

PART 1 - GENERAL

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| 1.1 | Section Includes | .1 | Specifications for excavation. |
| | | .2 | Materials and procedures for backfilling and construction of earth structures. |
| 1.2 | Measurement Procedures and Payment | .1 | In accordance with Section 01 29 01 – Methods of Measurement and Payment. |
| 1.3 | Related Sections | .1 | Section 01 29 01 – Methods of Measurement and Payment |
| | | .2 | Section 01 33 00 – Submittal Procedures |
| | | .3 | Section 01 35 33 – Health and Safety Requirements |
| | | .4 | Section 01 45 00 – Quality Control |
| | | .5 | Section 01 61 00 – Product Requirements |
| | | .6 | Section 01 74 19 – Waste Management and Disposal |
| | | .7 | Section 31 25 05 – Erosion and Sedimentation Control |
| 1.4 | References | .1 | ASTM International |
| | | .1 | ASTM D698-00a ¹ , Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Standard Effort (600 kN-m/m) |
| | | .2 | ASTM D2487-00e ¹ , Classification of Soils for Engineering Purposes. |
| | | .2 | British Columbia Ministry of Transportation Standard Specifications for Highway Construction (SS) |
| | | .1 | SS 201-12, Roadway and Drainage Excavation |
| | | .2 | SS 202-12, Granular Surfacing, Bases and Sub-bases |
| | | .3 | U.S. Environmental Protection Agency (EPA) / Office of Water |
| | | .1 | EPA 832/R-92-05, Storm Water Management for Construction Activities: Developing Pollution Prevention Plans and Best Practice Measures. |
| 1.5 | Administrative Requirements | .1 | Coordination: Arrange with authorities having jurisdiction for relation of buried services that interfere with execution of work. |
| | | .1 | Establish location of buried utilities and mark accordingly to prevent disturbance during construction. |
| 1.6 | Action and Informational | .1 | Submit in accordance with Section 01 33 00 – Submittal |
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Submittals	Procedures.
	.2 Samples: Submit to testing agency one 25 kg sample of backfill material proposed for use no later than one week before work.
	.3 Quality Control: In accordance with Section 01 45 00 – Quality Control.
	.1 Submit condition survey of existing conditions.
	.2 Submit construction equipment list for major equipment to be used for this Section prior to start of Work.
	.4 Erosion and Sedimentation Control: See PART 3.2 – Temporary Erosion and Sedimentation Control.
	.5 Construction Waste Management: In accordance with authorities having jurisdiction and Section 01 74 19 – Waste Management and Disposal.
1.7 Quality Assurance	.1 Deliver, store and handle goods in accordance with manufacturer's specifications and Section 01 61 10 – Product Requirements.
	.2 Qualification statement: Submit proof of insurance coverage for professional liability.
	.3 Health and Safety Requirements:
	.1 Conduct construction occupational health and safety in accordance with Section 01 35 33 – Health and Safety Requirements.
<u>PART 2 - PRODUCTS</u>	
2.1 Materials	.1 In accordance with drawings.
<u>PART 3 – EXECUTION</u>	
3.1 Preparation	.1 Temporary Erosion and Sedimentation Control
	.1 Provide temporary erosion and sedimentation control measures to prevent soil erosion and discharge of soil-bearing runoff or airborne dust to adjacent property in accordance with authorities having jurisdiction and Section 31 25 05 – Erosion and Sedimentation Control.

- .2 Inspect, repair and maintain erosion and sedimentation control measures during construction until permanent vegetation has been established.
 - .3 Upon completion of Work, remove temporary erosion and sedimentation controls and restore and stabilize areas disturbed during removal.
 - .2 Protection of in-place conditions:
 - .1 Protect excavations from freezing.
 - .2 Keep excavations clean and free of standing water or loose soil.
 - .3 Where soil is subject to significant change in volume due to changes in moisture content, cover and protect to Departmental Representative's approval.
 - .4 Protect natural and man-made features required to remain undisturbed. Unless otherwise indicated or located in an area to be occupied by new construction, protect existing trees from damage.
 - .5 Protect buried services that are required to remain undisturbed.
 - .3 Removal:
 - .1 Remove trees, stumps, logs, brush, shrubs, vines, undergrowth, rotten wood, dead plant material, exposed boulders and debris within areas designated on drawings.
 - .2 Remove stumps and tree roots below footings, slabs and paving, and to 600 mm below finished grade elsewhere.
 - .3 Remove obsolete buried services within 2 m of foundations and cap cut-offs.
 - 3.2 Excavation
 - .1 Shore and brace excavations, protect slopes and banks and perform work in accordance in accordance with SS 201-12.
 - .2 Borrow Material: In accordance with SS 201-12.
 - .3 Strip topsoil over areas to be covered by new construction, over
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areas where grade changes are required and so that excavated material may be stockpiled without covering soil.

.1 Stockpile topsoil for later use.

.4 Excavate as required to carry out work.

.1 Do not disturb soil or rock below bearing surfaces.

.2 Notify Departmental Representative at least 1 week prior to commencement of excavation operations.

.3 Notify Departmental Representative when excavations are complete.

.4 Should soil conditions be unsatisfactory at excavated depth, additional excavation will be authorized in writing and paid for as additional work.

.5 Excavation taken below depths without Departmental Representative's written authorization to be filled and compacted to same standards as culvert backfill at Contractor's expense.

.5 Excavate trenches to provide uniform continuous bearing and support for 200 mm pipe bedding material on solid and undisturbed ground.

.6 Excavate for paving to subgrade level and remove all encountered topsoil, organic matter, debris and other loose or harmful material.

3.3 Field Quality Control

.1 Testing of materials and compaction of backfill to be carried out by testing laboratory designated by Departmental Representative.

.2 Not later than 1 week minimum before backfilling or filling, submit to testing agency samples of backfill described in 1.6 – Action and Informational Submittals.

.3 Do not begin backfilling or filling operations until material has been approved for use by Departmental Representative.

.4 Not later than 48 hours before backfilling or filling with approved material, notify Departmental Representative to allow compaction tests to be carried out by agency.

3.4 Backfilling

.1 Remove snow, ice, construction debris, organic soil and standing

water from spaces to be filled.

- .2 Lateral Support: Maintain even levels of backfill around structures as work progresses, to equalize earth pressures.
- .3 Compaction of subgrade: Compact existing subgrade under paving to same compaction as fill.
 - .1 Fill excavated areas with selected subgrade material compacted as specified for fill.
- .4 Place backfill, fill and base course material in 150 mm lifts and add water as necessary to achieve specified density.
- .5 Compaction: Compact each layer of material to following densities for material to ASTM D698:
 - .1 To underside of base courses: 95%
 - .2 Base courses: 100%
 - .3 Elsewhere: 90%
- .6 Paving: In accordance with Section 31 21 16 – Asphalt Paving.
- .7 In trenches:
 - .1 Up to 300 mm above pipe: OGSB / GSB
 - .2 Over 300 mm above: Common material / Clay.
 - .3 Clay Seals for end of pipe as per Drawings.
- .8 Under seeded and sodded areas: use site excavated material to bottom of topsoil except in trenches and within 600 mm of foundations.
- .9 Blown rock material, not capable of fine grading, is not acceptable. Imported material must be placed on this type of material.
- .1 Grade so that water will drain away from paved areas and structures to catch basins and other disposal areas approved by Departmental Representative.
 - .1 Grade to be gradual between finished spot elevations shown on drawings.

3.5 Grading

- 3.6 Cleaning
- .1 Progress Cleaning: Clean in accordance with Section 01 74 11 – Site Cleaning.
 - .1 Leave Work area clean at end of day.
 - .2 Dispose of cleared and grubbed material off site daily.
 - .2 Final Cleaning: Upon completion, remove surplus materials, rubbish, tools and equipment in accordance with Section 01 74 11 – Site Cleaning.
 - .3 Waste Management: Separate waste materials for reuse and recycling in accordance with Section 01 74 19 – Waste Management and Disposal.

END OF SECTION

PART 1 - GENERAL

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| 1.1 | Section Includes | .1 | Permanent Erosion and Sediment Control Devices |
| 1.2 | Methods of Measurement and Payment | .1 | In accordance with Section 01 29 01 – Methods of Measurement and Payment. |
| 1.3 | Related Sections | .1 | Section 31 32 19 – Geotextiles |
| | | .2 | Section 31 37 10 – Riprap |
| | | .3 | Section 31 35 43 – Environmental Procedures |
| 1.4 | References | .1 | ASTM D1777-96(2011)e1 - Standard Test Method for Thickness of Textile Materials. |
| | | .2 | ASTM D3776/D3776M-09ae2 - Standard Test Methods for Mass Per Unit Area (Weight) of Fabric. |
| | | .3 | ASTM D4355-07 - Standard Test Method for Deterioration of Geotextiles by Exposure to Light, Moisture and Heat in a Xenon Arc Type Apparatus. |
| | | .4 | ASTM D4632-08 - Standard Test Method for Grab Breaking Load and Elongation of Geotextiles. |
| | | .5 | ASTM D4751-12 - Standard Test Method for Determining Apparent Opening Size of a Geotextile. |
| | | .6 | ASTM D6818-02(2009) - Standard Test Method for Ultimate Tensile Properties of Turf Reinforcement Mats. |
| | | .7 | EPA 832/R-92-005 - Storm Water Management for Construction Activities: Developing Pollution Prevention Plans and Best Management Practices, September 1992. |
| | | .8 | Local erosion and sediment control guidelines. |
| 1.5 | Definitions | .1 | Erosion: Deterioration, displacement, or transportation of land surface by wind or water, intensified by land-clearing practices related to construction activities. |
| | | .2 | Rain or Rain Storm: An event defined causing the pooling of water on road or other impervious surfaces. |
| | | .3 | Sediment: Particulate matter transported and deposited as a layer of solid particles within a body of water. |
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- .4 Snow Melt: An event in snow conditions when the temperature is above 0°C or when environmental conditions causing snow on the ground to melt.
 - 1.6 Performance Requirements
 - .1 Supply and install sediment and erosion control measures as shown and as directed by the Departmental Representative.
 - 1.7 Administrative Requirements
 - .1 Section 01 31 19 – Project Management
 - .2 Section 01 32 17 – Construction Progress and Reporting
 - .1 Coordination:
 - .1 Coordinate with other work having a direct bearing on work of this section.
 - .2 Coordinate with maintenance, monitoring and reporting procedures.
 - 1.8 Submittals for Information
 - .1 Section 01 33 00: Submission Procedures
 - .2 Test Reports: Submit substantiating engineering data, test results of tests which purport to meet performance criteria and other supporting data.
 - .3 Installation Data: Manufacturer's recommended installing procedures.
 - 1.9 Quality Assurance
 - .1 Products of this section should be manufactured to ISO 9000 certification requirements.

PART 2 - PRODUCTS

- 2.1 Silt Fencing
 - .1 Geotextile: Woven polypropylene filter fabric resistant to ultraviolet degradation.
 - .1 Physical Properties and Test Methods
 - .1 Tensile Strength: 41 kg (ASTM D4632)
 - .2 Elongation : 50% (ASTM D4632)
 - .3 Apparent Opening Size: 0.60 mm (ASTM D4751)
 - .4 Ultraviolet Stability (retained strength after 500 hours exposure): 70% (ASTM D4355)
 - .2 Posts: Hardwood posts of 1200 mm minimum length and painted fluorescent orange for safety.
 - .3 Stabilization Plates: 115 cm² in size, galvanized.
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- .4 Ties: Heavy duty plastic.
- .5 Wire reinforcement: Galvanized 14 gauge (1.9 mm) wire with maximum 150 mm mesh spacing
- 2.2 Erosion Control Blanket
 - .1 Coconut matting: Weed free, 100% coconut fibre sewn to biodegradable netting.
 - .1 Product to be approved by Departmental Representative.
 - .2 Functional Longevity: 12 months minimum as specified by the manufacturer.

PART 3 - EXECUTION

- 3.1 Installation
 - .1 According to drawings, and as directed by Departmental Representative.
- 3.2 Silt Fences
 - .1 Install at the top of the banks where overland flow could carry silt into the watercourse, and as directed by the Departmental Representative.
 - .2 Place silt fences perpendicular to direction of flow.
 - .3 Install parallel fences in succession to achieve required degree of control.
 - .4 Height: Not exceeding 1000 mm above ground surface
 - .5 Posts: Position downstream at maximum 2 m on centre and extending minimum 400 mm into ground. Secure or brace posts to prevent overturning due to sediment overloading.
- 3.3 Erosion Control Blanket
 - .1 Erosion Control Blankets:
 - .1 Install on disturbed banks adjacent to the rock and gabions and as directed by the Departmental Representative.
 - .2 Install blankets to manufacturer's written instructions, anchor with staples or stakes in recommended pattern for proper load resistance.
 - .3 Duration: 12 months.

END OF SECTION

PART 1 - GENERAL

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| 1.1 | Section Includes | .1 | Geotextiles |
| 1.2 | Measurement Procedures and Payment | .1 | Installed geotextile material shall be considered incidental to the supply and installation of rip rap, and no additional payment shall be made. |
| 1.3 | Related Sections | .1 | Section 31 00 00 – Earthworks |
| | | .2 | Section 31 25 05 – Erosion and Sedimentation Control |
| | | .3 | Section 31 37 10 – Riprap |
| 1.4 | References | .1 | American Society for Testing and Materials (ASTM) |
| | | .1 | ASTM D4491-99a(2009), Standard Test Methods for Water Permeability of Geotextiles by Permittivity. |
| | | .2 | ASTM D4595-09, Standard Test Method for Tensile Properties of Geotextiles by the Wide-Width Strip Method.ASTM D4716-08, Standard Test Method for Determining the (In-Plane) Flow Rate Per Unit Width and Hydraulic Transmissivity of a Geosynthetic Using a Constant Head. |
| | | .3 | ASTM D4751-04, Standard Test Method for Determining Apparent Opening Size of a Geotextile. |
| | | .2 | Canadian General Standards Board (CGSB) |
| | | .1 | CAN/CGSB-4.2 No. 11.2-2004, 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 Opening Size |
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- .3 CSA International
 - .1 CSA G40.20/G40.21-04(R2009), General Requirements for Rolled or Welded Structural Quality Steel/Structural Quality Steel.
 - .4 Ontario Provincial Standard Specifications (OPSS)
 - .1 OPSS 1860-November 2010, Material Specification for Geotextiles.
 - 1.5 Action and Informational Submittals
 - .1 In accordance with Section 01 33 00 – Submittal Procedures.
 - .2 Product Data: Submit manufacturer's instructions, printed product literature and data sheets for geotextiles and include product characteristics, performance criteria, physical size, finish and limitations.
 - .3 Submit to Departmental Representative 2 copies of mill test data and certificate at least 1 weeks prior to start of Work, and in accordance with Section 01 33 00 - Submittal Procedures.
 - .4 If requested by the Departmental Representative, submit to Departmental Representative the following samples at least 1 weeks prior to beginning Work for each type of geotextile used on the project.
 - 1.6 Delivery, Storage and Handling
 - .1 Deliver, store and handle in accordance with Section 01 61 10 – Product requirements and manufacturer's specifications.
 - .2 Storage and Handling Requirements:
 - .1 Store materials in accordance with manufacturer's recommendations in clean, dry and well ventilated area.
 - .2 Store and protect geotextiles from direct sunlight and UV rays.
 - .3 Replace defective or damaged material with new.
 - .3 Packaging Waste Management: Remove for return or reuse of pallets, crates, padding and packaging materials as specified in Waste Management Plan Section and Section 01 74 19 – Waste Management and Disposal.
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PART 2 - PRODUCTS

- 2.1 Materials
- .1 Geotextile: Woven and nonwoven synthetic fibre fabric supplied in rolls.
 - .1 Should be composed of minimum 85% polypropylene by mass with inhibitors added to base plastic to resist deterioration by UV and heat exposure.
 - .2 Physical properties for woven geotextile:
 - .1 Grab Strength: 1275 N
 - .2 Elongation (Failure): 15%
 - .3 Puncture Strength: 275 N
 - .4 Burst Strength: 3.6 MPa
 - .5 Trapezoidal Tear: 475 N
 - .3 Physical properties for nonwoven geotextile:
 - .1 Grab Strength: 650 N
 - .2 Elongation (Failure): 50%
 - .3 Puncture Strength: 275 N
 - .4 Burst Strength: 2.1 MPa
 - .5 Trapezoidal Tear: 250 N
 - .4 Securing pins and washers: to CSA G40.21, Grade 300W, hot-dipped galvanized with minimum zinc coating of 600 g/m² to ASTM A123/A123M.
 - .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.

PART 3 - EXECUTION

- 3.1 Examination
- .1 Verification of Conditions: verify that conditions of substrate previously installed under other Sections or Contracts are acceptable for geotextile material installation in accordance with manufacturer's written instructions.
 - .1 Visually inspect substrate in presence of Departmental Representative.
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- .2 Inform Departmental Representative of unacceptable conditions immediately upon discovery.
 - .3 Proceed only after unacceptable conditions have been remedied and after receipt of written approval to proceed from Departmental Representative.
- 3.2 Installation
 - .1 Place geotextile free of tension stress, folds, wrinkles and creases.
 - .2 Place geotextile material on sloping surfaces in one continuous length from toe of slope to upper extent of geotextile.
 - .3 Overlap successive strips of geotextile in the direction of flow.
 - .1 Minimum fabric lap:
 - .1 Woven geotextile: 1000 mm.
 - .2 Non-woven geotextile: 300 mm.
 - .4 Pin strips of geotextile as indicated by the manufacturer.
 - .5 Protect installed geotextile material from displacement, damage or deterioration before, during and after placement of material.
 - .6 After installation, cover with overlying layer within 4 hours of placement.
 - .7 Replace damaged or deteriorated geotextile to approval of Departmental Representative.
- 3.3 Cleaning
 - .1 Progress and Final Cleaning: In accordance with Section 01 74 11 – Site Cleaning.
 - .2 Waste Management: In accordance with Section 01 74 19 – Waste Management and Disposal.
 - .1 Remove recycling containers and bins from site and dispose of materials at appropriate facility.
- 3.4 Protection
 - .1 Vehicular traffic not permitted directly on geotextile.

END OF SECTION

PART 1 - GENERAL

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|-----|------------------------------------|----|--|
| 1.1 | Section Includes | .1 | Riprap |
| 1.2 | Measurement Procedures and Payment | .1 | In accordance with Section 01 29 01 – Methods of Measurement and Payment. |
| 1.3 | Related Sections | .1 | Section 31 00 00 – Earthworks |
| | | .2 | Section 31 32 19 – Geotextiles |
| 1.4 | Waste Management and Disposal | .1 | In accordance with Section 01 74 19 – Waste Management and Disposal. |
| | | .2 | Divert left over geotextiles to local plastic recycling facility as approved by Departmental Representative. |

PART 2 - PRODUCTS

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| 2.1 | Stone | .1 | Rock should meet Class 250 riprap requirements as per the 2012 Standard Specifications for Highway Construction, published by the British Columbia Ministry of Transportation. |
| | | .2 | Stone should be hard with relative density no less than 2.65, free of seam, cracks and structural defects, and meeting the following size distribution for use intended: <ul style="list-style-type: none">.1 Heavy Rock Riprap (Class 250 kg)<ul style="list-style-type: none">.1 Approximate average dimension of angular rock: 565 mm..2 Not more than 15% of rock lighter than 25 kg (approx. 260 mm diameter)..3 Not more than 50% of rock lighter than 250 kg (approx. 565 mm diameter)..4 Not more than 85% of rock lighter than 750 kg (approx. 815 mm diameter). |
| | | .3 | Riprap that does not meet the required specification should not be used without the written permission of the Departmental Representative. |
| 2.2 | Geotextile Filter | .1 | In accordance with Section 31 32 19 – Geotextiles. |
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PART 3 - EXECUTION

- 3.1 Placing
- .1 Where riprap is to be placed on slopes, excavate trench at toe of slope to dimensions as indicated on drawings.
 - .2 Fine grade area to be protected with riprap to uniform, even surface. Fill depressions with suitable material and compact to provide firm bed.
 - .3 Place geotextile on prepared surface in accordance with Section 31 32 19 – Geotextiles and as indicated on drawings. Avoid puncturing geotextile. Vehicular traffic over geotextile not permitted.
 - .4 Place riprap to thickness and details as indicated.
 - .5 Place stones in manner approved by Departmental Representative to secure surface and create a stable mass. Place larger stones at bottom of slopes.

END OF SECTION
