

**Part 1            General**

1.1            WORK INCLUDED

- .1            This specification shall cover all Work associated with Rough Grading as described by the Drawings. The Contractor shall furnish all superintendence, overhead, labour, Materials, equipment, tools supplies and all things necessary for and incidental to the satisfactory performance and completion of all Work hereinafter specified.

1.2            RELATED SECTIONS

- .1            Section 32 11 23 – Aggregate Base Course.
- .2            Section 32 91 13 – Topsoil and Finish Grading.

**Part 2            Products**

2.1            MATERIALS

- .1            The Contractor shall be responsible for the supply, safe storage and handling of all Materials set forth in this specification.

2.2            HANDLING AND STORAGE OF MATERIALS

- .1            All Materials shall be handled and stored in a careful and workmanlike manner, to the satisfaction of the Contract Administrator.

2.3            TESTING AND APPROVAL

- .1            All Materials supplied under this Specification shall be subject to inspection and testing by the Contract Administrator or by the Testing Laboratory designated by the Contract Administrator. There shall be no charge to the owner for any Materials taken by the Contract Administrator for testing purposes. The Contract Administrator shall approve all Materials at least ten (10) days before any construction is undertaken. If, in the opinion of the Contract Administrator, such Materials, in whole or in part, do not conform to the Specification detailed herein or are found to be defective in manufacture or have become damaged in transit, storage or handling operations, then such Material shall be rejected by the Contract Administrator and replaced by the Contractor at his own expense.

2.4            FILL MATERIAL

- .1            Fill Material for embankment construction shall be obtained from site excavation, from borrow sites as specified in the Specifications for the Work or shall be imported Material, of a type approved by the Contract Administrator. Approved clay fill Material shall consist of low to medium plastic clays or of mixtures of sand and clay, uniform in texture and suitable for compaction.

2.5            SUB-BASE MATERIAL

- .1            Sub-base Material shall conform to Section 32 11 23.

2.6 EQUIPMENT

- .1 All equipment shall be of a size and type as required to complete the Work in reasonable time as approved by the Contract Administrator, and shall be kept in good working order.

**Part 3 Execution**

3.1 GENERAL

- .1 The Contractor shall grade to the levels and contours as directed allowing for surface treatment as shown on Drawings. Existing topsoil shall be stockpiled on-site as directed by the Contract Administrator. Prior to placing any fill over existing ground the Contractor shall scarify surface of existing ground to a depth of 150mm. Moisture content of filling and existing surface Material shall be the same in order to facilitate proper bonding.
- .2 All fill shall be clean fill.

3.2 EXCAVATION

- .1 Excavation shall consist of topsoil excavation, common excavation and borrow excavation, which shall be understood to mean the following:
  - .1 Topsoil Excavation
    - .1 The excavation of surface soil, organic growth, or other Material designated by the Contract Administrator as overburden, the stockpiling of topsoil for re-use on site, and the satisfactory disposal of unsuitable Material such as brush, grass, weeds and all other organic growth and any surface topsoil, unless otherwise specified herein or in the Specifications for the Work.
  - .2 Common Excavation
    - .1 The excavation of all Material encountered within the limits of grading following topsoil excavation, the on-site placement or the stockpiling of suitable site Material, and the satisfactory disposal of unsuitable site Material such as frost heaving clays, silts, rock, rubble, rubbish and any surplus suitable site Material, unless otherwise specified herein or in the Specifications for the Work.
  - .3 Borrow Excavation
    - .1 The excavation and placing of excavated Material, obtained from designated borrow locations. The widening of roadway cuts and ditches will not be considered as borrow. The excavation procedure shall be subject to the approval of the Contract Administrator. Excavation shall continue in as nearly a continuous manner as possible. Excavation at multiple locations at the same time shall be subject to the approval of the Contract Administrator. The Contractor shall conduct his excavation procedure in such a manner as to enable the Contract Administrator to inspect the separation of Materials and determine which Materials are to be disposed of and which Materials are to be used. The Contractor shall excavate as required to reach sub-grade levels of pavement and landscaping, and rough grade levels for areas to be graded only. During the course of common excavation, the Contractor will be advised by the Contract Administrator as to which areas have an unsuitable sub-grade. In the areas of unsuitable sub-grade, whether in a homogeneous mass or in isolated pockets, the excavation shall be extended either to the

lower limit of the unsuitable Material or to a depth of one metre below the elevation of the bottom of base course for a Portland cement concrete pavement, or to a depth of 600 mm below the elevation of the bottom of sub-base for an asphaltic concrete pavement, whichever is lesser, unless otherwise specified on the Drawings or in the Specifications for the Work. Additional excavation of unsuitable Material may be required as specified by the Contract Administrator. In areas of excavation of unsuitable Material, the side of the excavation may be sloped into the excavation provided that the sides remain at least 150 mm outside of the limits of the proposed pavement at the bottom of the excavation. The longitudinal slope shall not be steeper than 1:1. Excavation of solid bedrock, glacial till, boulders, loose rock, concrete rubble and foundations which are located within the limits of excavation and which require the use of additional or unconventional excavation equipment shall be measured and paid for in addition to the unit prices for excavation.

### 3.3 DISPOSAL OF MATERIAL

- .1 Disposal of Material shall be understood to mean the removal of a Material from the site, hauling of the Material along a route approved by the Contract Administrator, and the unloading and grading of the Material in a manner satisfactory to the Contract Administrator at a legal disposal site. If a disposal site is not otherwise indicated in the Specifications for the Work, the Contractor shall locate a legal disposal site and identify a haul route to be approved by the Contract Administrator. Any Material dropped or spilled on any streets during the hauling operation shall be promptly cleaned up by and at the expense of the Contractor, to the satisfaction of the Contract Administrator.

### 3.4 PREPARATION OF EXISTING GROUND SURFACE

- .1 Before any embankment is placed on original ground having a smooth firm surface, the existing ground shall be scarified or ploughed so as to permit bonding with the new Material. Where the existing ground surface is sloped sufficiently to affect the bond between the old and new Materials the original ground on which the embankment is to be placed shall be ploughed deeply or stepped before embankment construction is commenced, as directed by the Contract Administrator. When embankment is being placed on an existing roadbed, the side slopes of the existing roadbed shall have vegetation removed and then be scarified or ploughed, as directed by the Contract Administrator, to ensure adequate bonding between the new embankment and the existing Material. Following the excavation and disposal of unsuitable Material and the preparation of the side slopes, as described above, the surface of the existing roadbed shall be scarified to a depth of 150 mm, and compacted to the proper density, at the optimum moisture content. Where existing roadbeds are being widened and existing embankments extended, the existing slopes shall be denuded of all vegetation and either stepped or ploughed so as to form a medium of contact with the new embankment. Vertical cuts for the full depths of embankment shall not be permitted.
- .2 Compaction
  - .1 Compact fill and undisturbed areas to Standard Proctor Density to ASTM D698-78 as follows:
    - .1 Landscaped Areas – 85%
    - .2 Paved Areas – 95%
- .3 Finishing and Maintaining

- .1 The Contractor shall, as soon as practicable, bring the excavations and embankments to the correct widths, lines and grades as shown on the Drawings.
- .2 All surfaces shall be maintained to the specified grade and cross-section and to the specified density until the project or that portion of the project is accepted.

### 3.5 QUALITY CONTROL

#### .1 Inspection

- .1 All workmanship and all Materials furnished and supplied under this Specification are subject to close and systematic inspection and testing by the Contract Administrator including all operations from the selection and production of Materials through to final acceptance of the specified Work. The Contractor shall be wholly responsible for the control of all operations incidental thereto notwithstanding any inspection or approval that may have been previously given. The Contract Administrator reserves the right to reject any Materials or works that are not in accordance with the requirements of this Specification.

#### .2 Access

- .1 The Contract Administrator shall be afforded full access for the inspection and control testing of Materials, both at the site of Work and at any plant or borrow pit used for the supply of the Materials, to determine whether the Material is being supplied in accordance with this Specification.

#### .3 Quality of Sub-grade and Embankment Materials

- .1 The Standard Proctor Density for the sub-grade and embankment Materials shall be determined at the optimum moisture content in accordance with ASTM Standard D698. The field density of each layer shall be a percentage of the Standard Proctor Density, as specified in Section 9.7 of this Specification.
- .2 Quality control tests will be used to determine the acceptability of each layer, as placed and compacted by the Contractor, before the succeeding layer may be applied.
- .3 The field density of the compacted layers shall be verified by Field Density Tests in accordance with ASTM Standard D1556, Test for Density of Soil in Place by the Sand-Cone Method, or ASTM Standard D2922, Test of Density of Soil and Soil-Aggregate in Place by Nuclear Methods (Shallow Depth).
- .4 The frequency and number of tests to be made shall be as determined by the Contract Administrator.
- .5 Holes made by the removal of samples from the layers shall be promptly filled by the Contractor with appropriate Material and thoroughly compacted so as to conform in every way with the adjoining compacted Material.

#### .4 Corrective Action

- .1 The Contractor shall, at his own expense, correct such Work or replace such Materials found to be defective under this Specification in an approved manner to the satisfaction of the Contract Administrator.

**END OF SECTION**

**Part 1            General**

1.1            WORK INCLUDED

- .1            This specification covers the supply and installation of Separation (non – woven) and Separation/Reinforcement (woven) Geotextile Fabrics relating to Surface Works construction.
- .2            The Work to be done by the Contractor under this Specification shall include the furnishing of all superintendence, overhead, labour, Materials, equipment, tools, supplies and all things necessary for and incidental to the satisfactory performance and completion of all Work as hereinafter specified and in accordance with Section 31 32 19.

1.2            DEFINITIONS

- .1            Separation Geotextile Fabric – a non-woven geotextile fabric used to separate the sub-base from the sub-grade in a pavement structure.
- .2            Separation/Reinforcement Geotextile Fabric – a woven geotextile fabric used to separate the sub-base from the sub-grade and provide limited reinforcement in a pavement structure.

1.3            RELATED SECTIONS

- .1            Section 32 11 23 – Aggregate Base Course

**Part 2            Products**

2.1            MATERIAL IDENTIFICATION

- .1            Geotextile fabric is to be labelled in accordance with ASTM D4873, and must clearly show the manufacturer's product style number and unique roll number.

2.2            STORAGE AND HANDLING

- .1            Protect geotextile fabric at all times from contamination of dirt, dust any other deleterious Materials.
- .2            Protective coating is to remain on the geotextile fabric until installation.
- .3            Store and handle in accordance with manufacturer's and/or supplier's recommendations.
- .4            Protect geotextile fabric from exposure to ultraviolet light during storage.

2.3            MILL CERTIFICATE AND MARV DATA

- .1            Provide Mill Certificate and the MARV (Minimum Average Roll Value) Data upon request by the Contract Administrator.

2.4 SEPARATION GEOTEXTILE FABRIC

- .1 Separation Fabric will be non-woven and meet or exceed the following requirements:

TABLE A– Separation Fabric Requirements

Physical Property	Requirements	Test Method
Grab Tensile Strength	900 N – minimum	ASTM D4632
CBR Puncture	2200 N – minimum	ASTM D 6241
Trapezoid Tear	350 N – minimum	ASTM D4533
Apparent Opening Size	0.18 mm – maximum	ASTM D4751
Permittivity	1.4 sec <sup>-1</sup> – minimum	ASTM D4491
Flow Rate	4000 l/min/m <sup>2</sup> - minimum	ASTM D4491
U.V. Resistance	0% per 500 hrs - minimum	STM D4355

- .2 When CBR Puncture and Trapezoid Tear material property values are not available from the manufacturer, the following material property values for Puncture Strength\* and Mullen Burst \*\* must be met as alternatives to CBR Puncture and Trapezoid Tear in Table CW A.

*Puncture Strength	575 N – minimum	ASTM D4833
**Mullen Burst	2000 KPa – minimum	ASTM D 3786

- .3 All physical property requirements are MARV (Minimum Average Roll Values) determined in accordance with ASTM 4759.

2.5 SEPARATION/REINFORCEMENT GEOTEXTILE FABRIC

- .1 Separation/reinforcement geotextile fabric will be woven fabric and meet or exceed the following requirements:

TABLE B– Separation/Reinforcement Geotextile Fabric Requirements

Physical Property	Requirements	Test Method
Grab Tensile Strength	1400 N – minimum	ASTM D4632
CBR Puncture	4000 N – minimum	ASTM D 6241
Trapezoid Tear	500 N – minimum	ASTM D4533
Apparent Opening Size	0.43 mm – maximum	ASTM D4751
Permittivity	0.05 sec <sup>-1</sup> – minimum	ASTM D4491
U.V. Resistance	70% per 500 hrs - minimum	ASTM D4355

- .2 When CBR Puncture material property values are not available from the manufacturer, the following material property values for Puncture Strength\* and Mullen Burst\*\* must be met as alternatives to CBR Puncture in Table B.

*Puncture Strength	530 N – minimum	ASTM D4833
**Mullen Burst	3500 KPa – minimum	ASTM D 3786

- .3 All physical property requirements are MARV (Minimum Average Roll Values) determined in accordance with ASTM 4759.

### **Part 3 Execution**

#### **3.1 GENERAL**

- .1 Sub-base, base Materials and depths are as noted on Drawing.
- .2 Where the sub-grade is unstable as determined by the Contract Administrator, place separation (non-woven) geotextile fabric and geogrid over the sub-grade.
- .3 Where the sub-grade is stable as determined by the Contractor Administrator, place separation (non-woven) geotextile fabric without geogrid over the sub-grade.
- .4 Separation/Reinforcement (Woven) Geotextile Fabric may be used as directed by the Contract Administrator in place of Separation Geotextile Fabric over stable sub-grade.

#### **3.2 SEPARATION OR SEPARATION/REINFORCEMENT GEOTEXTILE FABRIC**

- .1 Commence installation of geotextile fabric after Material has been approved by the Contract Administrator and the preparation of the sub-grade has been completed in accordance with Section 32 11 23.
- .2 Install geotextile fabric to the complete limits of the roadway sub-grade including intersections and turning lanes or as directed by the Contract Administrator.
- .3 Unroll geotextile fabric as smooth as possible on the prepared sub-grade in the direction of the construction traffic.
- .4 Install geotextile fabric in the longest continuous practical length, free from tension, stress, wrinkles and creases.
- .5 Cut or fold geotextile fabric to conform to curves.
- .6 Install geotextile fabric in accordance with this specification and procedures recommended by the manufacturer.
- .7 Overlap joints a minimum of 600 millimetres.
- .8 Install pins or place piles of sub-base Material as required to hold geotextile fabric in place.
- .9 Place a minimum of 150mm of sub-base over the geotextile fabric before driving construction vehicles over the geotextile fabric.

- .10 Remove and replace geotextile fabric that is improperly installed or damaged as directed by the Contract Administrator.

**END OF SECTION**