

**Part 1 General**

**1.1 RELATED REQUIREMENTS**

- .1 Section 31 14 13 – Soil Stripping
- .2 Section 31 23 33.01 – Excavating, Trenching and Backfilling.

**1.2 REFERENCES**

- .1 ASTM International
  - .1 ASTM D698-12e2, Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Standard Effort (12,400ft-lbf/ft<sup>3</sup>) (600kN-m/m<sup>3</sup>).
- .2 CSA International
  - .1 CSA A23.1/A23.2-14, Concrete Materials and Methods of Concrete Construction/Test Methods and Standard Practices for Concrete.
  - .2 CSA A3000-13, Cementitious Materials Compendium.
- .3 U.S. Environmental Protection Agency (EPA)/Office of Water
  - .1 EPA 832/R-92-005, Storm Water Management for Construction Activities: Developing Pollution Prevention Plans and Best Management Practices.

**1.3 ADMINISTRATIVE REQUIREMENTS**

- .1 Co-ordination: arrange with authority having jurisdiction for relocation of buried services that interfere with execution of work.
  - .1 Pay costs of relocating services.

**1.4 ACTION AND INFORMATIONAL SUBMITTALS**

- .1 Submit in accordance with Section 01 33 00 – Submittal Procedures.
- .2 Samples: submit to designated testing agency, 23 kg sample of backfill for fill material proposed for use, no later than 1 week before backfilling or filling work.

**Part 2 Products**

**2.1 MATERIALS**

- .1 Pit run gravel, cover material and crushed sandstone sub-base to meet standards in NBDOT&I Standard Specification Item 201.

**Part 3 Execution**

**3.1 EXAMINATION**

- .1 Evaluation and Assessment:
  - .1 Examine geotechnical report attached to specifications.

- .2 Before commencing work verify locations of buried services on and adjacent to site.

### 3.2 PREPARATION

- .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.
- .2 Protection of in-place conditions:
  - .1 Protect excavations from freezing.
  - .2 Keep excavations clean, free of standing water, and loose soil.
  - .3 Where soil is subject to significant volume change due to change 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, bushes, 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: cap cut-offs.

### 3.3 EXCAVATION

- .1 Shore and brace excavations, protect slopes and banks and perform work in accordance with Provincial regulations.
- .2 Perform blasting in accordance with Provincial regulations: repair damage as directed as authorized by Departmental Representative.
  - .1 Do not blast within 3 m of building and where damage would result.
- .3 Strip topsoil over areas to be covered by new construction, over areas where grade changes are required, and so that excavated material may be stockpiled without covering topsoil.
  - .1 Stockpile topsoil on site 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 when excavations are complete.
- .3 If bearings are unsatisfactory, additional excavation will be authorized in writing and paid for as additional work.
- .4 Excavation taken below depths shown without Departmental Representative's written authorization to be filled with concrete of same strength as for footings at Contractor's expense.
- .5 Excavate trenches to provide uniform continuous bearing and support for 150 mm thickness of pipe bedding material on solid and undisturbed ground.
  - .1 Trench widths below point 150 mm above pipe not to exceed diameter of pipe plus 600 mm.
- .6 Excavate for slabs and paving to subgrade levels.
  - .1 In addition, remove all topsoil, organic matter, debris and other loose and harmful matter encountered at subgrade level.

### 3.4 FIELD QUALITY CONTROL

- .1 Testing of materials and compaction of backfill and fill will be carried out by testing laboratory designated by the Departmental Representative and paid for by the Owner.
- .2 Not later than 1 week minimum before backfilling or filling, submit to designated testing agency, samples of backfill as described in PART 1 - 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 designated testing agency.

### 3.5 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 walks, paving, and slabs on grade, to same compaction as fill.
  - .1 Fill excavated areas with gravel and sand compacted as specified for fill.
- .4 Placing:
  - .1 Place backfill, fill and base course material in 150 mm lifts: add water as required 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 Under slabs and paving:
  - .1 Use 225 mm up to bottom of granular base courses.
  - .2 Use 150 mm for base courses.
- .7 In trenches:
  - .1 Up to 300 mm above pipe or conduit: sand placed by hand.
  - .2 Over 300 mm above pipe or conduit: native material approved by Departmental Representative.
- .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
- .10 Against foundations (except as applicable to trenches and under slabs and paving): excavated material or imported material with no stones larger than 200 mm diameter within 600 mm of structures.
- .11 Underground tanks: use sand to bottom of granular base courses or to bottom of topsoil, as applicable.

### **3.6 GRADING**

- .1 Grade so that water will drain away from buildings, walls and paved areas, to catch basins and other disposal areas approved by Departmental Representative.
  - .1 Grade to be gradual between finished spot elevations shown on drawings.

### **3.7 CLEANING**

- .1 Progress Cleaning: clean in accordance with Section 01 74 11 – Cleaning.
  - .1 Leave Work area clean at end of each 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 – Cleaning.
- .3 Waste Management: separate waste materials for reuse recycling in accordance with Section 01 74 22 – Construction/Demolition Waste Management.

**END OF SECTION**

**Part 1 General**

**1.1 RELATED REQUIREMENTS**

- .1 Section 01 35 43 – Environmental Procedures.
- .2 Section 31 00 00.01 – Earthwork – Short Form

**1.2 MEASUREMENT PROCEDURES**

- .1 Worked formed under this section shall be incidental to work unless otherwise stated.

**1.3 REFERENCES**

- .1 U.S. Environmental Protection Agency (EPA)/Office of Water
  - .1 EPA 832R92005, Storm Water Management for Construction Activities: Developing Pollution Prevention Plans and Best Management Practices.

**1.4 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 and boulders and rock fragments of 0.25 cubic metre size to not less than specified depth below existing ground surface.

**1.5 ACTION AND INFORMATIONAL SUBMITTALS**

- .1 Provide submittals in accordance with Section 01 33 00 – Submittal Procedures.
- .2 Samples:
  - .1 Submit 3 samples of each material listed below for approval prior to delivery of materials to project site.
  - .2 Tree wound paint: one liter can with manufacturer's label.
  - .3 Herbicide: one liter can with manufacturer's label.
- .3 Submit certificates signed by manufacturer certifying that materials comply with specified performance characteristics and physical properties.
- .4 Submit manufacturer's installation instructions.

## **1.6 QUALITY ASSURANCE**

- .1 Do construction occupational health and safety in accordance with Section 01 35 29 – Health and Safety Requirements.
- .2 Safety Requirements: worker protection.
  - .1 Workers must wear gloves, respecters, long sleeved clothing, eye protection and protective clothing when applying herbicide materials.
  - .2 Workers must not eat, drink or smoke while applying herbicide material.
  - .3 Clean up spills of preservative materials immediately with absorbent material and safely discard to landfill.

## **1.7 STORAGE AND PROTECTION**

- .1 Prevent damage to fencing, trees, landscaping, natural features, bench marks, existing buildings, existing pavement, utility lines, site appurtenances, water courses and root systems of trees 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.

## **1.8 WASTE MANAGEMENT AND DISPOSAL**

- .1 Separate waste materials for reuse recycling in accordance with Section 01 74 22 – Construction/Demolition Waste Management and Disposal.
- .2 Consider felled timber from which saw logs, pulpwood, posts, poles, ties, or fuel wood can be produced as saleable timber.
  - .1 Stockpile adjacent to site.

## **Part 2 Products**

### **2.1 MATERIALS**

- .1 Bituminous based paint of standard manufacture specially formulated for tree wounds.
- .2 Herbicide: effective for killing annual and perennial weeds, and bamboo grass, by being absorbed through roots and foliage.
  - .1 Spray applied on non-crop land areas.
- .3 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 line(s) 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 APPLICATION**

- .1 Manufacturer's instructions: comply with manufacturer's written recommendations or specifications, including product technical bulletins, handling, storage and installation instructions, and datasheet.

**3.4 CLEARING**

- .1 Clearing includes felling, trimming, cutting of trees into sections and satisfactory disposal of trees and other vegetation designated for removal, including downed timber, snags, brush, rubbish occurring within cleared areas.
- .2 Clear as indicated 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 1000 mm above ground surface.
- .3 Cut off branches, 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.
- .5 Apply herbicide in accordance with manufacturer's label.

### **3.5 CLOSE CUT CLEARING**

- .1 Close cut clearing to ground level.
- .2 Cut off branches, down trees overhanging area cleared as directed by Departmental Representative.
- .3 Cut off unsound branches on trees designated to remain as directed by Departmental Representative.

### **3.6 ISOLATED TREES**

- .1 Cut off isolated trees as indicated by Departmental Representative at height of not more than 300 mm above ground surface.
- .2 Grub out isolated tree stumps.
- .3 Prune individual trees as indicated.
- .4 Trim trees designated to be left standing within cleared areas of dead branches 4 cm or more in diameter; and trim branches to heights as indicated.
- .5 Cut limbs and branches to be trimmed close to bole of tree or main branches.
- .6 Paint cuts more than 3 cm in diameter with approved tree wound paint.

### **3.7 UNDERBRUSH CLEARING**

- .1 Clear underbrush from areas as indicated to within 3000 mm of ground surface.

### **3.8 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.

### **3.9 REMOVAL AND DISPOSAL**

- .1 Remove cleared grubbed materials off site to disposal area designated by Departmental Representative.
- .2 Cut timber greater than 125 mm diameter to 2500 mm lengths and stockpile as indicated. Stockpiled timber becomes property of Owner.
- .3 Dispose of cleared grubbed materials by burying.
- .4 Bury to approval of Departmental Representative by:
  - .1 Consolidating.
  - .2 Covering with minimum 500 mm of mineral soil.
  - .3 Finishing surface.



- .5 Chip mulch and stockpile spread cleared and grubbed vegetative material on site as directed by Departmental Representative.
- .6 Remove diseased trees identified by Departmental Representative and dispose of this material to approval of Departmental Representative.

**3.10 FINISHED SURFACE**

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

**3.11 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**

**Part 1 General**

**1.1 RELATED REQUIREMENTS**

- .1 Section 31 00 00.01 – Earthwork and Related Work – Short Form.

**1.2 REFERENCES**

- .1 U.S. Environmental Protection Agency (EPA)/Office of Water
  - .1 EPA 832R92005, Storm Water Management for Construction Activities: Developing Pollution Prevention Plans and Best Management Practices.

**Part 2 Products**

**2.1 NOT USED**

- .1 Not Used.

**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 STRIPPING OF TOPSOIL**

- .1 Ensure that procedures are conducted in accordance with applicable Provincial requirements.
- .2 Remove topsoil before construction procedures commence to avoid compaction of topsoil.
- .3 Handle topsoil only when it is dry and warm.
- .4 Remove vegetation from targeted areas by non-chemical means and dispose of stripped vegetation.
- .5 Remove brush from targeted area by non-chemical means and dispose of through mulching.
- .6 Strip topsoil to depths as directed by Departmental Representative.
  - .1 Avoid mixing topsoil with subsoil.
- .7 Pile topsoil by mechanical hoe in berms in locations as by Departmental Representative.

- .1 Stockpile height not to exceed 2.5 - 3 m.
- .8 Dispose of unused topsoil off-site in location as indicated by Departmental Representative.
- .9 Protect stockpiles from contamination and compaction.
- .10 Cover topsoil that has been piled for long term storage, with trefoil or grass to maintain agricultural potential of soil.

### **3.3 PREPARATION OF GRADE**

- .1 Verify that grades are correct and notify Departmental Representative if discrepancies occur do not begin work until instructed by Departmental Representative.
  - .1 Grade area only when soil is dry to lessen soil compaction.
  - .2 Grade soil with scrapers establishing natural contours and eliminating uneven areas and low spots, ensuring positive drainage.

### **3.4 PLACING OF TOPSOIL**

- .1 Place topsoil only after Departmental Representative has accepted subgrade.
- .2 Spread topsoil during dry conditions by mechanical hoe in uniform layers not exceeding 150 mm, over unfrozen subgrade free of standing water.
- .3 Establish traffic patterns for equipment to prevent driving on topsoil after it has been spread to avoid compaction.
- .4 Cultivate soil following spreading procedures.

### **3.5 SUB-SOILING**

- .1 Apply sub-soil, following spreading and cultivating procedures to designated areas to improve drainage and agricultural potential of soil.
- .2 Work sub-soil area following natural grade contour lines, with vibrating sub-soiler to depth of 40 cm.
- .3 Cross sub-soil the area following the first pass.
- .4 Cultivate the soil with a chain harrow to de-clod the soil.

### **3.6 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**

**Part 1 General**

**1.1 RELATED REQUIREMENTS**

- .1 Section 31 00 00.01 – Earthwork and Related Work – Short Form.

**1.2 MEASUREMENT PROCEDURES**

- .1 Work performed under this Section shall be incidental to work unless otherwise stated.
  - .1 All trench and foundation excavation will be recognized as common excavation. Trench and foundation excavation of materials of whatever nature, including dense sandstones, tills, hardpan, frozen materials and partially cemented materials which can be ripped and excavated with heavy construction equipment.
  - .2 Shoring, bracing, cofferdams, underpinning and de-watering of excavation will not be measured separately for payment, and will be incidental to work.
  - .3 Restoration of all trenches and excavations during the process of the work, including topsoil, seeding, road base, crushed stone, grading, lawns, driveways, and all related work will not be measured and will be paid as outlined in the Tender form and specifications.

**1.3 REFERENCES**

- .1 American Society for Testing and Materials International (ASTM)
  - .1 ASTM C117-13, Standard Test Method for Material Finer than 0.075 mm (No.200) Sieve in Mineral Aggregates by Washing.
  - .2 ASTM C136-14, Standard Test Method for Sieve Analysis of Fine and Coarse Aggregates.
  - .3 ASTM D422-63 2007, Standard Test Method for Particle-Size Analysis of Soils.
  - .4 ASTM D698-12e2, Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Standard Effort (12,400 ft-lbf/ft<sup>3</sup>) (600 kN-m/m<sup>3</sup>).
  - .5 ASTM D1557-12e1, Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Modified Effort (56,000 ft-lbf/ft<sup>3</sup>) (2,700 kN-m/m<sup>3</sup>).
  - .6 ASTM D4318-10e1 Standard Test Methods for Liquid Limit, Plastic Limit, and Plasticity Index of Soils.
- .2 Canadian General Standards Board (CGSB)
  - .1 CAN/CGSB-8.1-88, Sieves, Testing, Woven Wire, Inch Series.
  - .2 CAN/CGSB-8.2-M88, Sieves, Testing, Woven Wire, Metric.
- .3 Canadian Standards Association (CSA International)
  - .1 CAN/CSA-A3000-13, Cementitious Materials Compendium (Consists of A3001, A3002, A3003, A3004 and A3005).
    - .1 CSA-A3001-13, Cementitious Materials for Use in Concrete.
  - .2 CSA-A23.1/A23.2-14, Concrete Materials and Methods of Concrete Construction/Methods of Test and Standard Practices for Concrete.
- .4 U.S. Environmental Protection Agency (EPA)/Office of Water

- .1 EPA 832R92005, Storm Water Management for Construction Activities: Developing Pollution Prevention Plans and Best Management Practices.

#### 1.4 DEFINITIONS

- .1 Excavation classes: one class of excavation will be recognized; common excavation and rock excavation.
  - .1 Common excavation: excavation of materials of whatever nature.
- .2 Topsoil:
  - .1 Material capable of supporting good vegetative growth and suitable for use in top dressing, landscaping and seeding.
  - .2 Material reasonably free from subsoil, clay lumps, brush, objectionable weeds, and other litter, and free from cobbles, stumps, roots, and other objectionable material larger than 25 millimeters in any dimension.
- .3 Waste material: excavated material unsuitable for use in Work or surplus to requirements.
- .4 Borrow material: material obtained from locations outside area to be graded, and required for construction of fill areas or for other portions of Work.
- .5 Recycled fill material: material, considered inert, obtained from alternate sources and engineered to meet requirements of fill areas.
- .6 Unsuitable materials:
  - .1 Weak, chemically unstable, and compressible materials.
  - .2 Frost susceptible materials:
    - .1 Fine grained soils with plasticity index less than 10 when tested to ASTM D4318, and gradation within limits specified when tested to ASTM C136: Sieve sizes to CAN/CGSB-8.1.
    - .2 Table:

Sieve Designation	% Passing
2.00 mm	100
0.10 mm	45 – 100
0.02 mm	10 - 80
0.005 mm	0 - 45
    - .3 Coarse grained soils containing more than 20 % by mass passing 0.075 mm sieve.
- .7 Unshrinkable fill: very weak mixture of cement, concrete aggregates and water that resists settlement when placed in utility trenches, and capable of being readily excavated.

#### 1.5 ACTION AND INFORMATIONAL SUBMITTALS

- .1 Make submittals in accordance with Section 01 33 00 – Submittal Procedures.
- .2 Quality control:
  - .1 Submit for review by Departmental Representative proposed dewatering methods as described in PART 3 of this Section.
  - .2 Submit to Departmental Representative written notice at least 7 days prior to excavation work, to ensure cross sections are taken.

- .3 Submit to Departmental Representative written notice when bottom of excavation is reached.
- .4 Submit to Departmental Representative testing inspection results as described in PART 3 of this Section.
- .3 Preconstruction Submittals:
  - .1 Submit construction equipment list for major equipment to be used in this section prior to start of Work.
  - .2 Submit records of underground utility locates, indicating: location plan of existing utilities as found in field, as required.
- .4 Samples:
  - .1 Submit samples in accordance with Section 01 33 00 – Submittal Procedures.
  - .2 Inform Departmental Representative at least 4 weeks prior to beginning Work, of proposed source of fill materials and provide access for sampling.
  - .3 Submit 70 kg samples of type of fill specified including representative samples of excavated material.
  - .4 Ship samples to Departmental Representative, in tightly closed containers to prevent contamination and exposure to elements.
  - .5 At least 4 weeks prior to beginning Work, inform Departmental Representative source of fly ash and submit samples to Departmental Representative.
    - .1 Do not change source of Fly Ash without written approval of Departmental Representative.

## **1.6 QUALITY ASSURANCE**

- .1 Qualification Statement: submit proof of insurance coverage for professional liability.
- .2 Where Departmental Representative is employee of Contractor, submit proof that Work by Departmental Representative is included in Contractor's insurance coverage.
- .3 Submit design and supporting data at least 2 weeks prior to beginning Work.
- .4 Design and supporting data submitted to bear stamp and signature of qualified professional engineer registered or licensed in Province of New Brunswick, Canada.
- .5 Keep design and supporting data on site.
- .6 Engage services of qualified professional Engineer who is registered or licensed in the Province of New Brunswick, Canada in which Work is to be carried out to design and inspect cofferdams, shoring, bracing and underpinning required for Work.
- .7 Do not use soil material until written report of soil test results are reviewed by Departmental Representative.
- .8 Health and Safety Requirements:
  - .1 Do construction occupational health and safety in accordance with Section 01 35 29 – Health and Safety Requirements.

**1.7 WASTE MANAGEMENT AND DISPOSAL**

- .1 Separate waste materials for reuse recycling in accordance with Section 01 74 22 – Construction/Demolition Waste Management and Disposal.
- .2 Divert excess materials from landfill to local quarry for reuse as directed by Departmental Representative.

**1.8 EXISTING CONDITIONS**

- .1 Examine soil report attached to the specifications.
- .2 Buried services:
  - .1 Before commencing work establish location of buried services on and adjacent to site.
  - .2 Arrange with appropriate authority for relocation of buried services that interfere with execution of work: pay costs of relocating services.
  - .3 Remove obsolete buried services within 2 m of foundations: cap cut-offs.
  - .4 Size, depth and location of existing utilities and structures as indicated are for guidance only. Completeness and accuracy are not guaranteed.
  - .5 Prior to beginning excavation Work, notify applicable Departmental Representative establish location and state of use of buried utilities and structures. Departmental Representative to clearly mark such locations to prevent disturbance during Work.
  - .6 Confirm locations of buried utilities by careful test excavations.
  - .7 Maintain and protect from damage, water, sewer, gas, electric, telephone and other utilities and structures encountered as indicated.
  - .8 Where utility lines or structures exist in area of excavation, obtain direction of Departmental Representative before re-routing. Costs for such Work to be paid by Owner.
  - .9 Record location of maintained, re-routed and abandoned underground lines.
  - .10 Confirm locations of recent excavations adjacent to area of excavation.
- .3 Existing buildings and surface features:
  - .1 Conduct, with Departmental Representative, condition survey of existing buildings, trees and other plants, lawns, fencing, service poles, wires, rail tracks, pavement, survey bench marks and monuments which may be affected by Work.
  - .2 Protect existing buildings and surface features from damage while Work is in progress. In event of damage, immediately make repair as directed by Departmental Representative.
  - .3 Where required for excavation, cut roots or branches as directed by Departmental Representative in accordance with Section 32 01 90.33 – Tree and Shrub Preservation.

**Part 2 Products**

**2.1 MATERIALS**

- .1 Type 1 and Type 2 fill: properties to Section 31 05 16 – Aggregate Materials and the following requirements:

- .1 Crushed, pit run or screened stone, gravel or sand.  
.2 Gradations to be within limits specified when tested to ASTM C136. Sieve sizes to CAN/CGSB-8.1.

- .3 Table:

Sieve Designation	% Passing	
Type 1	Type 2	Type 1
75 mm	-	100
50 mm	-	-
37.5 mm	-	-
25 mm	100	-
19 mm	75-100	-
12.5 mm	-	-
9.5 mm	50-100	-
4.75 mm	30-70	22-85
2.00 mm	20-45	-
0.425 mm	10-25	5-30
0.180 mm	-	-
0.075 mm	3-8]	0-10

- .2 Type 3 fill: selected material from excavation or other sources, approved by Departmental Representative for use intended, unfrozen and free from rocks larger than 75 mm, cinders, ashes, sods, refuse or other deleterious materials.
- .3 Unshrinkable fill: proportioned and mixed to provide:
- .1 Maximum compressive strength of 0.4 MPa at 28 days.  
.2 Maximum cement content of 25 kg/m<sup>3</sup> with 40% by volume fly ash replacement: to CSA-A3001, Type GU.  
.3 Minimum strength of 0.07MPa at 24 h.  
.4 Concrete aggregates: to CSA-A23.1/A23.2.  
.5 Cement: Type GU.  
.6 Slump: 160 to 200 mm.
- .4 Shearmat: honeycomb type bio-degradable cardboard 100 mm thick, treated to provide sufficient structural support for poured concrete until concrete cured.
- .5 Geotextiles: to Section 31 32 19.01 – Geotextiles.



**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 SITE PREPARATION**

- .1 Remove obstructions, ice and snow, from surfaces to be excavated within limits indicated.
- .2 Cut pavement or sidewalk neatly along limits of proposed excavation in order that surface may break evenly and cleanly.

**3.3 PREPARATION/PROTECTION**

- .1 Protect existing features in accordance with applicable local regulations.
- .2 Keep excavations clean, free of standing water, and loose soil.
- .3 Where soil is subject to significant volume change due to change in moisture content, cover and protect to Departmental Representative 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.

**3.4 STRIPPING OF TOPSOIL**

- .1 Begin topsoil stripping of areas as directed by Departmental Representative after area has been cleared of brush, weeds and grasses and removed from site.
- .2 Strip topsoil to depths as directed by Departmental Representative.
  - .1 Do not mix topsoil with subsoil.
- .3 Stockpile in locations as directed by Departmental Representative.
  - .1 Stockpile height not to exceed 2 m and should be protected from erosion.
- .4 Dispose of unused topsoil as directed by Departmental Representative.

**3.5 STOCKPILING**

- .1 Stockpile fill materials in areas designated by Departmental Representative.
  - .1 Stockpile granular materials in manner to prevent segregation.
- .2 Protect fill materials from contamination.

- .3 Implement sufficient erosion and sediment control measures to prevent sediment release off construction boundaries and into water bodies.

### **3.6 COFFERDAMS, SHORING, BRACING AND UNDERPINNING**

- .1 Maintain sides and slopes of excavations in safe condition by appropriate methods and in accordance with Section 01 35 29 – Health and Safety Requirements Health and Safety Act for the Province of New Brunswick.
  - .1 Where conditions are unstable, Departmental Representative to verify and advise methods.
- .2 Obtain permit from authority having jurisdiction for temporary diversion of water course.
- .3 Construct temporary Works to depths, heights and locations as directed by Departmental Representative approved by Departmental Representative.
- .4 During backfill operation:
  - .1 Unless otherwise indicated or directed by Departmental Representative, remove sheeting and shoring from excavations.
  - .2 Do not remove bracing until backfilling has reached respective levels of such bracing.
  - .3 Pull sheeting in increments that will ensure compacted backfill is maintained at elevation at least 500 mm above toe of sheeting.
- .5 When sheeting is required to remain in place, cut off tops at elevations as indicated.
- .6 Upon completion of substructure construction:
  - .1 Remove cofferdams, shoring and bracing.
  - .2 Remove excess materials from site and restore watercourses as directed by Departmental Representative.

### **3.7 DEWATERING AND HEAVE PREVENTION**

- .1 Keep excavations free of water while Work is in progress.
- .2 Provide for Departmental Representative's review details of proposed dewatering or heave prevention methods, including dikes, well points, and sheet pile cut-offs.
- .3 Avoid excavation below groundwater table if quick condition or heave is likely to occur.
  - .1 Prevent piping or bottom heave of excavations by groundwater lowering, sheet pile cut-offs, or other means.
- .4 Protect open excavations against flooding and damage due to surface run-off.
- .5 Dispose of water in accordance with Section 01 35 43 – Environmental Procedures and in manner not detrimental to public and private property, or portion of Work completed or under construction.
  - .1 Provide and maintain temporary drainage ditches and other diversions outside of excavation limits.
- .6 Provide flocculation tanks, settling basins, or other treatment facilities to remove suspended solids or other materials before discharging to storm sewers, watercourses or drainage areas.

### 3.8 EXCAVATION

- .1 Advise Departmental Representative at least 7 days in advance of excavation operations for initial cross sections to be taken.
- .2 Excavate to lines, grades, elevations and dimensions as directed by Departmental Representative.
- .3 Remove concrete, masonry, paving, walks, demolished foundations and rubble and other obstructions encountered during excavation.
- .4 Excavation must not interfere with bearing capacity of adjacent foundations.
- .5 Do not disturb soil within branch spread of trees or shrubs that are to remain.
  - .1 If excavating through roots, excavate by hand and cut roots with sharp axe or saw.
- .6 For trench excavation, unless otherwise authorized by Departmental Representative in writing, do not excavate more than 30 m of trench in advance of installation operations and do not leave open more than 15 m at end of day's operation.
- .7 Keep excavated and stockpiled materials safe distance away from edge of trench as directed by Departmental Representative.
- .8 Restrict vehicle operations directly adjacent to open trenches.
- .9 Dispose of surplus and unsuitable excavated material off site.
- .10 Do not obstruct flow of surface drainage or natural watercourses.
- .11 Earth bottoms of excavations to be undisturbed soil, level, free from loose, soft or organic matter.
- .12 Notify Departmental Representative when bottom of excavation is reached.
- .13 Obtain Departmental Representative approval of completed excavation.
- .14 Remove unsuitable material from trench bottom including those that extend below required elevations to extent and depth as directed by Departmental Representative.
- .15 Correct unauthorized over-excavation as follows:
  - .1 Fill under bearing surfaces and footings with concrete specified for footings Type 2 fill compacted to not less than 100% of corrected Standard Proctor maximum dry density.
  - .2 Fill under other areas with Type 2 fill compacted to not less than 95 % of corrected Standard Proctor maximum dry density.
- .16 Hand trim, make firm and remove loose material and debris from excavations.
  - .1 Where material at bottom of excavation is disturbed, compact foundation soil to density at least equal to undisturbed soil.
  - .2 Clean out rock seams and fill with concrete mortar or grout to approval of Departmental Representative.
- .17 Install geotextiles in accordance with Section 31 32 19.01 – Geotextiles.

### **3.9 FILL TYPES AND COMPACTION**

- .1 Use types of fill as indicated or specified below. Compaction densities are percentages of maximum densities obtained from ASTM D698.
  - .1 Exterior side of perimeter walls: use Type 3 fill to subgrade level. Compact to 95% of corrected maximum dry density.
  - .2 Within building area: use Type 2 to underside of base course for floor slabs. Compact to 100 % of corrected maximum dry density.
  - .3 Under concrete slabs: provide 150 mm compacted thickness base course of Type 1 fill to underside of slab. Compact base course to 100 %.
  - .4 Retaining walls: use Type 2 fill to subgrade level] on high side for minimum 500 mm from wall and compact to 95 %. For remaining portion, use Type 3 fill compacted to 95 %.
  - .5 Place unshrinkable fill in areas as indicated.

### **3.10 BEDDING AND SURROUND OF UNDERGROUND SERVICES**

- .1 Place and compact granular material for bedding and surround of underground services as indicated in Section 33 41 00 – Storm Utility Drainage Piping, Section 33 11 16.01 – Incoming Water Utility Distribution Piping, and Section 33 31 13 –Sanitary Utility Sewerage Piping.
- .2 Place bedding and surround material in unfrozen condition.

### **3.11 BACKFILLING**

- .1 Vibratory compaction equipment: 500 kg minimum weight.
- .2 Do not proceed with backfilling operations until completion of following:
  - .1 Departmental Representative has inspected and approved installations.
  - .2 Departmental Representative has inspected and approved of construction below finish grade.
  - .3 Inspection, testing, approval, and recording location of underground utilities.
  - .4 Removal of concrete formwork.
  - .5 Removal of shoring and bracing; backfilling of voids with satisfactory soil material.
- .3 Areas to be backfilled to be free from debris, snow, ice, water and frozen ground.
- .4 Do not use backfill material which is frozen or contains ice, snow or debris.
- .5 Place backfill material in uniform layers not exceeding 150 mm compacted thickness up to grades indicated. Compact each layer before placing succeeding layer.
- .6 Backfilling around installations:
  - .1 Place bedding and surround material as specified elsewhere.
  - .2 Do not backfill around or over cast-in-place concrete within 24 hours after placing of concrete.
  - .3 Place layers simultaneously on both sides of installed Work to equalize loading. Difference not to exceed 300 m.

- .4 Where temporary unbalanced earth pressures are liable to develop on walls or other structures:
  - .1 Permit concrete to cure for minimum 14 days or until it has sufficient strength to withstand earth and compaction pressure and approval obtained from Departmental Representative.
  - .2 If approved by Departmental Representative, erect bracing or shoring to counteract unbalance, and leave in place until removal is approved by Departmental Representative.
- .7 Place recycled fill in areas as indicated.

### **3.12 RESTORATION**

- .1 Upon completion of Work, remove waste materials and debris in accordance to Section 01 74 22 – Construction/Demolition Waste Management and Disposal, trim slopes, and correct defects as directed by Departmental Representative.
- .2 Replace topsoil as directed by Departmental Representative.
- .3 Reinstall lawns to elevation which existed before excavation.
- .4 Reinstall pavements and sidewalks disturbed by excavation to thickness, structure and elevation which existed before excavation.
- .5 Clean and reinstall areas affected by Work as directed by Departmental Representative.
- .6 Use temporary plating to support traffic loads over unshrinkable fill for initial 24 hours.
- .7 Protect newly graded areas from traffic and erosion and maintain free of trash or debris.

**END OF SECTION**

**Part 1 General**

**1.1 RELATED REQUIREMENTS**

- .1 Section 31 23 33.01 – Excavating, Trenching and Backfilling
- .2 Section 31 37 00 – Rip-Rap.

**1.2 MEASUREMENT AND PAYMENT**

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

**1.3 REFERENCES**

- .1 ASTM International
  - .1 ASTM A123/A123M-15, Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products.
  - .2 ASTM D4491-16, Standard Test Methods for Water Permeability of Geotextiles by Permittivity.
  - .3 ASTM D4595-11, Standard Test Method for Tensile Properties of Geotextiles by the Wide-Width Strip Method.
  - .4 ASTM D4716-14, Standard Test Method for Determining the (In-Plane) Flow Rate Per Unit Width and Hydraulic Transmissivity of a Geosynthetic Using a Constant Head.
  - .5 ASTM D4751-16, 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.

**1.4 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 following samples 4 weeks prior to beginning Work.
    - .1 Minimum length of 2 m of roll width of geotextile.
    - .2 Methods of joining.
- .4 Test and Evaluation Reports:
  - .1 Submit copies of mill test data and certificate at least 4 weeks prior to start of Work.

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

- .1 Deliver, store and handle materials in accordance with Section 01 61 00 – Common Product Requirements.
- .2 Storage and Handling Requirements:
  - .1 Store materials off ground and in accordance with manufacturer's recommendations in clean, dry, well-ventilated area.
  - .2 Store and protect geotextiles from direct sunlight and UV rays.
  - .3 Replace defective or damaged materials with new.
- .3 Packaging Waste Management: remove for reuse of pallets, crates, padding, packaging materials as specified in Construction Waste Management Plan in accordance with Section 01 74 22 – Construction/Demolition Waste Management and Disposal.

## **Part 2 Products**

### **2.1 GEOTEXTILE MATERIAL**

- .1 All materials shall be supplied by the Contractor.
- .2 The plastic yarn of the geotextile and the threads used in sewing operations shall consist of a long chain synthetic polymer composed of at least 85% by mass propylene, ethylene, ester, amide or vinylidene-chloride, and shall contain stabilizers or inhibitors added to the base plastic to make the filaments resistant to deterioration by ultraviolet and heat exposure.
- .3 Type N1, N2, N3 and N4 geotextile shall be a pervious sheet of non-woven plastic yarn.
- .4 Type W1, W2 and W3 geotextile shall be a sheet of woven plastic yarn.
- .5 The geotextile shall conform to the requirements as indicated in Table 350-1.
- .6 The material shall be handled and protected as per the manufacturer's instructions and recommendations until incorporated into the Work.
- .7 Thread for the seams shall be equal to or better than the geotextile in resistance to chemical and biological degradation and both factory and field sewn or sealed seams shall have a grab tensile strength equal to 90% of that of the geotextile.

**TABLE 350-1**  
**REQUIREMENTS OF NON-WOVEN AND WOVEN GEOTEXTILES**

Property (Note 1)	Unit	AST M	Type of Fabric						
			N1	N2	N3	N4	W1	W2	W3
Tearing Strength (Trapezoid Method)	N	D4533	160	250	310	500	200	500	625
Grab Tensile Strength (Both Directions)	N	D4632	400	600	790	1200	400	1200	1500
Elongation at Break	%	D4632	50	50	50	50	25 max.	25 max.	25 max.
Apparent Opening Size	mm	D4751	50 to 250	50 to 250	50 to 250	50 to 250	840 max.	Note 2	Note 2
UV Degradation	% Ret.	D4355					70 min.	Note 2	Note 2
Permittivity	sec <sup>-1</sup>	D4491	1.75 to 3.50	1.25 to 2.75	1.00 to 2.50	1.00 to 2.50	0.01 min.	Note 2	Note 2
Thickness	mm								
Terrafix Designation			240R	360R	400R	800R	24-15		

Note 1 Values above the heavy line are Minimum Average Roll values (MARV) and unless otherwise noted, values are minimum requirements.

Note 2 Special requirements defined in the Contract Documents.

### 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.
  - .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 GEOTEXTILE INSTALLATION**

- .1 The area to be covered with geotextile shall be prepared by shaping the ground to present a uniform and regular surface free from bumps and depressions.
  - .1 Geotextile shall not be placed on stumps, brush, limbs, ice or other material may tear or puncture the fabric.
  - .2 The geotextile shall be placed so as to create a surface that is smooth and free of tension stress, folds, wrinkles and creases.
- .2 The manufacturer's installation procedures shall be the standard of installation that shall be applied except as follows:
  - .1 Where more than one width of fabric is used, the fabric shall be joined by sewing or by an overlap of at least 500mm and all overlap joints shall be securely held in place.
- .3 For roadbed construction, at least 300mm of fill material shall be kept between the equipment and fabric.
  - .1 In no case shall equipment travel on uncovered fabric.
- .4 The Contractor shall immediately repair damaged fabric:
  - .1 The damaged area shall be covered with a patch of the same fabric type extending a minimum of one metre beyond the perimeter of the damaged area.

### **3.3 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 in accordance with Section 01 74 22 – Construction/Demolition 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**

**1.1 RELATED REQUIREMENTS**

- .1 Section 31 00 00.01 – Earthwork and Related Work – Short Form
- .2 Section 31 32 19.01 – Geotextiles.

**1.2 MEASUREMENT PROCEDURES**

- .1 Work performed under this section shall be incidental to work unless otherwise stated.

**1.3 WASTE MANAGEMENT AND DISPOSAL**

- .1 Separate and recycle waste materials in accordance with Section 01 74 22 – Construction/Demolition Waste Management And Disposal.
- .2 Collect and separate plastic, paper packaging in accordance with Waste Management Plan.
- .3 Place materials defined as hazardous or toxic in designated containers.
- .4 Fold up metal banding, flatten and place in designated area for recycling.
- .5 Divert left over aggregate materials from landfill to local quarry for reuse as approved by Departmental Representative.
- .6 Divert left over geotextiles to local plastic recycling facility as approved by Departmental Representative.

**Part 2 Products**

**2.1 STONE**

- .1 All materials shall be supplied by the Contractor.
- .2 Random rip-rap materials shall be well-graded mixture and shall conform to the grading limits show in in Table 608-1.
- .3 Random rip-rap for each rock shall have both thickness and breadth greater than or equal to one-third of its length.
- .4 Random rip-rap shall consist of clean, hard, sound, durable rock, having a density of not less than 2.6 t/m<sup>3</sup> and angular surfaces such that the rocks interlock when placed.
  - .1 Rock when tested by the Micro-Deval test method in accordance with MTO LS – 618, shall have a Micro=Deval loss not greater than 35%.
  - .2 Rock when tested by the Freeze/Thaw test method in accordance with MTO LS – 614, shall have a Freeze/Thaw loss not greater than 15%.
- .5 Random rip-rap used by Backslope stabilization or in erosion control structures may have a Micro-Deval loss not greater than 70% and a Freeze/Thaw loss not greater than 30%.
- .6 Accessibility of the rock will be determined by the Owner's service records and/or by laboratory and/or field testing procedures carried out by qualified personnel.

.7 Random Rip-Rap mixed:

- .1 Random rip-rap mixed shall be noted by the Contract Documents as R-# mixed and shall consist of a random rip-rap material of the designated size (R-#) thoroughly mixed with a pitrun gravel subbase which shall conform to requirements of specification Section 32 11 16.01 – Granular Subbase.
  - .1 Finely shattered rock which conforms to the requirements of 608.2.4, 608.2.4.1, and 608.2.4.2 may be substituted for gravel, subject to the approval of the Engineer.
- .2 The Contractor shall produce a consistent mixed homogeneous blended supply of the specified mixture mixed at the proportion of approximately 20% by weight to the random rip-rap material indicated, to form a very dense material.

**Table 608 - 1**  
**Random Riprap**  
**Grading Limits**

Mass	Size (Note 1)	Finer by Mass (%)								
(kg)	(mm)	R-A (Note 2)	R-5	R-25	R-50	R-100	R-250	R-500	R-1000	R-2000
6000	1600									100
4000	1400									70 - 90
3000	1300								100	
2000	1100								70 - 90	40 - 55
1500	1000							100		
1000	900							70 - 90	40 - 55	
750	820						100			
500	710						70 - 90	40 - 55		
300	600					100				
250	570						40 - 55			
200	530					70 - 90				0 - 15
150	480				100					
100	420				70 - 90	40 - 55			0 - 15	
75	380			100						
50	330			70 - 90	40 - 55			0 - 15		
25	260			40 - 55			0 - 15			
15	220	100	100							
10	190		70 - 90			0 - 15				
5	150		40 - 55		0 - 15					
2.5	120	0		0 - 15						
0.5	70		0 - 15							

Thickness (mm) (Note 3)	300	300	500	600	800	1100	1400	1600	2200
NOTES: 1) Approximate diameter (for information only) 2) Random riprap for abutment and slope protection 3) Measured perpendicular to the prepared surface									

## 2.2 GEOTEXTILE FILTER

- .1 Geotextile: in accordance with Section 31 32 19.01 – Geotextiles, Type W2.

## Part 3 Execution

### 3.1 PLACING

- .1 Where rip-rap is to be placed on slopes, excavate trench at toe of slope to dimensions as indicated.
- .2 Fine grade area to be rip-rapped 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 19.01 – Geotextiles and as indicated. Avoid puncturing geotextile. Vehicular traffic over geotextile not permitted.
- .4 Place rip-rap 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.
- .6 Hand placing:
  - .1 Use larger stones for lower courses and as headers for subsequent courses.
  - .2 Stagger vertical joints and fill voids with rock spalls or cobbles.
  - .3 Finish surface evenly, free of large openings and neat in appearance.

**END OF SECTION**