proctor (ASTM D698, AASHTO T-99) density within 2% of its optimum moisture content.
- .5 Install each subsequent course in like manner. Repeat procedure to the extent of wall height.
- .6 Allowable construction tolerance at the wall face is 2 degrees vertically and 1 in 120 horizontally.
- .7 Install all walls in accordance with local building codes and requirements.

PART 1 - GENERAL

<u>1.1 RELATED SECTIONS</u>	.1	Section 01 33 00 - Submittal Procedures
	.2	Section 31 23 13 - Roadway Embankment
	.3	Section 31 25 00 - Erosion and Sediment Control
	.4	Section 32 92 19 - Hydraulic Seeding
<u>1.2 REFERENCE STANDARDS</u>	.1	Canadian Council of Ministers of Environment Guide.
	.2	Contractors are advised to check Soil and Compost Guidelines 1st Edition Landscape Nova Scotia 2003 for information on soil mixes and organic matter content requirements.
<u>1.3 SOURCE QUALITY CONTROL</u>	.1	Inform Departmental Representative of proposed source of topsoil to be supplied and provide access for sampling.
	.2	Arrange to have testing of topsoil. Testing to be carried out by N.S. Dept. of Agriculture laboratory or other approved laboratory.
	.3	Test topsoil from source prior to stripping and stockpiling for clay, sand and silt, coarse fragments, particle size, N, P, K, Mg, and organic matter.
	.4	Perform pH test to determine required treatment to bring pH value of soil to 5.5 - 7.0 level. Test stockpiled soil after it has been spread in place.
	.5	Submit two (2) copies of soil analysis and recommendations for corrections to Departmental Representative.
	.6	Implement recommendations.
<u>1.4 DELIVERY, STORAGE AND PROTECTION</u>	.1	Schedule deliveries to minimize storage at job site without causing delays.
	.2	Protect newly graded and filled areas from washouts and settlements caused by rain and water damage. Fill

<u>1.4 DELIVERY, STORAGE AND PROTECTION (Cont'd)</u>	.2	(Cont'd) and grade settled or washed out areas to required levels and slopes as specified.
<u>1.5 SCHEDULING</u>	.1	Schedule topsoiling and finish grading operations to coincide with seeding, sodding, and planting operations.
<u>1.6 SAMPLES</u>	.1	Submit samples of materials as directed by the Departmental Representative.
<u>PART 2 - PRODUCTS</u>		
<u>2.1 LANDSCAPE FILL</u>	.1	Site excavated material, or selected material from excavation or other sources, unfrozen, free from rocks, roots larger than 75 maximum dimension, sods, debris, or other deleterious materials, as approved by Departmental Representative.
<u>2.2 TOPSOIL</u>	.1	Soil requirements for this project shall meet the guidelines specified in the Soils and Compost Use Guidelines for Low Maintenance Soil for Low Traffic Lawns.
<u>2.3 MANURE</u>	.1	Well rotted, unleached cattle manure, not less than eight months or more than two (2) years old, free of harmful chemicals and substances, containing no more than 25% straw, leaves or other materials unsuitable for planting use.
<u>2.4 PEAT MOSS</u>	.1	Derived from partially decomposed fibrous or cellular stems and leaves of species of sphagnum mosses.
	.2	Elastic and homogeneous; brown in colour.
	.3	Free of wood and deleterious material which could inhibit growth.
	.4	Shredded particle minimum size 5 mm.

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- 2.5 BONE MEAL .1 Raw bone meal, finely ground with a minimum analysis of 2% nitrogen and 20% phosphoric acid.
- 2.6 FERTILIZER .1 Complete non-toxic, no-burning, slow release fertilizer.
- .2 Fertilizer analysis for hydroseeding areas, sodding areas and planting areas as determined from soil sample test.
- 2.7 LIMESTONE .1 Ground agricultural limestone containing minimum 85% of total carbonates.
- .2 Gradation requirements: percentage passing by weight, 90% passing 1.0 mm sieve, 50% passing 0.125 mm sieve.
- 2.8 PLANTING SOIL MIXTURE .1 Mechanically mix: nine (9) parts topsoil with one (1) part well-rotted manure, compost or peat moss.
- .1 Incorporate bone meal at rate of 3 kg bone meal per cubic metre.
- .2 Incorporate fertilizer at rate determined by soil sample test.
- 2.9 COMPOST .1 Mixture of soil and decomposing organic matter containing 40% or more organic matter as determined by the LOI test or its equivalent under the Walkley-Black test.
- .2 Product must be sufficiently decomposed (i.e., stable) so that any further decomposition does not adversely affect plant growth (C:N ratio below (25) (50), and contain no toxic or growth inhibiting contaminants.
- .3 Composed bio-solids must meet the requirements of the guidelines for Compost Quality, Category (A) (B) produced by the Canadian Council of the Ministers of the Environment (CCME), January 1996.
-

PART 3 - EXECUTION

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|--|--|
| <u>3.1 GENERAL</u>   | <ul style="list-style-type: none"><li>.1 The Contractor must be a member in good standing of Landscape Nova Scotia Horticultural Trades Association.</li><li>.2 Where required, raise subgrade to rough grade levels with landscape fill, deposit in layers not exceeding 200 mm. Consolidate each layer to minimum 93% Standard Proctor Density.</li></ul>  |
| <u>3.2 PREPARATION OF EXISTING GRADE FOR SEEDING, SODDING AND PLANTING</u> | <ul style="list-style-type: none"><li>.1 Verify that subgrade elevations are correct.</li><li>.2 Grade soil. Eliminate uneven areas and low spots to ensure positive drainage. Remove soil contaminated with toxic materials from site as required by the Nova Scotia Environment.</li><li>.3 Cultivate entire area which is to receive topsoil to a depth of 100 mm where practical. Repeat cultivation in those areas where equipment used for hauling and spreading has compacted the soil.</li><li>.4 Remove surface debris, roots, vegetation, branches, and stones in excess of 50 mm in diameter.</li></ul> |
| <u>3.3 PLACING TOPSOIL</u>   | <ul style="list-style-type: none"><li>.1 Do not spread approved topsoil until subgrade has been approved by Departmental Representative.</li><li>.2 Spread topsoil with adequate moisture in uniform layers over approved, unfrozen subgrade where planting is indicated.</li><li>.3 Place topsoil to the depths indicated in 3.3.2.</li><li>.4 Topsoil is to be lightly compacted. For seeded areas, bring topsoil to finished grade.</li></ul>   |
| <u>3.4 SOIL AMENDMENTS</u>   | <ul style="list-style-type: none"><li>.1 Apply lime or other soil amendments at specified rate as determined by soil sample test.</li><li>.2 Mix soil amendment well into full depth of topsoil prior to fertilizer application.</li></ul>   |
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- 3.5 FERTILIZER .1 Fertilizer type and rate of application to be determined from soil test and approved by Departmental Representative.
- .2 Spread fertilizer uniformly over entire area of topsoil.
- 3.6 FINISH GRADING .1 Fine grade entire topsoil area to contours and elevations as indicated or directed. Eliminate rough spots and low areas to ensure positive drainage.
- .2 Prepare loose friable bed by means of raking prior to sodding.
- .3 Leave surface smooth, uniform, and firm against deep foot printing, with a fine loose texture using approved equipment.
- 3.7 ACCEPTANCE .1 Departmental Representative will inspect and test topsoil in place and determine acceptance of material, depth, and finish grading.
- 3.8 CLEAN UP .1 Remove surplus materials at no additional cost to the contract.

PART 1 - GENERAL

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|----------------------------------|---|
| <u>1.1 RELATED<br/>SECTIONS</u>  | <ul style="list-style-type: none"><li>.1 Section 01 33 00 - Submittal Procedures</li><li>.2 Section 32 91 19 - Topsoil Placement and Grading</li></ul>  |
| <u>1.2 SUBMITTALS</u>            | <ul style="list-style-type: none"><li>.1 Product Data.<ul style="list-style-type: none"><li>.1 Submit product data in accordance with Section 01 33 00.</li><li>.2 Provide product data for:<ul style="list-style-type: none"><li>.1 Seed.</li><li>.2 Mulch.</li><li>.3 Tackifier.</li><li>.4 Fertilizer.</li></ul></li><li>.3 Submit in writing to Departmental Representative ten (10) days prior to commencing work:<ul style="list-style-type: none"><li>.1 Volume capacity of hydraulic seeder in litres.</li><li>.2 Amount of material to be used per tank based on volume.</li><li>.3 Number of tank loads required per hectare to apply specified slurry mixture per hectare.</li></ul></li></ul></li></ul> |
| <u>1.3 QUALITY<br/>ASSURANCE</u> | <ul style="list-style-type: none"><li>.1 Test Reports: certified test reports showing compliance with specified performance characteristics and physical properties.</li><li>.2 Certificates: product certificates signed by manufacturer certifying materials comply with specified performance characteristics and criteria and physical requirements.</li><li>.3 Pre-Installation Meetings: conduct pre-installation meeting to verify project requirements, installation instructions and warranty requirements.</li></ul>  |
| <u>1.4 SCHEDULING</u>            | <ul style="list-style-type: none"><li>.1 Schedule hydraulic seeding to coincide with preparation of soil surface.</li><li>.2 Schedule hydraulic seeding using grass mixtures and mixtures containing Crownvetch or Trefoil between dates recommended by the Provincial Agricultural Department.</li></ul>   |
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- 1.5 WASTE MANAGEMENT AND DISPOSAL
- .1 Separate and recycle waste materials.
  - .2 Divert unused fertilizer from landfill to official hazardous material collections site approved by Departmental Representative.
  - .3 Do not dispose of unused fertilizer into sewer systems, into lakes, streams, onto ground or in locations where it will pose health or environmental hazard.

PART 2 - PRODUCTS

- 2.1 SEED
- .1 Canada No. 1 Grade to Government of Canada Seeds Act and Seeds regulations where applicable having a minimum germination of 80% and minimum purity of 85%. Seed mixture shall consist of 1.5 kg per 100 m<sup>2</sup> and conform to the the following:

<u>Name</u>	<u>Proportion by Weight</u>
Creeping Red Fescue (Festuca rubra)	40%
Perennial Rye (Lolium perenne)	25%
Canada Bluegrass (Poa compressa)	10%
Redtop (Agrostis alba)	7%
Annual Rye Grass (Lolium multiflorum)	5%
Birdsfoot Trefoil (Lotus corniculatus)	5%
Yarrow (Achillea millefolium)	5%
Colonial Bentgrass (Agrostis capillaris)	3%

- 2.2 WATER
- .1 Free of impurities that would inhibit plant growth.

- 2.3 SEED FERTILIZER
- .1 To Canada "Fertilizers Act" and "Fertilizers Regulations."
  - .2 Complete synthetic, slow release with 35% of nitrogen content in water soluble form.

- |                                     |    |   |
|-------------------------------------|----|---|
| <u>2.3 SEED FERTILIZER (Cont'd)</u> | .3 | Ratio spring seeding 1:2:2; ratio fall seeding 1:4:4 or as recommended by the Nova Scotia Agricultural College Soils Department or by an approved soils lab.                  |
| <br>                                |    |   |
| <u>2.4 SEED MULCH</u>               | .1 | Fibre: wood or wood-cellulose fibres free of germination or growth-inhibiting ingredients and forming blotter like ground cover allowing absorption and percolation of water. |
|                                     | .2 | Capable of dispersing in water to form homogeneous slurry.  |
|                                     | .3 | Capable of forming an absorptive mat ground cover allowing water percolation.   |
| <br>                                |    |   |
| <u>2.5 SEED TACKIFIER</u>           | .1 | Water diluted liquid dispersion containing polyvinyl acetate polymer emulsion.  |
| <br>                                |    |   |
| <u>2.6 EQUIPMENT</u>                | .1 | Truck (hydraulic):  |
|                                     | .1 | Slurry tank: approved commercial hydraulic equipment.   |
|                                     | .2 | Pumps capable of maintaining continuous non-fluctuating flow of solution.   |

### PART 3 - EXECUTION

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

3.2 PREPARATION OF SURFACES .1 As specified in Section 32 91 19.

3.3 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 all materials are in the seeder and well mixed, charge tackifier into seeder and mix thoroughly to complete slurry.

3.4 HYDRAULIC SEEDING .1 Seed during local growing season when natural moisture is available and temperature is suitable to ensure germination and growth.

.2 Measure all quantities of material by weight or by weight-calibrated volume measurement.

.3 Charge seeder with water, and while agitating, slowly add mulch, seed, fertilizer and lime until all components are thoroughly mixed.

.4 When required, add erosion control agent to seed and mix thoroughly to complete seeding slurry.

.5 Slurry application per 100 m<sup>2</sup>:  
.1 Seed - 1.5 kg or as recommended by seed supplier.  
.2 Fertilizer - Not less than 1650 g of phosphorus per 100 m<sup>2</sup>.  
.3 Mulch - 10 kg.  
.4 Erosion control agent - as recommended by manufacturer.  
.5 Water - minimum 100 litres.  
.6 Lime - as determined by soil analysis.

.6 Apply slurry uniformly, blending into existing grassed areas. Slurry to be thick enough to prevent grass seed from drying and blowing but not to impact germination and growth. Reshoot areas where application is not uniform.

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

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3.5 MAINTENANCE  
DURING  
ESTABLISHMENT  
PERIOD

- .1 Perform the following maintenance operations from time of seeding and or sodding to acceptance:
  - .1 Repair dead or bare spots to allow establishment of seed and sod prior to acceptance.
  - .2 Water to maintain soil moisture conditions for optimum establishment, growth and health of plant material without causing shrinkage or erosion.
  - .3 Cut grass to 50 mm, a minimum of twice, when it reaches a height of 70 mm. Remove clippings.
  - .4 Fertilize seeded areas after first cutting in accordance with fertilizing program. Spread half the required amount of fertilizer in one direction and the remainder at right angles.
  - .5 Control weeds by mechanical or chemical means utilizing acceptable integrated pest management practices.
  - .6 Where continued maintenance is required after final acceptance, commence maintenance immediately following installation of work. Continue it for one year following final acceptance at Project completion.
  - .7 Notify Departmental Representative upon completion of maintenance period to arrange inspection and transfer maintenance responsibility to Departmental Representative.
  - .8 Where Municipal (By-laws) Regulations prohibit the use of Federally or Provincially approved pesticides, and the available (alternative) non-pesticide controls are not acceptable to the Contractor, the application of pesticides to control weeds, insects, fungus and disease shall be deemed to be removed from Maintenance during Establishment Period.

3.6 ACCEPTANCE

- .1 Grassed areas will be accepted upon completion of the second mowing provided that:
  - .1 Growth is properly established.
  - .2 Area is free of bare and dead spots and 98% weed free subject to section 3.8.9.
  - .3 Minimal surface soil is visible when grass has been cut to a height of 50 mm.
- .2 Areas seeded in the fall will be accepted the following spring, one month after the start of growing season provided that acceptance conditions have been met.
- .3 Continue maintenance and mowing until acceptance.