

1.1 GENERAL

Related Sections:

Not Used.

REFERENCES

- .1 ASTM International
  - .1 ASTM D4791-[10], Standard Test Method for Flat Particles, Elongated Particles, or Flat and Elongated Particles in Coarse Aggregate.
- .2 Canada Green Building Council (CaGBC)
  - .1 LEED Canada-NC Version 1.0-[2004], LEED (Leadership in Energy and Environmental Design): Green Building Rating System for New Construction and Major Renovations (including Addendum [2007]).
  - .2 LEED Canada-NC-[2009], LEED (Leadership in Energy and Environmental Design): Green Building Rating System for New Construction and Major Renovations 2009.
  - .3 LEED Canada-CI Version 1.0-[2007], LEED (Leadership in Energy and Environmental Design): Green Building Rating System for Commercial Interiors.
  - .4 LEED Canada-EB: O M-[2009], LEED (Leadership in Energy and Environmental Design): Green Building Rating System for Existing Buildings: Operations and Maintenance 2009.
- .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.

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 Allow continual sampling by Departmental Representative during production.
  - .2 Provide Departmental Representative with access to source and processed material for sampling.
  - .3 Install sampling facilities at discharge end of production conveyor, to allow Departmental Representative to obtain representative samples of items being produced. Stop conveyor belt when requested by Departmental Representative to permit full cross section sampling.
  - .4 Provide front end loader or other suitable equipment including trained operator for stockpile sampling as necessary. Move samples to storage place as directed by Departmental Representative.
  - .5 Supply new or clean sample bags or containers according appropriate to aggregate materials.
  - .6 Pay cost of sampling and testing of aggregates which fail to meet specified requirements.
  - .7 Provide water, electric power and propane to Departmental Representative laboratory trailer at production site.
- .4 Sustainable Design Submittals:
  - .1 Construction Waste Management:
    - .1 Submit project Waste Management Plan highlighting recycling and salvage requirements.
  - .2 Erosion and Sedimentation Control: submit copy of erosion and sedimentation control plan in

accordance with authorities having jurisdiction.

#### DELIVERY, STORAGE AND HANDLING

- .1 Deliver, store and handle materials in accordance with manufacturer's written instructions and with 01 61 00 - Common Product Requirements.
- .2 Transportation and Handling: handle and transport aggregates to avoid segregation, contamination and degradation.
- .3 Storage: store washed materials or materials excavated from underwater 24 hours minimum to allow free water to drain and for materials to attain uniform water content.

#### 1.2 MATERIALS

##### MATERIALS

- .1 Aggregate materials shall conform to the requirements of New Brunswick Department requirements of Transportation and Infrastructure, standard specifications, section 201.2.
- .2 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.
- .3 Flat and elongated particles of coarse aggregate: to ASTM D4791.

##### SOURCE QUALITY CONTROL

- .1 Inform Departmental Representative of proposed source of aggregates and provide access for sampling 4 weeks 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 4 weeks 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.

### 1.3 EXECUTION

#### EXAMINATION

- .1 Verification of Conditions: verify that conditions are acceptable for topsoil stripping.
  - .1 Visually inspect substrate in presence of Departmental Representative.
  - .2 Inform Departmental Representative of unacceptable conditions immediately upon discovery.
  - .3 Proceed with topsoil stripping. only after unacceptable conditions have been remedied [and after receipt of written approval to proceed from Departmental Representative.

#### PREPARATION

- .1 Topsoil stripping:
  - .1 Do not handle topsoil while in wet or frozen condition or in any manner in which soil structure is adversely affected.
  - .2 Begin topsoil stripping of areas as indicated by Departmental Representative after area has been cleared of grasses, weeds, brush, and removed from site.
  - .3 Strip topsoil to depths as indicated by Departmental Representative. Avoid mixing topsoil with subsoil.
  - .4 Stockpile in locations as indicated by Departmental Representative. Stockpile height not to exceed 2m.
  - .5 Dispose of topsoil to location as indicated off site by Departmental Representative.

- .2 Aggregate source preparation:
  - .1 Prior to excavating materials for aggregate production, clear and grub area to be worked, and strip unsuitable surface materials. Dispose of cleared, grubbed and unsuitable materials as approved by authority having jurisdiction and as directed by Departmental Representative.
  - .2 Where clearing is required, leave screen of trees between cleared area and roadways as directed.
  - .3 Clear, grub and strip area ahead of quarrying or excavating operation sufficient to prevent contamination of aggregate by deleterious materials.
  - .4 When excavation is completed dress sides of excavation to nominal 1.5:1 slope, and provide drains or ditches as required to prevent surface standing water.
  - .5 Trim off and dress slopes of waste material piles and leave site in neat condition.
  - .6 Provide silt fence or other means to prevent contamination of existing watercourse or natural wetland features.
- .3 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 requirements for material and, percentage of crushed particles, or particle shapes specified.
    - .1 Use methods and equipment approved in writing by Departmental Representative.
- .4 When operating in stratified deposits use excavation equipment and methods that produce uniform, homogeneous aggregate

gradation.

- .5 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.
- .6 Stockpiling:
  - .1 Stockpile aggregates in accordance with the requirements of NBDTI standard specifications, Item 20.4.5.
  - .2 Stockpile aggregates in sufficient quantities to meet project schedules.
  - .3 Stockpiling sites to be level, well drained, and of adequate bearing capacity and stability to support stockpiled materials and handling equipment.
  - .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 as directed by Departmental Representative within 48 hours of rejection.
  - .6 Aggregate acceptance shall be based on sampling and testing in accordance with the requirements of NBDTI standard specifications, Item 201.4.6.
  - .7 Handling of Aggregates produced outside the specified limits and the aggregate rejection criteria shall be in accordance with the requirements of NBDTI standard specification Item 201.4.7.
  - .8 During winter operations, prevent ice and snow from becoming mixed into stockpile or in material being removed from stockpile.

1.4 FINAL 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 as directed by Departmental Representative.
- .5 Waste Management: separate waste materials for reuse / recycling in accordance with Section 01 74 21 - Construction/Demolition Waste Management and Disposal.
  - .1 Remove recycling containers and bins from site and dispose of materials at appropriate facility.
- .6 For temporary or permanent abandonment of aggregate source, restore source to condition meeting requirements of authority having jurisdiction.
- .7 Restrict public access to temporary or permanently abandoned stockpiles by means acceptable to Departmental Representative.

END OF SECTION

1.1 GENERAL

RELATED SECTIONS

- .1 Not used.

MEASUREMENT PROCEDURES

- .1 Fixed price payments will be made for:
  - .1 Clearing.
  - .2 Close cut clearing.
  - .3 Clearing isolated trees.
  - .4 Grubbing.

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.

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.

#### 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.

#### QUALITY ASSURANCE

- .1 Do construction occupational health and safety in accordance with Section 01 35 29.06 - Health and Safety Requirements.
- .2 Safety Requirements: worker protection:
  - .1 Workers must wear gloves respirators dust masks long sleeved clothing eye protection 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.

#### STORAGE AND PROTECTION

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

#### WASTE MANAGEMENT AND DISPOSAL

- .1 Separate waste materials for reuse and recycling in accordance with Section 01 74 21 - 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.

#### 1.2 MATERIALS

- .1 Bituminous based paint of standard manufacture specially formulated for tree wounds.
- .2 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 reuse.

#### 1.3 EXECUTION

#### 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 sediment and erosion control drawings sediment and erosion control plan, specific to site, that complies with EPA 832/R-92-005 or requirements of

authorities having jurisdiction,  
whichever is more stringent.

- .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.

#### PREPARATION

- .1 Inspect site and verify with the Departmental Representative, items designated to remain.
- .2 Locate and protect utility lines: preserve in operating condition active utilities traversing site:
  - .1 Notify the 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 the 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.

#### APPLICATION

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

#### 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 indicated directed by the 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 and cut down trees overhanging area cleared as directed by the Departmental Representative.
- .4 Cut off unsound branches on trees designated to remain as directed by the Departmental Representative.

#### CLOSE CUT CLEARING

- .1 Close cut clearing to ground level to within 100 mm of ground surface.
- .2 Perform close cut clearing by hand so that existing muskeg is not damaged.
- .3 Cut off branches down trees overhanging area cleared as directed by the Departmental Representative.
- .4 Cut off unsound branches on trees designated to remain as directed by Departmental Representative.

#### ISOLATED TREES

- .1 Cut off isolated trees as indicated directed by the 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.

#### UNDERBRUSH CLEARING

- .1 Clear underbrush from areas as indicated at ground level to within 200 mm of ground surface.

#### 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.

#### REMOVAL AND DISPOSAL

- .1 Remove cleared and grubbed materials off site to disposal area as indicated designated by the Departmental Representative.
- .2 Burning material on-site is not permitted.
- .3 Burying material on-site is not permitted.
- .4 Chip or mulch and stockpile spread cleared and grubbed vegetative material on site as

directed by the Departmental  
Representative.

- .5 Remove diseased trees identified by the  
Departmental Representative and dispose of  
this material to approval of the  
Departmental Representative.

FINISHED SURFACE

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

1.4 FINAL 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

## 1.1 GENERAL

### .1 RELATED REQUIREMENTS

- .1 Not used.

### MEASUREMENT PROCEDURES

- .1 Excavated materials will be measured in cubic metres in their original location:
  - .1 Common Unclassified excavation quantities measured will be actual volume removed within following limits:
    - .1 Width for trench excavation as indicated.
    - .2 Width for excavation for structures as indicated.
    - .3 Depth from ground elevation and surface of pavement surface of sidewalk immediately prior to excavation, to elevation as indicated as directed by Departmental Representative.
  - .2 Rock quantities measured will be actual volume removed within following limits:
    - .1 Width for trench excavation as indicated.
    - .2 Width for excavation for structures to be bounded by vertical planes up to 500 mm outside of and parallel to neat lines of footings as indicated.
    - .3 Depth from rock surface elevations immediately prior to excavation, to elevation as indicated.
    - .4 Where design elevation is less than 300 mm below original rock surface, depth will be considered to be 300 mm below original rock surface.
    - .5 Volume of individual boulders and rock fragments will be determined by measuring three maximum mutually perpendicular dimensions.

- .2 Sheeting and bracing left in place on direction of Departmental Representative will be measured in square metres of surface area of plane surface of sheeting.
- .3 Shoring, bracing, cofferdams, underpinning and de-watering of excavation will not be measured separately for payment.
- .4 Backfilling to authorized excavation limits will be measured in cubic metres compacted in place tonnes for each type of material specified.
- .5 Placing and spreading of topsoil will be measured for payment in cubic metres calculated from cross sections taken in area of excavation from original location.
  - .1 If double handling of topsoil is directed by Departmental Representative (stockpiling and later placing), then quantities will be measured twice; on excavation from original location and on excavation from stockpile.

#### REFERENCES

- .1 American Society for Testing and Materials International (ASTM):
  - .1 ASTM C117-04, Standard Test Method for Material Finer than 0.075 mm (No.200) Sieve in Mineral Aggregates by Washing.
  - .2 ASTM C136-05, Standard Test Method for Sieve Analysis of Fine and Coarse Aggregates.
  - .3 ASTM D422-632002, Standard Test Method for Particle-Size Analysis of Soils.
  - .4 ASTM D698-00ae1, Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Standard Effort (12,400 ft-lbf/ft ; ) (600 kN-m/m ; ).



- .5 ASTM D1557-02e1, Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Modified Effort (56,000 ft-lbf/ft ; ) (2,700 kN-m/m ; ).
- .6 ASTM D4318-05, 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 Canada Green Building Council (CaGBC):
  - .1 LEED Canada-NC Version 1.0-2004, LEED (Leadership in Energy and Environmental Design): Green Building Rating System Reference Package For New Construction and Major Renovations (including Addendum 2007).
  - .2 LEED Canada-CI Version 1.0-2007, LEED (Leadership in Energy and Environmental Design): Green Building Rating System Reference Guide For Commercial Interiors.
- .4 Canadian Standards Association (CSA International):
  - .1 CAN/CSA-A3000-03, Cementitious Materials Compendium (Consists of A3001, A3002, A3003, A3004 and A3005):
    - .1 CSA-A3001-03, Cementitious Materials for Use in Concrete.
  - .2 CSA-A23.1/A23.2-04, Concrete Materials and Methods of Concrete Construction/Methods of Test and Standard Practices for Concrete.
- .5 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.

#### DEFINITIONS

- .1 Excavation classes: two classes of excavation will be recognized; common excavation and rock excavation:
  - .1 Rock: solid material in excess of 1.00 m ; and which cannot be removed by means of heavy duty mechanical excavating equipment with 0.95 to 1.15 m; bucket. Frozen material not classified as rock.
  - .2 Common excavation: excavation of materials of whatever nature, which are not included under definitions of rock excavation.
- .2 Unclassified excavation: excavation of deposits of whatever character encountered in Work.
- .3 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 1 inch in any dimension.
- .4 Waste material: excavated material unsuitable for use in Work or surplus to requirements.
- .5 Borrow material: material obtained from locations outside area to be graded, and required for construction of fill areas or for other portions of Work.
- .6 Recycled fill material: material, considered inert, obtained from alternate sources and engineered to meet requirements of fill areas.

- .7 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 D422 and ASTM C136: Sieve sizes to CAN/CGSB-8.1 CAN/CGSB-8.2.
    - .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.
- .8 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.

#### ACTION AND INFORMATIONAL SUBMITTALS

- .1 Make submittals in accordance with Section 01 33 00 - Submittal Procedures.
- .2 Quality Control: in accordance with Section 01 45 00 - Testing and Quality Control:
  - .1 Submit condition survey of existing conditions as described in EXISTING CONDITIONS article of this Section.
  - .2 Submit for review by the Departmental Representative proposed dewatering and heave prevention methods as described in PART 3 of this Section.
- .3 Submit to the Departmental Representative written notice at least 7 days prior to excavation work, to ensure cross sections are taken.

- .4 Submit to the Departmental Representative written notice when bottom of excavation is reached.
- .5 Submit to the Departmental Representative testing inspection results and report 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 clearance record from utility authority location plan of relocated and abandoned services, as required.
- .4 Samples:
  - .1 Submit samples in accordance with Section 01 33 00 - Submittal Procedures.
  - .2 Inform the Departmental Representative at least 4 weeks prior to beginning Work, of proposed source of fill unshrinkable fill materials and provide access for sampling.
  - .3 Submit 70 kg samples of type of fill unshrinkable fill specified including representative samples of excavated material.
  - .4 Ship samples prepaid to the Departmental Representative, in tightly closed containers to prevent contamination and exposure to elements.
  - .5 At least 4 weeks prior to beginning Work, inform the Departmental Representative source of fly ash and submit samples to the Departmental Representative:
    - .1 Do not change source of Fly Ash without written approval of the Departmental Representative.

#### QUALITY ASSURANCE

- .1 Qualification Statement: submit proof of insurance coverage for professional liability.
- .2 Where the Departmental Representative is employee of Contractor, submit proof that Work by the 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 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 and approved by the 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.

#### WASTE MANAGEMENT AND DISPOSAL

- .1 Separate waste materials for reuse and recycling in accordance with Section 01 74 21 - Construction/Demolition Waste Management and Disposal.
- .2 Divert excess aggregate materials from landfill to local quarry recycling facility for reuse as directed by Departmental Representative.

#### EXISTING CONDITIONS

- .1 Examine soil report available by Departmental Representative.
- .2 Buried services:
  - .1 Before commencing work verify 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 Departmental Representative and authorities having jurisdiction establish location and state of use of buried utilities and structures. Authorities having jurisdiction to clearly mark such locations to prevent disturbance during Work.
  - .6 Confirm locations of buried utilities by careful test excavations soil hydrovac methods.
  - .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 removing re-routing. Costs for such Work to be paid by Departmental Representative.
  - .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, 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.

## 1.2 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 and ASTM C117. Sieve sizes to CAN/CGSB-8.1 CAN/CGSB-8.2.

.3 Table:

Sieve Designation	% Passing	
	Type 1	Type 2
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 ; 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.

### 1.3 EXECUTION

#### 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 sediment and erosion control plan, specific to site, that complies with EPA 832/R-92-005 or requirements of authorities having jurisdiction, whichever is more stringent.
- .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.



#### 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 in accordance with Section 02 41 13 - Selective Site Demolition.

#### PREPARATION/PROTECTION

- .1 Protect existing features in accordance with Section 01 56 00 - Temporary Barriers and Enclosures and 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 the Departmental Representative approval.
- .4 Protect natural and man-made features required to remain undisturbed. Unless otherwise indicated by Departmental Representative 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.

#### STRIPPING OF TOPSOIL

- .1 Begin topsoil stripping of areas as indicated as directed by the Departmental Representative after area has been cleared of brush weeds and grasses and removed from site.
- .2 Strip topsoil to depths as indicated as directed by the Departmental Representative:
  - .1 Do not mix topsoil with subsoil.

- .3 Stockpile in locations as indicated as directed by the Departmental Representative:
  - .1 Stockpile height not to exceed 2 m and should be protected from erosion.
- .4 Dispose of unused topsoil to location as indicated as directed by the Departmental Representative off site.

#### STOCKPILING

- .1 Stockpile fill materials in areas designated by the Departmental Representative:
  - .1 Stockpile granular materials in manner to prevent segregation.
- .2 Implement sufficient erosion and sediment control measures to prevent sediment release off construction boundaries and into water bodies.

#### 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 indicated or directed and 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 indicated and as directed by Departmental Representative.

#### DEWATERING AND HEAVE PREVENTION

- .1 Keep excavations free of water while Work is in progress.
- .2 Provide for the Departmental Representative's review approval 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 to approved collection runoff areas 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.

#### EXCAVATION

- .1 Advise Departmental Representative at least 7 days in advance of excavation operations for initial cross sections to be taken. Excavate to lines, grades, elevations, and dimensions as indicated as directed by the Departmental Representative.
- .2 Remove concrete masonry paving walks demolished foundations and rubble and other obstructions encountered during excavation in accordance with Section 02 41 13 - Selective Site Demolition.
- .3 Excavation must not interfere with bearing capacity of adjacent foundations.
- .4 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.
- .5 For trench excavation, unless otherwise authorized by the 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.
- .6 Keep excavated and stockpiled materials safe distance away from edge of trench as directed by the Departmental Representative.
- .7 Restrict vehicle operations directly adjacent to open trenches.
- .8 Dispose of surplus and unsuitable excavated material in approved location on site off site.

- .9 Do not obstruct flow of surface drainage or natural watercourses. Earth bottoms of excavations to be undisturbed soil, level, free from loose, soft, or organic matter.
- .10 Notify the Departmental Representative when bottom of excavation is reached.
- .11 Obtain the Departmental Representative approval of completed excavation.
- .12 Remove unsuitable material from trench bottom including those that extend below required elevations to extent and depth as directed by the Departmental Representative.
- .13 Correct unauthorized over-excavation as follows:
  - .1 Fill under bearing surfaces and footings with concrete specified for footings fill or type 3 fill compacted to not less than 100% 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.
- .14 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.
- .15 Install geotextiles in accordance with Section 31 32 19.01 - Geotextiles.

- .1 Use types of fill as indicated or specified below. Compaction densities are percentages of maximum densities obtained from ASTM D698/ASTM D1557:
  - .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 topped with shearmat filler as indicated 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.

#### BEDDING AND SURROUND OF UNDERGROUND SERVICES

- .1 Place and compact granular material for bedding and surround of underground services as indicated and as specified in Section 33 11 16 - Site Water Utility Distribution Piping Section 33 31 13 - Public Sanitary Utility Sewerage Piping, Sewerage Force Mains.
- .2 Place bedding and surround material in unfrozen condition.

#### BACKFILLING

- .1 Vibratory compaction equipment.
- .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. SPEC NOTE:  
Where longer curing times before  
backfilling are required for specific  
structures, specify time for each  
separately.
  - .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  
0.3m.
  - .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 or:
    - .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 unshrinkable recycled fill in areas as indicated.
- .8 Consolidate and level unshrinkable fill with internal vibrators.
- .9 Install drainage filter system in backfill as indicated as directed by Departmental Representative.

#### 1.4 FINAL CLEANING

- .1 Upon completion of Work, remove waste materials and debris in accordance to Section 01 74 21 - Construction/Demolition Waste Management and Disposal, trim slopes, and correct defects as directed by the Departmental Representative.
- .2 Replace topsoil as indicated as directed by the Departmental Representative.
- .3 Reinstate lawns to elevation which existed before excavation.
- .4 Reinstate pavements and sidewalks disturbed by excavation to thickness, structure and elevation which existed before excavation.
- .5 Clean and reinstate areas affected by Work as directed by the 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



## 1.1 GENERAL

### RELATED REQUIREMENTS

- .1 Not used.

### MEASUREMENT AND PAYMENT

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

### REFERENCES

- .1 ASTM International
  - .1 ASTM A123/A123M-[09], Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products.
  - .2 ASTM D4491-[99a(2009)], Standard Test Methods for Water Permeability of Geotextiles by Permittivity.
  - .3 ASTM D4595-[09], Standard Test Method for Tensile Properties of Geotextiles by the Wide-Width Strip Method.
  - .4 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.
  - .5 ASTM D4751-[04], Standard Test Method for Determining Apparent Opening Size of a Geotextile.
- .2 Canada Green Building Council (CaGBC)
  - .1 LEED Canada-NC Version 1.0-[2004], LEED (Leadership in Energy and Environmental Design): Green Building Rating System Reference Package For New Construction and Major Renovations (including Addendum [2007]).
  - .2 LEED Canada-CI Version 1.0-[2007], LEED (Leadership in Energy and Environmental Design): Green Building Rating System Reference Guide for Commercial Interiors.

- .3 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.
- .4 CSA International
  - .1 CSA G40.20/G40.21-[04(R2009)], General Requirements for Rolled or Welded Structural Quality Steel/Structural Quality Steel.
- .5 Ontario Provincial Standard Specifications (OPSS)
  - .1 OPSS 1860-[November 2010], Material Specification for Geotextiles.

#### 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 2m 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.

#### DELIVERY, STORAGE AND HANDLING

- .1 Deliver, store and handle materials in accordance with Section 01 61 00 - Common Product Requirements with manufacturer's written instructions.
- .2 Storage and Handling Requirements:
  - .1 Store materials off ground in dry location 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 and return to manufacturer of pallets, crates, padding, packaging materials as specified in Construction Waste Management Plan in accordance with Section 01 74 21 - Construction/Demolition Waste Management and Disposal

## 1.2 MATERIALS

- .1 Geotextile: non-woven synthetic fiber fabric, supplied in rolls.
  - .1 Composed of: minimum 85% by mass of polypropylene 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 1.1 mm.
  - .2 Mass per unit area: to [CAN/CGSB-148.1, No.2], minimum 150 g/m<sup>2</sup>.
  - .3 Tensile strength and elongation (in any principal direction): to [ASTM D4595].
    - .1 Tensile strength: minimum 400 N, wet condition.
    - .2 Elongation at break: minimum 50%.
    - .3 Seam strength: [equal to or greater than tensile strength of fabric minimum 400 N.
  - .4 Grab tensile strength and elongation: to [CAN/CGSB-148.1, No.7.3].
    - .1 Breaking force: minimum 450 N, wet condition.
    - .2 Elongation at future: maximum 50%.
  - .5 Ball burst strength: to [CAN/CGSB-4.2, No.11.2], minimum 240 N, wet condition.
  - .6 Bursting strength: to [CAN/CGSB-148.1, No.6.1] minimum 1275 kPa, wet condition.
- .3 Hydraulic properties:
  - .1 Apparent opening size (AOS): to [ASTM D4751], 75-125 micrometres.
  - .2 Filtration opening size (FOS): to [CAN/CGSB-148.1 No.10] [OPSS 1860].
  - .3 Transmissivity: to ASTM D4716
  - .4 Permitivity: to ASTM D4491
- .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 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.

1.3 CLEANING DURING  
CONSTRUCTION

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.

.2 INSTALLATION

- .1 Place geotextile material by unrolling onto graded surface in orientation, manner and locations indicated and retain in position as per manufacturers recommendations.
- .2 Place geotextile material smooth and free of tension stress, folds, wrinkles and creases.
- .3 Place geotextile material on sloping surfaces in one continuous length from toe of slope to upper extent of geotextile.
- .4 Overlap each successive strip of geotextile 600 mm over previously laid strip.
- .5 Join successive strips of geotextile by sewing.
- .6 Pin successive strips of geotextile

as indicated.

- .7 Protect installed geotextile material from displacement, damage or deterioration before, during and after placement of material layers.
- .8 After installation, cover with overlying layer within 4 hours of placement.
- .9 Replace damaged or deteriorated geotextile to approval of Departmental Representative.
- .10 Place and compact soil layers in accordance with Section 31 23 33.01 - Excavating, Trenching and Backfilling.

#### 1.4 FINAL 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 recycling in accordance with Section [01 74 21 - Construction/Demolition Waste Management and Disposal.
  - .1 Remove recycling containers and bins from site and dispose of materials at appropriate facility.

#### PROTECTION

- .1 Vehicular traffic not permitted directly on geotextile.

END OF SECTION

## 1.1 GENERAL

### RELATED REQUIREMENTS

- .1 Not Used.

### MEASUREMENT PROCEDURES

- .1 Measure rip-rap without cement mortar in tonnes of material placed.
- .2 Measure rip-rap with cement mortar in cubic metres in place.

### REFERENCES

- .1 American Society for Testing and Materials (ASTM)
  - .1 ASTM C144-[99], Standard Specification for Aggregate for Masonry Mortar.
  - .2 ASTM C618-[00], Standard Specification for Coal Fly Ash and Raw or Calcined Natural Pozzolan for Use as a Mineral Admixture in Concrete.
- .2 Canadian Standards Association (CSA)
  - .1 CAN/CSA-A23.1-[00], Concrete Materials and Methods of Concrete Construction.
  - .2 CAN/CSA-A3000-[98], Cementitious Materials Compendium.

### WASTE MANAGEMENT AND DISPOSAL

- .1 Separate and recycle waste materials in accordance with Section 01 74 21 - Construction/Demolition Waste Management and Disposal.
- .2 Collect and separate plastic, paper packaging, and corrugated cardboard 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 facility for reuse as approved by Departmental Representative.

.6 Divert left over hardened cement materials from landfill to local facility for reuse as approved by Departmental Representative.

.7 Divert left over geotextiles to local plastic recycling facility as approved by Departmental Representative.

## 1.2 MATERIALS

### STONE

.1 Hard, dense with relative density (formally specific gravity) not less than 2.65, durable quarry stone, free from seams, cracks or other structural defects, to meet following size distribution for use intended:

.1 Armour rip-rap:

.1 Not more than 10% of total volume of stones with individual volume less than 30 dm<sup>3</sup>.

.2 Not less than 50% of total volume of stones with individual volume of 225 dm<sup>3</sup> or more.

.3 Remaining percentage of total volume to have uniform distribution of stones between 30 and 225dm<sup>3</sup> size.

.2 Heavy rip-rap:

.1 Not more than 10% of total volume of stones with individual volume less than 30 dm<sup>3</sup>.

.2 Not less than 50% of total volume of stones with individual volume of 140 dm<sup>3</sup> or more.

.3 Remaining percentage of total volume to have uniform distribution of stones between 30 and 140dm<sup>3</sup> size.

.3 Random rip-rap:

.1 Not more than 10% of total volume of stones with individual volume less than 15dm<sup>3</sup>.

.2 Not less than 50% of total volume of stones with individual volume of 85dm<sup>3</sup> or more.



- .3 Remaining percentage of total volume to have uniform distribution of stones between 15 and 85dm<sup>3</sup> size.
- .4 Hand placed rip-rap:
  - .1 Minimum size of individual stones 10dm<sup>3</sup>.
  - .2 Not less than 75% of total volume of stones with individual volume of 25 dm<sup>3</sup> or more.
  - .3 Supply rock spalls or cobbles to fill open joints.

#### CEMENT MORTAR

- .1 Cement: to CAN/CSA-A3000, type 10.
- .2 Sand for mortar: to ASTM C144.
- .3 Mortar mix: 1 part by volume of cement to 3 parts sand, to consistency approved by Departmental Representative.
- .4 Fly ash cement with 40 % fly ash replacement: to ASTM C618.

#### GEOTEXTILE FILTER

- .1 Geotextile: in accordance with Section 31 32 19.01 - Geotextiles.

### 1.3 CLEANING DURING CONSTRUCTION

#### 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.
- .7 Mortar:
  - .1 Use mortar within one hour after water has been added. Do not add additional water after initial mixing.
  - .2 Begin applying mortar at bottom courses and work upwards completely filling voids except for sub drainage relief holes as indicated, and leaving outer faces of stones exposed. Remove excess mortar to expose faces of stones as indicated.
  - .3 Cure and protect mortar in accordance with CAN/CSA-A23.1 by keeping fabric continuously wet.

END OF SECTION