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**DIVISION 31**

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Part 1 General

1.1 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 aggregate materials and include product characteristics, performance criteria, physical size, finish and limitations.
- .3 Samples:
  - .1 Submit 1 sample of each aggregate type being incorporated into the Work to the Departmental Representative.
  - .2 Allow continual sampling by Departmental Representative during production.
  - .3 Provide Departmental Representative with access to source and processed material for sampling.
  - .4 Supply new or clean sample bags or containers appropriate to aggregate materials.
  - .5 Pay cost of sampling and testing of aggregates which fail to meet specified requirements.

Part 2 Products

2.1 MATERIALS

- .1 Aggregate quality: sound, hard, durable material free from soft, thin, elongated or laminated particles, organic material, clay lumps or minerals, free from adherent coatings and injurious amounts of disintegrated pieces or other deleterious substances.
- .2 Flat and elongated particles of coarse aggregate: to ASTM D 4791.
  - .1 Greatest dimension to exceed 5 times least dimension.
- .3 Fine aggregates satisfying requirements of applicable section to be one of, or blend of following:
  - .1 Screenings produced in crushing of quarried rock, boulders, gravel or slag.
  - .2 Reclaimed asphalt pavement.
  - .3 Reclaimed concrete material.
  - .4 Coarse aggregates satisfying requirements of applicable section to be one of, or blend of following:

- .1 Crushed rock.
- .2 Crushed gravel composed of naturally formed particles of stone.
- .3 Reclaimed asphalt pavement.
- .5 Base Course aggregate shall meet the gradation requirements outlined in Section 32 00 02 - Granular Base and Sub Base Courses.
- .6 Sub Base Course aggregate shall meet the gradation requirements outlined in Section 32 00 02 - Granular Base and Sub Base Courses.

## 2.2 SOURCE QUALITY CONTROL

- .1 Inform Departmental Representative of proposed source of aggregates and provide access for sampling 5 days minimum before starting production.
- .2 If materials from proposed source do not meet, or cannot reasonably be processed to meet, specified requirements, locate alternative source.
- .3 Advise Departmental Representative 3 days minimum in advance of proposed change of material source.
- .4 Acceptance of material at source does not preclude future rejection if it fails to conform to requirements specified, lacks uniformity, or if its field performance is found to be unsatisfactory.

## Part 3 Execution

### 3.1 PREPARATION

- .1 Processing:
  - .1 Process aggregate uniformly using methods that prevent contamination, segregation and degradation.
  - .2 Blend aggregates, as required, including reclaimed materials that meet physical requirements of specification is permitted in order to satisfy gradation

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requirements for material and, percentage of crushed particles, or particle shapes specified.

- .1 Use methods and equipment approved in writing by Departmental Representative.
- .2 When operating in stratified deposits use excavation equipment and methods that produce uniform, homogeneous aggregate gradation.
- .3 Where necessary, screen, crush, wash, classify and process aggregates with suitable equipment to meet requirements.
  - .1 Use only equipment approved in writing by Departmental Representative.
- .4 Stockpiling:
  - .1 Stockpile aggregates in sufficient quantities to meet project schedules.
  - .2 Stockpiling sites to be level, well drained, and of adequate bearing capacity and stability to support stockpiled materials and handling equipment.
  - .3 Except where stockpiled on acceptably stabilized areas, provide compacted sand base not less than 300 mm in depth to prevent contamination of aggregate. Stockpile aggregates on ground but do not incorporate bottom 300 mm of pile into Work.
  - .4 Separate different aggregates by strong, full depth bulkheads, or stockpile far enough apart to prevent intermixing.
  - .5 Do not use intermixed or contaminated materials. Remove and dispose of rejected materials within 48 hours of rejection.
  - .6 During winter operations, prevent ice and snow from becoming mixed into stockpile or in material being removed from stockpile.

### 3.2 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 Leave aggregate stockpile site in tidy, well drained condition, free of standing surface water.
- .4 Leave any unused aggregates in neat compact stockpiles.

**END OF SECTION**

## Part 1 GENERAL

### 1.1 DEFINITIONS

- .1 Clearing consists of cutting off trees and brush vegetative growth to not more than specified height above ground and disposing of felled trees, previously uprooted trees and stumps, and surface debris.
- .2 Close-cut clearing consists of cutting off standing trees, brush, scrub, roots, stumps and embedded logs, removing at, or close to, existing grade and disposing of fallen timber and surface debris.
- .3 Clearing isolated trees consists of cutting off to not more than specified height above ground of designated trees, and disposing of felled trees and debris.
- .4 Underbrush clearing consists of removal from treed areas of undergrowth, deadwood, and trees smaller than 50 mm trunk diameter and disposing of fallen timber and surface debris.
- .5 Grubbing consists of excavation and disposal of stumps and roots, boulders and rock fragments of specified size to not less than specified depth below existing ground surface.

### 1.2 STORAGE AND PROTECTION

- .1 Prevent damage to all which are to remain.
  - .1 Repair damaged items to approval of Departmental Representative.
  - .2 Replace trees designated to remain, if damaged, as directed by Departmental Representative.

### 1.3 WASTE MANAGEMENT AND DISPOSAL

- .1 Separate waste materials for reuse and recycling in accordance with local Municipal bylaws/regulations.

## Part 2 PRODUCTS

### 2.1 MATERIALS

- .1 Soil Material for Fill:
  - .1 Excavated soil material: free of debris, roots, wood, scrap material, vegetable matter, refuse, soft unsound particles, deleterious, or objectionable materials.
  - .2 Remove and store soil material for reused.

### Part 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.
- .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 PREPARATION

- .1 Inspect site and verify with Departmental Representative, items designated to remain.
- .2 Locate and protect utility lines: preserve in operating condition active utilities traversing site.
  - .1 Notify Departmental Representative immediately of damage to or when unknown existing utility lines are encountered.
  - .2 When utility lines which are to be removed are encountered within area of operations, notify Departmental Representative in ample time to minimize interruption of service.
- .3 Notify utility authorities before starting clearing and grubbing.
- .4 Keep roads and walks free of dirt and debris.

#### 3.3 CLEARING

- .1 Clearing includes felling, trimming, and cutting of trees into sections and satisfactory disposal of trees and other vegetation designated for removal, including downed timber, snags, brush, and rubbish occurring within cleared areas.
- .2 Clear as directed by Departmental Representative, by cutting at height of not more than 300 mm above ground. In areas to be subsequently grubbed, height of stumps left from clearing operations to be not more than 300 mm above ground surface.
- .3 Cut off branches and cut down trees overhanging area cleared as directed by Departmental Representative.
- .4 Cut off unsound branches on trees designated to remain as directed by Departmental Representative.

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### 3.4 CLOSE CUT CLEARING

- .1 Close cut clearing to ground level.
- .2 Perform close cut clearing by hand so that existing muskeg is not damaged.
- .3 Cut off branches or down trees overhanging area cleared as directed by Departmental Representative.
- .4 Cut off unsound branches on trees designated to remain as directed by Departmental Representative.

### 3.5 GRUBBING

- .1 Remove and dispose of roots larger than 7.5 cm in diameter, matted roots, and designated stumps from indicated grubbing areas.
- .2 Grub out stumps and roots to not less than 200 mm below ground surface.
- .3 Grub out visible rock fragments and boulders, greater than 300 mm in greatest dimension, but less than 0.25 m<sup>3</sup>.
- .4 Fill depressions made by grubbing with suitable material and to make new surface conform with existing adjacent surface of ground.

### 3.6 REMOVAL AND DISPOSAL

- .1 Remove cleared and grubbed materials off site to disposal area as indicated by Departmental Representative.
- .2 Cut timber greater than 125 mm diameter to 50 mm lengths and stockpile as indicated. Stockpiled timber becomes property of Owner.
- .3 Chip or mulch and spread cleared and grubbed vegetative material on site as directed by Departmental Representative.

### 3.7 FINISHED SURFACE

- .1 Leave ground surface in condition suitable for immediate grading operations to approval of Departmental Representative.

### 3.8 CLEANING

- .1 Proceed in accordance with Section 01 74 11 - Cleaning.
- .2 On completion and verification of performance of installation, remove surplus materials, excess materials, rubbish, tools and equipment.

**END OF SECTION**

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Part 1 General

1.1 RELATED REQUIREMENTS

- .1 Section 31 24 13.01 Permanent Garbage Cans.

1.2 MEASUREMENT PROCEDURES

- .1 Stripping: measure in cubic metres calculated from cross sections taken by Departmental Representative in areas of excavation.
- .1 Departmental Representative will take initial cross sections after clearing and grubbing completed.
- .2 Stripping unit price to include cost of placing material on slopes upon completion of excavation and embankment.
- .2 Common Excavation: measure in cubic metres calculated from cross sections taken by Departmental Representative in areas of excavation.
- .1 Departmental Representative will take initial cross sections after clearing, grubbing and stripping completed and immediately prior to excavation of material to be incorporated into work.
- .3 Borrow, including Contractor Supply: measure in cubic metres calculated from cross sections taken by Departmental Representative in areas of excavation.
- .1 Departmental Representative will take initial cross sections after clearing, grubbing and stripping completed and immediately prior to excavation of material to be incorporated into work.
- .4 Unclassified excavation:
- .1 Measure in cubic metres calculated from cross sections taken by Departmental Representative in areas of excavation.
- .2 Departmental Representative will take initial cross sections after clearing, grubbing and stripping completed and immediately prior to excavation of material to be incorporated into work.
- .5 No separate payment for:
- .1 Excavating unnecessarily beyond lines established by Departmental Representative, with exception of unavoidable slide material. Do not measure slide material, when such slides are attributable to negligence.
- .2 Ripping and/or drilling and blasting of material.
- .3 Scarifying or benching existing slopes or existing road surfaces.
- .4 Removing and disposing of roots, stumps and other materials excavated during waste operation.



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- .5 Removing unsuitable material from embankment attributable to negligence.
  - .6 Shattering rock to 300 mm below subgrade elevation.
  - .7 Scaling and removing loose rock from rock face.
  - .8 Watering, drying and compacting.
  - .9 Finishing.

### 1.3 REFERENCES

#### .1 Definitions:

##### .1 Rock Excavation: excavation of:

- .1 Material from solid masses of igneous, sedimentary or metamorphic rock which, prior to removal, was integral with parent mass. Material that cannot be ripped with reasonable effort with a Caterpillar D9 crawler bulldozer or equivalent to be considered integral with parent mass.
- .2 Boulder or rock fragments measuring in volume 1 cubic metre or more.

##### .2 Common Excavation: excavation of materials that are not Rock Excavation or Stripping.

##### .3 Unclassified Excavation: excavation of whatever character other than stripping encountered in the Work.

##### .4 Free Haul: distance that excavated material is hauled without compensation. Free haul distance to be 0.5 km or less.

##### .5 Stripping: excavation of organic material covering original ground.

##### .6 Over Haul: authorized hauling in excess of free haul distance that excavated material is moved.

##### .7 Embankment: material derived from usable excavation and placed above original ground or stripped surface up to top of subgrade.

##### .8 Waste Material: material unsuitable for embankment, embankment foundation or material surplus to requirements.

##### .9 Borrow Material: material obtained from areas outside right-of-way and required for construction of embankments or for other portions of work.

##### .10 Topsoil: material capable of supporting good vegetative growth and suitable for use in top dressing, landscaping and seeding.

#### .2 Reference Standards:

##### .1 ASTM International

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- .1 ASTM D 698-12e2, Standard Test Method for Laboratory Compaction Characteristics of Soil Using Standard Effort (12,000 ft-lbf/ft<sup>3</sup>) (600 kN-m/m<sup>3</sup>).
  - .2 American Association of State Highway and Transportation Officials (AASHTO)
    - .1 AASHTO T99, Standard Method of test for Moisture-Density Relations of Soils Using a 2.5 kg (5.5lb) Rammer and 305 mm (12 in) Drop.
  - .3 Alberta Transportation Test (ATT) Methods
    - .1 ATT-19/95 MOISTURE-DENSITY RELATION, Standard Compaction, + 5 000 µm.
    - .2 ATT-23/95 MOISTURE-DENSITY RELATION, Standard Compaction, - 5 000 µm.
    - .3 ATT-20/95 MOISTURE-DENSITY RELATION, Standard Compaction, One Point.

#### 1.4 ACTION AND INFORMATIONAL SUBMITTALS

- .1 Submit in accordance with Section 01 33 00 - Submittal Procedures.

#### 1.5 QUALITY ASSURANCE

- .1 Not Used.

### Part 2 PRODUCTS

#### 2.1 MATERIALS

- .1 Embankment materials require approval by Departmental Representative.
- .2 Material used for embankment not to contain more than 3% organic matter by mass, frozen lumps, weeds, sod, roots, logs, stumps or other unsuitable material.
- .3 Borrow material:
  - .1 Obtain from Contractor supplied sources off-site such as quarry, or borrow pit as approved by Departmental Representative.
  - .1 Earth Embankment materials to consist of acceptable earth material and processed rock material free from objectionable quantities of organic matter, frozen soil, stumps, trees, moss, and other unsuitable materials.

### Part 3 EXECUTION

#### 3.1 EXAMINATION

- .1 Verification of Conditions: verify that condition of substrate is acceptable for roadway embankment Work:

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- .1 Visually inspect substrate in presence of Departmental Representative.
  - .2 Inform Departmental Representative of unacceptable conditions immediately upon discovery.
  - .3 Proceed with installation only after unacceptable conditions have been remedied and after receipt of written approval to proceed from Departmental Representative.

### 3.2 COMPACTION EQUIPMENT

- .1 Compaction equipment: vibratory rollers or vibrating plate compactors capable of obtaining required density in materials on project.
  - .1 Demonstrate compaction equipment effectiveness on specified material and lift thickness by documented performance of test-strip before start of Work.
  - .2 Replace or supplement equipment that does not achieve specified densities.
- .2 Operate compaction equipment continuously in each embankment when placing material.

### 3.3 WATER DISTRIBUTORS

- .1 Apply water with equipment capable of uniform distribution.

### 3.4 STRIPPING OF TOPSOIL

- .1 Prior to commencement of stripping, remove any wooden barrier posts within the work limits and place into temporary storage those which are in good condition and suitable for reinstallation.
- .2 Commence topsoil stripping of areas as directed by Departmental Representative after brush and grasses have been removed from these areas.
- .3 Strip topsoil to depths as directed by Departmental Representative. Do not mix topsoil with subsoil.
- .4 Stockpile in locations as indicated.
  - .1 Stockpile height: not to exceed 2 m.
- .5 Dispose of unused topsoil as directed by Departmental Representative.
- .6 Remove clearing and grubbing debris from stripping.
- .7 Spread organic stripping, on completion of excavation and embankment construction, on slopes and trim or remove from site if quantity exceeds ability to grade on site. Place top soil and finish grading in accordance with Section 32 91 19.13 - Topsoil Placement and Grading.

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### 3.5 EXCAVATING

#### .1 General:

- .1 Notify Departmental Representative when waste materials are encountered and remove to depth and extent directed.
- .2 Sub-excavate 600 mm below subgrade in cut sections unless otherwise directed by Departmental Representative.
  - .1 Compact top 150 mm below sub-excavate to minimum 95% maximum dry density, based on either ATT-23, ATT-19, or ATT-20.
  - .2 Replace with approved embankment material and compact to specified embankment density.
- .3 Treat ground slopes, where subgrade is on transition from excavation to embankment, at grade points as directed by Departmental Representative.
- .4 Treat ground slopes, where subgrade is on transition from excavation to embankment, at grade points in accordance with standard plans for "Cut and Fill Construction Methods at Grade Points" and as directed by Departmental Representative.

#### .2 Drainage:

- .1 Maintain profiles, crowns and cross slopes to provide good surface drainage.
- .2 Provide ditches as work progresses to provide drainage.
- .3 Construct interceptor ditches as indicated or as directed before excavating or placing embankment in adjacent area.

#### .3 Rock excavation:

- .1 Notify Departmental Representative, when material appearing to conform to classification for rock is encountered, to enable measurements to be made to determine volume of rock. Provide 12 hour notification.
- .2 Submit blasting program to Departmental Representative, for approval 48 hours minimum before start of Work.
  - .1 Do not proceed without written approval of blasting program from Departmental Representative.
- .3 Shatter rock to 300 mm below subgrade elevation as indicated.
- .4 Reduce overbreak and increase stability of rock faces by using smooth blasting techniques.
- .5 Use smooth blast and excavate short sections in rock cuts to determine optimum spacing of holes when requested by Departmental Representative.

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- .6 Stem holes as necessary to contain blast.
  - .7 Do not use prilled type ammonium nitrate and fuel oil (ANFO) explosives within 4 m of final cut line.
  - .8 Form back wall by pre-splitting at least 10 m in advance of production blasting.
    - .1 Smooth wall blast just prior to or just after production blast as determined by approved blast program.
  - .9 Scale rock backslopes to achieve smooth, stable face, free of loose rock and overhangs to design backslope.
  - .10 Control blasting to minimize flying particles.
  - .4 Borrow Excavation - Contractor Supply from off-site:
    - .1 Completely use in embankments, suitable materials removed from right-of-way excavations before taking material from borrow areas.
      - .1 Completely use: 1) suitable materials excavated from underneath raised medians in the Astotin Lake Parking Lot and 2) suitable materials excavated from obliterated traffic circle road - before taking material from borrow areas.
    - .2 The Contractor shall obtain a borrow source of suitable material from outside of Park boundaries.
      - .1 The Contractor shall provide a sample of proposed borrow material to the Departmental Representative for approval prior to use on the project.
      - .2 The Contractor shall provide proof of landowner consent for, and the right to enter by the Departmental Representative.
      - .3 The Contractor shall be responsible for development and post-reclamation of the borrow source as required by all current legislation and regulations.
    - .3 Trim and leave borrow pits in condition to permit accurate measurement of material removed.

### 3.6 EMBANKMENTS

- .1 Scarify or bench existing slopes in side hill or sloping sections to ensure proper bond between new materials and existing surfaces.
  - .1 Method used to be to be pre-approved in writing by Departmental Representative.
- .2 Break up or scarify existing road surface prior to placing embankment material.
- .3 Do not place material which is frozen nor place material on frozen surfaces except in

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areas authorized by Departmental Representative.

- .4 Maintain crowned surface during construction to ensure ready run-off of surface water.
- .5 Drain low areas before placing materials.
  - .1 Place and compact to full width in layers not exceeding 200 mm loose thickness. Departmental Representative may authorize thicker lifts if specified compaction can be achieved and if material contains more than 25% by volume stone and rock fragments larger than 100 mm.
- .6 Where material consists of rock:
  - .1 Place to full width in layers of sufficient depth to contain maximum sized rocks, but in no case is layer thickness to exceed 1 m.
  - .2 Distribute rock material to fill voids with smaller fragments to form compact mass.
  - .3 Fill surface voids at subgrade level with rock spalls or selected material to form earth-tight surface.
  - .4 Do not place boulders and rock fragments with dimensions exceeding 150 mm within 300 mm of top-of-subgrade elevation.
- .7 Deductions from excavation will be made for overbuild of embankments.

### 3.7 COMPACTION

- .1 Break material down to sizes suitable for compaction and mix for uniform moisture to full depth of layer.
- .2 Deposit, spread, and level, embankment material in layers 200 mm maximum thickness before compaction.
  - .1 Compact each layer of embankment until compaction equipment achieves no further significant consolidation.
  - .2 Ensure required compaction for each layer before placing any material for next layer.
- .3 Use specialized compaction equipment supplemented by routing, hauling, and leveling equipment over each layer of fill.
- .4 Obtain written approval from Departmental Representative before using specialized compaction equipment such as tamping rollers, vibratory rollers, or other alternate compaction equipment that produces the required results
  - .1 For tamping rollers, use equipment that exerts 1000 kPa minimum of pressure on tamping surface of each tamping foot in transverse row.
- .5 Compact each layer to minimum 95% maximum dry density: based on either ATT-23, ATT-19, or ATT-20. except top 300 mm of subgrade.

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.1 Compact top 300 mm to 100% maximum dry density.

.6 Add water or dry as required to bring moisture content of materials to level required to achieve specified compaction.

### 3.8 FINISHING

.1 Shape entire roadbed to within 25 mm of design elevations.

.2 Finish slopes, ditch bottoms and borrow pits true to lines, grades and drawings where applicable. Scale slope by removing loose fragments, for cut slopes in bedrock steeper than 1:1.

.3 Remove rocks over 150 mm in dimension from slopes and ditch bottoms.

.4 Hand finish slopes that cannot be finished satisfactorily by machine.

.5 Round top of backslope 1.5 m both sides of top of slope.

.6 Run tractor tracks over slopes exceeding 3 m in height to leave tracks parallel to centreline of highway.

.7 Trim between constructed slopes and edge of clearing to provide drainage and free of humps, sags and ruts.

### 3.9 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 Waste Management: separate waste materials for reuse and recycling.

.1 Remove recycling containers and bins from site and dispose of materials at appropriate facility.

### 3.10 PROTECTION

.1 Maintain finished surfaces in condition conforming to this section until acceptance by Departmental Representative.

.2 Provide silt fences and erosion protection as required to mitigate and prevent impacts to adjacent properties.

**END OF SECTION**

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1.0 GENERAL

1.1 Action and Informational Submittals

- .1 Not used.

2.0 EXECUTION

- .1 The Contractor shall carefully remove and relocate existing steel garbage containers and 150 mm thick concrete bases from the vicinity of the work area to a temporary location as directed by the Departmental Representative. The containers are currently located at:
- .1 Astotin Lake Parking Lot – 5 containers.
  - .2 Club House Parking Lot – 4 containers.
  - .3 Tenting Area walkway – 2 containers.
- .2 Upon completion of all construction operations, the Contractor shall replace the garbage containers and concrete bases to their original location or to locations within the Project limits, as directed by the Departmental Representative.
- .3 The Contractor shall be responsible for the condition of the garbage containers and bases, while handling or while they are stored under his supervision.

**END OF SECTION**



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Part 1 General

1.1 MEASUREMENT AND PAYMENT

- .1 Measure geotextiles in square metres of surface covered by material. No allowance will be made for seams and overlaps.

1.2 REFERENCES

- .1 American Society for Testing and Materials International, (ASTM)
  - .1 ASTM D 4491/ D 4491M-15 Standard Test Methods for Water Permeability of Geotextiles by Permittivity.
  - .2 ASTM D 4595-11, Standard Test Method for Tensile Properties of Geotextiles by the Wide-Width Strip Method.
  - .3 ASTM D 4716/ D 4716M-14, Standard Test Method for Determining the (In-Plane) Flow Rate Per Unit Width and Hydraulic Transmissivity of a Geosynthetic Using a Constant Head.
  - .4 ASTM D 4751-12, Standard Test Method for Determining Apparent Opening Size of a Geotextile.
  - .5 ASTM D 4632 / D 4632M-15a, Standard Test Method for Grab Breaking Load and Elongation of Geotextiles.
  - .6 ASTM D 4533 / D4533M-15, Standard Test Method for Trapezoid Tearing Strength of Geotextiles.
  - .7 ASTM D 4833 / D4833M-07(2013)e1, Standard Test Method for Index Puncture Resistance of Geomembranes and Related Products.
- .2 Canadian General Standards Board (CGSB)
  - .1 CAN/CGSB-4.2 No. 11.2 M89 (R2013), Textile Test Methods - Bursting Strength - Ball Burst Test (Extension of September 1989).
  - .2 CAN/CGSB-148.1, Methods of Testing Geotextiles and Complete Geomembranes.
    - .1 No.2-M85, Methods of Testing Geosynthetics - Mass per Unit Area.
    - .2 No.3-M85, Methods of Testing Geosynthetics - Thickness of Geotextiles.
    - .3 No.6.1-93, Methods of Testing Geotextiles and Geomembranes - Bursting Strength of Geotextiles Under No Compressive Load.
    - .4 No.7.3-92, Methods of Testing Geotextiles and Geomembranes - Grab Tensile Test for Geotextiles.
    - .5 No. 10-94, Methods of Testing Geosynthetics - Geotextiles - Filtration

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Opening Size.

### 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 geotextiles and include product characteristics, performance criteria, physical size, finish and limitations.
- .3 Samples:
  - .1 Submit to Departmental Representative following samples at least 5 days prior to beginning Work for each type of geotextile used on the project.
    - .1 Minimum length of 2 m of roll width of geotextile.
    - .2 Minimum of 1 m seam with at least 300 mm of geotextile on both sides of seam.
- .4 Test and Evaluation Reports:
  - .1 Submit to Departmental Representative 4 copies of mill test data and certificate at least 5 days prior to start of Work.

### 1.4 DELIVERY, STORAGE AND HANDLING

- .1 During delivery and storage, protect geotextiles from direct sunlight and UV rays, excessive heat, mud, dirt, dust debris and rodents.

### 1.5 WASTE MANAGEMENT AND DISPOSAL

- .1 Separate and recycle waste materials in accordance with Section 01 35 43, Environmental Procedures.

## 2 PRODUCTS

### 2.1 MATERIAL

- .1 Geotextile: woven synthetic fibre fabric, supplied in rolls.
  - .1 Width: 3 m minimum.
  - .2 Length: 30 m minimum.
  - .3 Composed of: minimum 85% by mass of polyester with inhibitors added to base plastic to resist deterioration by ultra-violet and heat exposure for 60 days.
- .2 Physical properties:
  - .1 Thickness: to CAN/CGSB-148.1, No.3, minimum 2.5 mm.

Specifications

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- .2 Mass per unit area: to CAN/CGSB-148.1, No.2, minimum 400 g/m<sup>2</sup>.
  - .3 Tear strength: to ASTM D 4533.
    - .1 Tensile strength: minimum 450 N, minimum.
    - .2 Elongation at break: maximum 50%.
    - .3 Seam strength: equal to or greater than tensile strength of fabric.
  - .4 Grab tensile strength and elongation: to ASTM D 4632
    - .1 Breaking force: minimum 1100 N, wet condition.
    - .2 Elongation at future: maximum 50%.
  - .5 Bursting strength: to CAN/CGSB-148.1, No.6.1 minimum 2100 kPa, wet condition.
  - .6 Puncture Strength: to ASTM D 4833, 400 N, minimum.
  - .3 Hydraulic properties:
    - .1 Apparent opening size (AOS): to ASTM D 4751, 0.60 mm maximum.
    - .2 Filtration opening size (FOS): to CAN/CGSB-148.1 No.10 OPSS 1860.
    - .3 Permeability: to ASTM D 4491 1.7 sec<sup>-1</sup>.
    - .4 Permittivity: to ASTM D 4491 0.02 sec<sup>-1</sup> minimum.
  - .4 Securing pins and washers: to CSA G40.21, Grade 300W, hot-dipped galvanized with minimum zinc coating of 600 g/m<sup>2</sup> to CAN/CSA G164.
  - .5 Factory seams: sewn in accordance with manufacturer's recommendations.
  - .6 Thread for sewn seams: equal or better resistance to chemical and biological degradation than geotextile.
  - .7 Values listed, with the exception of AOS, are minimum average values.

### 3 EXECUTION

#### 3.1 INSTALLATION

- .1 Filter Fabric Requirements:
  - .1 Place geotextile material by unrolling onto graded surface in orientation, manner and locations indicated and retain in position with pins.
  - .2 Place geotextile material smooth and free of tension stress, folds, wrinkles and

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creases.

- .3 Overlap each successive strip of geotextile 600 mm over previously laid strip.
- .4 Pin successive strips of geotextile with securing pins at 3 m intervals.
- .5 Protect installed geotextile material from displacement, damage or deterioration before, during and after placement of material layers.
- .6 After installation, cover with overlying layer within 8 hours of placement.
- .7 Replace damaged or deteriorated geotextile to approval of Departmental Representative.
- .8 Place and compact Granular Base Course in accordance with Section 32 00 02.

### 3.2 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.

### 3.3 PROTECTION

- .1 Vehicular traffic not permitted directly on geotextile.

END OF SECTION