
1.0 GENERAL

1.1 Related requirements

- .1 Section 32 11 23.

1.2 References

- .1 American Society for Testing and Materials International (ASTM)
 - .1 ASTM C127-04, Standard Test Method for Density, Relative Density (Specific Gravity) and Absorption of Coarse Aggregate.
 - .2 ASTM D698-00ae1, Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Standard Effort (12,400 ft-lbf/ft³) (600 kN-m/m³).
 - .3 ASTM D1557-02e1, Test Method for Laboratory Compaction Characteristics of Soil Using Modified Effort (56,000 ft-lbf/ft³) (2,700 kN-m/m³).
 - .4 ASTM D4253-00, Standard Test Methods for Maximum Index Density and Unit Weight of Soils Using a Vibratory Table.

1.2 Definitions

- .1 Corrected maximum dry density is defined as:
 - .1 $D = (F1 \times D1) + (0.9 \times D2 \times F2)$
 - .2 Where: D = corrected maximum dry density kg/m³.
 - .1 F1 = fraction (decimal) of total field sample passing 19 mm sieve.
 - .2 F2 = fraction (decimal) of total field sample retained on 19 mm sieve (equal to 1.00 – F1).
 - .3 D1 = maximum dry density, kg/m³ of material passing 19 mm sieve determined in accordance with Method of.
 - .4 D2 = bulk density, kg/m³, of material retained on 19 mm sieve, equal to 1000G where G is bulk specific gravity (dry basis) of material when tested to ASTM C127.
- .3 For free draining aggregates, determine D1 (maximum dry density) to ASTM D4253 (dry method) when directed by Departmental Representative.

2.0 PRODUCTS

2.1 **Not used**

.1 Not used.

3.0 EXECUTION

3.1 **Not used**

.1 Not used.

End of Section

1.0 GENERAL

This section prescribes the basic requirements for the crushed materials.

The following sections provide the specific requirements for crushed materials:

Section 32 11 23	Aggregate base courses
Section 32 15 40	Crushed stone surfacing

1.1 References

- .1 ASTM International
 - .1 ASTM D4791-[10], Standard Test Method for Flat Particles, Elongated Particles, or Flat and Elongated Particles in Coarse Aggregate.

1.2 Action and Informational Submittals

- .1 Submit in accordance with Section 01 33 00.
- .2 Product data:
 - .1 Submit manufacturer's instructions, certificate of conformity from accredited laboratory, printed product literature and data sheets for aggregate materials and include product characteristics, performance criteria, physical size, finish and limitations.

1.3 Delivery, Storage and Handling

- .1 Transportation and handling: handle and transport aggregates to avoid segregation, contamination and degradation.

2.0 PRODUCTS

2.1 Materials

- .1 Aggregate quality: sound, hard, durable material free from soft, thin, elongated or laminated particles, organic material, clay lumps or minerals, free from adherent coatings and injurious amounts of disintegrated pieces or other deleterious substances.
- .2 Flat and elongated particles of coarse aggregate: to ASTM D4791.
 - .1 Greatest dimension to exceed five (5) times least dimension.
- .3 Fine aggregates satisfying requirements of applicable section to be one, or blend of following:
 - .1 Screenings produced in crushing of quarried rock, boulders, gravel or slag.
 - .2 Reclaimed asphalt pavement.
 - .3 Reclaimed concrete material.
- .4 Coarse aggregates satisfying requirements of applicable section to be one of or blend of following:
 - .1 Crushed rock.
 - .2 Gravel and crushed gravel composed of naturally-formed particles of stone.

2.2 Source Quality Control

- .1 Inform Departmental Representative of proposed source of aggregates and provide access for sampling 4 weeks minimum before starting production. Testing shall be done by laboratory contracted by the Construction Manager.
- .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.

3.0 EXECUTION

3.1 Examination

Not used.

3.2 Preparation

Not used.

3.3 Cleaning

- .1 Progress cleaning: clean in accordance with Section 01 74 11.
 - .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.
- .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 Contaminated granular material disposed of in accordance with Section 01 74 21.
- .6 For temporary or permanent abandonment of aggregate source, restore source to condition meeting requirements of authority having jurisdiction.

End of Section

1.0 GENERAL

There is no re-usable topsoil on site. All the stripping material must be disposed offsite in an authorized site.

1.1 References

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

2.0 PRODUCTS

2.1 **Material**

Not used.

3.0 EXECUTION

Before starting work, the Contractor must provide the Erosion, Sedimentation Control Plan according to Section 31 25 00.

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 according to sediment and erosion control plan specific to site.
- .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 territorial 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 area by non-chemical means and dispose of stripped vegetation by disposal.
- .5 Remove brush from targeted area by non-chemical means and dispose of through disposal or mulching.
- .6 If reusable topsoil can be recovered, stockpile it on the site for further use in this contract.
- .7 If topsoil is stockpile off-site, it is the contractor responsibility to find off-site disposal place and pay for it.
- .8 Protect stockpiles from contamination and compaction.

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.
- .2 Grade area only when soil is dry to lessen soil compaction.
- .3 Grade soil with scrapers establishing natural contours and eliminating uneven areas and low spots, ensuring positive drainage.

3.4 **Cleaning**

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

End of Section

1.0 GENERAL

1.1 Price and Payment Procedures

- .1 Payment:
 - .1 The cost for rock removal is paid in lump sum of civil works. The quantity estimated of excavation of rock is 250 m³, including rock in mass and trench. In case of variation, an adjustment will be considered for the payment.

1.2 Definitions

- .1 Rock: any solid material in excess of 1.0 m³ and which cannot be removed by means of heavy duty mechanical excavating equipment with 0.95 to 1.15 m³ bucket. Frozen material not classified as rock.
- .2 PPV: peak particle velocity.

1.3 Action and Informational Submittals

- .1 Submit in accordance with Section 01 33 00.
- .2 Blasting submittals: submit for approval, written proposal of operations for removal of rock by blasting to Departmental Representative.
 - .1 Indicate proposed method of carrying out work, types and quantities of explosives to be used, loading charts and drill hole patterns, type of caps, blasting techniques, blast protection measures for items such as flying rock, vibration, dust and noise control. Include details on protective measures, time of blasting and other pertinent details.
 - .2 Submit records to Departmental Representative at end of each shift. Maintain complete and accurate record of drilling and blasting operations.
- .3 Construction waste management: submit copy of Waste Management Plan for project highlighting recycling and salvage requirements.
- .4 Erosion and sedimentation control: submit copy of Erosion and Sedimentation Control Plan for project highlighting implementation measures according to Section 31 25 00.
- .5 Qualification statements:
 - .1 Retain licensed explosives expert to program and supervise blasting work, to interpret recommendations of pre-blasting report and to determine precautions, preparation and operations techniques.
 - .2 Submit documentation verifying explosives expert's qualifications.

1.4 Delivery, Storage and Handling

- .1 Deliver, store and handle materials in accordance with manufacturer's written instructions.

1.5 Quality Assurance

.1 Blasting survey and monitoring:

- .1 Contractor must visit property holders of adjacent buildings and structures to determine existing conditions and describe blasting and seismic recording operations and obtain their permission for setting up seismographs. Photographic report of adjacent building and structure must be taken before any blast.
- .2 Seismographic monitoring will be conducted during entire progress of blasting operations.

.2 Blasting and vibration control:

- .1 Reduce ground vibrations to avoid damage to structures or remaining rock mass.
- .2 In general, vibration from blasting not to exceed 25 mm/s, 10 m from blast.
- .3 Blasting not permitted within distance of 10 m of fresh concrete or grout poured within 24 hours. Maximum PPV not to exceed 5 mm/s measured at face of fresh concrete or grout after 24 hours from pouring.
- .4 In vicinity of structure, PPV not to exceed 25 mm/s at distance of 3,0 m, from structure.
- .5 Complete blasting before any structural element including socketed pile and caissons, rock anchors, concrete footings, walls and columns are installed within 5 m from blast holes.

2.0 PRODUCTS

2.1 **Material**

Not used.

3.0 EXECUTION

3.1 Rock Removal

- .1 Perform excavation in accordance with Erosion and Sedimentation Control Plan in accordance with Section 31 25 00.
- .2 Coordinate this section with Section 01 35 29.06.
- .3 Remove rock to alignments, profiles, and cross sections as indicated.
- .4 Explosive blasting is permitted at locations indicated.
 - .1 Do blasting operations in accordance with local and territorial codes or requirements of authority having jurisdiction.
- .5 Use rock removal procedures to produce uniform and stable excavation surfaces. Minimize overbreak and to avoid damage to adjacent structures.
- .6 Excavate rock to horizontal surfaces with slope not to exceed 4%.
- .7 Prepare rock surfaces which are to bond to concrete, by scaling, pressure washing and broom cleaning surfaces.
- .8 Excavate trenches to lines and grades to minimum of 300 mm below pipe invert indicated. Provide recesses for bell and spigot pipe to ensure bearing will occur uniformly along barrel of pipe.
- .9 Cut trenches to widths as indicated on plans.
- .10 Use pre-shearing, cushion blasting or other smooth wall drilling and blasting techniques unless specified otherwise or directed by Departmental Representative.
- .11 Remove boulders and fragments which may slide or roll into excavated area.
- .12 Correct unauthorized rock removal at no extra cost, in accordance with Section 31 23 33.1.

3.2 Cleaning

- .1 Clean in accordance with Section 01 74 11.
- .2 Rock disposal:
 - .1 Relocate rock for landscaping purposes or rip-rap construction.
 - .2 Do not dispose removed rock into landfill. Send material to appropriate location, as approved by Departmental Representative.
 - .3 Dispose of surplus removed rock off site in accordance with Section 01 74 21.

3.3 Protection

- .1 Prevent damage to surroundings and injury to persons in accordance with Section 01 56 00.

End of Section

1.0 GENERAL

1.1 Measurement Procedures

- .1 The payment is executed by lump sum.

1.2 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 D422-63-2002, 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/ft³) (600 kN-m/m³).
 - .5 ASTM D1557-02e1, Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Modified Effort (56,000 ft-lbf/ft³) (2,700 kN-m/m³).
 - .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.

1.3 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 m³ and which cannot be removed by means of heavy duty mechanical excavating equipment with 0.95 to 1.15 m³ 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 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 Departmental Representative 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: Sieve sizes to CAN/CGSB-8.1 and 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.

1.4 Action and Informational Submittals

- .1 Make submittals in accordance with Section 01 33 00.
- .1 Submit certificates of conformity of all granular materials required for the work.
- .2 Submit certificates of conformity for geotextiles.
- .3 Submit Erosion and Sediment Control Plan in compliance with Section 31 25 00.
- .4 Submit Waste and Debris Disposal Plan in compliance with Section 01 74 21.
- .5 Advise Departmental Representative at least seven (7) days in advance of excavation operations for initial cross sections to be taken.

1.5 Waste Management and Disposal

- .1 Waste materials disposal in accordance with Section 01 74 21.

1.6 Existing Conditions

- .1 Examine soil report (Volume 3) in appendix.
- .2 Buried services:
- .1 Before commencing work, verify and 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 Size, depth and location of existing utilities and structures as indicated are for guidance only. Completeness and accuracy are not guaranteed.
- .4 Prior to beginning excavation work, notify applicable Departmental Representative and establish location and state of use of buried utilities and structures to clearly mark such locations to prevent disturbance during work.
- .5 Confirm locations of buried utilities by careful test excavations.
- .6 Maintain and protect from damage, water, sewer, gas, electric, telephone and other utilities and structures encountered.

- .7 Where utility lines or structures exist in area of excavation, obtain direction of Departmental Representative. Costs for such work to be paid by Departmental Representative.
- .8 Record location of maintained, re-routed and abandoned underground lines.
- .9 Confirm locations of recent excavations adjacent to area of excavation.

2.0 PRODUCTS

2.1 Materials

- .1 Granular material: properties to Section 31 05 16.
- .2 Aggregate base courses according to Section 32 11 23.
- .3 Crushed stone surfacing: According with Section 32 15 40.

3.0 EXECUTION

3.1 Temporary Erosion and Sedimentation Control

- .1 Provide temporary erosion and sedimentation control measures to prevent erosion, according to Sediment and Erosion Control Plan specific to site, Section 31 25 00.
- .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.

3.3 Preparation/Protection

- .1 Keep excavations clean, free of standing water, and loose soil.
- .2 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.
- .3 Protect buried services that are required to remain undisturbed.

3.4 Stockpiling

- .1 Stockpile fill materials at site or off-site. If off-site, it is the Contractor responsibility to find off-site areas and pay for it.
 - .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 off-site boundaries and into water bodies.
- .4 Dispose of topsoil to an authorized location.

3.5 Cofferdams, Shoring, Bracing and Underpinning

- .1 Maintain sides and slopes of excavation in safe condition by appropriate methods and in accordance with Health and Safety Requirements Territory of Nunavut.
 - .1 Where conditions are unstable, refer to a Professional Engineer to verify and advise. Provide a signed advice.
- .2 Obtain permit from authority having jurisdiction for temporary diversion of water course.
- .3 Construct temporary works to depths, heights and locations approved by Professional Engineer.

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- .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 access materials from site and restore watercourses as directed by Departmental Representative.

3.6 Dewatering and Heave Prevention

- .1 Keep excavations free of water while work is in progress.
- .2 Provide for Departmental Representative 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.
- .4 Protect open excavations against flooding and damage due to surface run-off.
- .5 Dispose of water in accordance with Section 01 35 43.
 - .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.

3.7 Excavation

- .1 Advise Departmental Representative at least seven (7) days in advance of excavation operations for initial cross sections to be taken.
- .2 Excavate to lines, grades, elevations and dimensions as indicated by Departmental Representative.
- .3 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.
- .4 Keep excavated and stockpiled materials safe distance away from edge of trench as directed by Departmental Representative.
- .5 Restrict vehicle operations directly adjacent to open trenches.

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- .6 Dispose of surplus and unsuitable excavated material off site.
 - .7 Do not obstruct flow of surface drainage or natural watercourses.
 - .8 Earth bottoms of excavations to be undisturbed soil, level, free from loose, soft or organic matter.
 - .9 Notify Departmental Representative when bottom of excavation is reached.
 - .10 Obtain Departmental Representative's approval of completed excavation.
 - .11 Remove unsuitable material from trench bottom including those that extend below required elevations to extent and depth as directed by Departmental Representative.
 - .12 Correct unauthorized over-excavation as follows:
 - .1 Fill under bearing surfaces and footing with aggregate base courses material fill compacted to not less than 98% of corrected Standard Proctor maximum dry density.
 - .13 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.

3.8 Fill Types and Compaction

- .1 Use types of fill as indicated or specified. Compaction densities are percentages of maximum densities.

3.9 Bedding and Surround of Underground Services

- .1 Place and compact granular material for bedding and surround of underground services as indicated.
- .2 Place bedding and surround material in unfrozen condition.
- .3 Use compaction equipment approved by Departmental Representative.
- .4 Do not proceed with backfilling operations until completion of following:
 - .1 Departmental Representative has inspected and approved installations.
 - .2 Inspection, testing, approval, and recording location of underground utilities.
- .5 Areas to be backfilled to be free from debris, snow, ice, water and frozen ground.
- .6 Do not use backfill material which is frozen or contains ice, snow or debris.
- .7 Place backfill material in uniform layers not exceeding 150 mm compacted thickness up to grades indicated. Compact each layer before placing succeeding layer.
- .8 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 150 mm.
- .4 Where temporary unbalanced earth pressures are liable to develop on walls or other structures:
 - .1 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 Permit approved by Departmental Representative, erect bracing or shoring to counteract unbalance, and leave in place until removal is approved by Departmental Representative.
- .9 Place unshrinkable fill in areas as indicated. Lean mix concrete is considered as unshrinkable fill.
- .10 Consolidate and level unshrinkable fill with internal vibrators.
- .11 Install drainage system in backfill as directed by Departmental Representative.

3.10 Restoration

- .1 Upon completion of work, remove waste materials and debris in accordance to Section 01 74 21.
- .2 Construction/Demolition Waste Management and Disposal, trim slopes and correct defects as directed by Departmental Representative.
- .3 Replace topsoil as indicated by Departmental Representative.
- .4 Reinstall pavement 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 mud and dirt contaminations and maintain free of trash or debris.

End of Section

1.0 GENERAL

This section provides the requirements for the construction of roads and parking lots and others pads.

1.1 Measurements Procedures

- .1 Stripping:
 - .1 Lump sum.
- .2 Common excavation:
 - .1 Lump sum.
- .3 Borrow sub-grade granular material:
 - .1 Lump sum.
- .4 Rock excavation:
 - .1 Lump sum.
- .5 Unclassified excavation:
 - .1 Lump sum.
- .6 No additional payment for:
 - .1 Excavating unnecessarily beyond lines established by Departmental Representative with exception of unavoidable slide material. Do not measure slide material, when such slides are attributable to negligence.
 - .2 Ripping and/or drilling and blasting of material.
 - .3 Scarifying or benching existing slopes or existing road surfaces.
 - .4 Removing and disposing of roots, stumps and other materials excavated during waste operation.
 - .5 Burying existing culverts from old road.
 - .6 Removing unsuitable materials from embankments attributable to negligence.
 - .7 Shattering rock to 300 mm below subgrade elevation.
 - .8 Scaling and removing loose rock from rock face.
 - .9 Watering, drying and compacting.
 - .10 Finishing.

1.2 References

- .1 Definitions:
 - .1 Rock excavation: excavation of:
 - .1 Material from solid masses of igneous, sedimentary or metamorphic rock which, prior to removal, was integral with parent mass. Material that cannot be ripped with reasonable effort with a crawler bulldozer or equivalent to be considered integral with parent mass.
 - .2 Boulder or rock fragments measuring in volume 1 cubic metre or more. Frozen material not classified as rock.
 - .2 Common excavation: excavation of materials that are noted in "Rock Excavation or Stripping".

- .3 Unclassified excavation: excavation of whatever character other than stripping encountered in the work.
 - .4 Stripping: excavation of organic material covering original ground.
 - .5 Over-haul: authorized hauling in excess of free haul distance that excavated material is moved.
 - .6 Embankment: material derived from usable excavation and placed above original ground or stripped surface up to top of subgrade.
 - .7 Waste material: material unsuitable for embankment, embankment foundation or material surplus to requirements.
 - .8 Borrow material: material obtained from areas outside right-to-way and required for construction of embankments or for other portions of work.
 - .9 Topsoil: material capable of supporting good vegetative growth and suitable for use in top dressing, landscaping and seeding.
- .2 Reference standards:
- .1 ASTM International
 - .1 ASTM D698-07ea1, Standard Test Method for Laboratory Compaction Characteristics of Soil Using Standard Effort (600 kN-m/m³).
 - .2 American Association of State Highway and Transportation Officials (AASHTO)
 - .1 AASHTO T99-10, Standard Method of Test for Moisture-Density Relations of Soils Using a 2.5 kg Rammer and 305 mm Drop.

1.3 Action and Informational Submittals

- .1 Submit in accordance with Section 01 33 00.
- .2 Submit for approval and review blasting program including preshear details, powder factors fly-rock control, and vibration monitoring methods.
- .3 Submit Erosion and Sedimentation Control Plan according to Section 31 25 00.

1.4 Quality Assurance

- .1 Regulatory requirements:
- .2 Adhere to regulations of authority having jurisdiction when blasting is required.
- .3 Adhere to territorial and national environmental requirements when potentially toxic materials are involved.

2.0 PRODUCTS

2.1 **Materials**

- .1 Granular sub-base material according to Section 32 11 16.01.

3.0 EXECUTION

3.1 Examination

- .1 Verification of conditions: verify that condition of substrate is acceptable for roadway embankment work:
 - .1 Visually inspect substrate in presence of Departmental Representative.
 - .2 Inform Departmental Representative of unacceptable conditions immediately upon discovery.
 - .3 Proceed with installation only after unacceptable conditions have been remedied and after receipt of written approval to proceed from Departmental Representative.

3.2 Compaction Equipment

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

3.3 Water Distributors

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

3.4 Stripping Of Topsoil

- .1 Dispose of topsoil offsite in authorized site accordance with Section 01 74 21.
- .2 Commence topsoil stripping of areas as directed by Departmental Representative including organic tundra.
- .3 If topsoil can be recover, stockpile on the site for further use in this contract.
- .4 If not, dispose of topsoil.

3.5 Excavating

- .1 General:
 - .1 Notify Departmental Representative when waste materials are encountered and remove to depth and extent directed.
 - .2 Sub-excavate 150 mm below subgrade in cut sections unless otherwise directed by Departmental Representative.
 - .3 Compact top 150 mm below sub-excavate to maximum dry density, to ASTM D698.
 - .4 Replace with approved embankment material and compact to specified embankment density.

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- .5 Treat ground slopes, where subgrade is on transition from excavation to embankment, at grade points as directed by Departmental Representative.
 - .6 Treat ground slopes, where subgrade is on transition from excavation to embankment, at grade points in accordance with standard plans for "Cut and Fill Construction Methods at Grade Points" as directed by Departmental Representative.
 - .2 Drainage:
 - .1 Maintain profiles, crowns and cross slopes to provide good surface drainage.
 - .2 Provide ditches as work progresses to provide drainage.
 - .3 Construct interceptor ditches as indicated or as directed before excavating or placing embankment in adjacent area.
 - .3 Rock excavation:
 - .1 Notify Departmental Representative when material appearing to conform to classification for rock is encountered to enable measurements to be made to determine volume of rock. Provide 12-hour notification.
 - .2 Submit blasting program to Departmental Representative for approval 48 hours minimum before start of work.
 - .1 Do not proceed without written approval of blasting program from Departmental Representative.
 - .3 Shatter rock to 300 mm below subgrade elevation as indicated.
 - .4 Reduce overbreak and increase stability of rock faces by using smooth blasting techniques.
 - .5 Use smooth blast and excavate short sections in rock cuts to determine optimum spacing of holes when requested by Departmental Representative.
 - .6 Stem holes as necessary to contain blast.
 - .7 Do not use prilled type ammonium nitrate and fuel oil (ANFO) explosives within 4 m of final cut line.
 - .8 Form back wall by pre-splitting at least 10 m in advance of production blasting.
 - .1 Smooth wall blast just prior to or just after production blast as determined by approved blast program.
 - .9 Scale rock backslopes to achieve smooth, stable face, free of loose rock and overhangs to design backslope.
 - .10 Control blasting to minimize flying particles.
 - .11 Scale rock backslopes to achieve smooth, stable face, free of loose rock and overhangs to design backslope.
 - .12 Control blasting to minimize flying particles.

3.6 Embankments

- .1 Scarify or bench existing slopes in side hill or sloping sections to ensure proper bond between new materials and existing surfaces.
 - .1 Method used to be pre-approved in writing by Departmental Representative.
- .2 Do not place material which is frozen nor place material on frozen surfaces except in areas authorized by Departmental Representative.
- .3 Maintain crowned surface during construction to ensure ready run-off of surface water.
- .4 Drain low areas before placing materials.

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

3.7 Compaction

- .1 Break material down to sizes suitable for compaction and mix for uniform moisture to full depth of lay.
- .2 Deposit, spread, and level embankment material in layers 200 mm maximum thickness before compaction.
 - .1 Compact each layer of embankment until compaction equipment achieves no further significant consolidation.
 - .2 Ensure required compaction for each layer before placing any material for next layer.
- .3 Use specialized compaction equipment supplemented by routing, hauling and levelling equipment over each layer of fill.
- .4 Obtain written approval from Departmental Representative before using specialized compaction equipment such as tamping rollers, vibratory rollers, or other alternate compaction equipment that produces the required results.
 - .1 For tamping rollers, use equipment that exerts 1,000 kPa minimum of pressure on tamping surface of each tamping foot in transverse row.
- .5 Compact each layer to maximum dry density: ASTM D698 and ASTM T99 except top 150 mm of subgrade.
 - .1 Compact top 150 mm to maximum dry density.
- .6 Add water or dry as required to bring moisture content of materials to level required to achieve specified compaction.

3.8 Finishing

- .1 Shape entire roadbed to within 25 mm of design elevations.
- .2 Finish slopes, ditch bottoms and borrow pits true to lines, grades and drawings where applicable. Scale slope by removing loose fragments for cut slopes in bedrock steeper than 1:1.
- .3 Remove rocks over 150 mm in dimension from slopes and ditch bottoms.

- .4 Hand finish slopes that cannot be finished satisfactorily by machine.
- .5 Round top of backslope 1.5 m both sides of top of slope.
- .6 Run tractor tracks over slopes exceeding 3 m in height to leave tracks parallel to centreline of highway.
- .7 Trim between constructed slopes and edge of clearing to provide drainage and free of humps, sags and ruts.

3.9 Cleaning

- .1 Progress Cleaning: clean in accordance with Section 01 74 11.
 - .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.
- .3 Waste management: disposal waste materials in accordance with Section 01 74 21.

3.10 Protection

- .1 Maintain finished surface in condition conforming to this section until acceptance by Departmental Representative.
- .2 Provide silt fences and erosion protection as required to mitigate and prevent impacts to adjacent properties.

End of Section

1.0 GENERAL

1.1 Description

- .1 This work shall consist of erosion control on all cut and fill operations, excavation, backfill or other construction activities within the limits of the construction site, within any temporary or permanent easements, and within any borrow site used during the period of construction. The protection of these sites shall continue throughout the construction period. During flood seasons, protect the sites by sandbagging, the pumping of water, and any other means appropriate to restrain flooding. During dry weather, sprinkle the sites with water or use other means as necessary to provide dust control.
- .2 Temporary pollution control provisions contained herein shall be coordinated with the permanent erosion control features, to ensure economical, effective, and continuous erosion control throughout the construction and post construction period.
- .3 Since the Contractor is responsible for the construction means and method which in turn are responsible for ensuring that construction does not harm the Waters of Nunavut, the Contractor is solely responsible for ensuring that the above mentioned laws and regulations are met.

1.2 Summary

- .1 Impletion of Erosion and Sedimentation Control (ESC) Plan for the duration of the Work.
 - .1 Prevent loss of soil during construction through stormwater runoff and wing erosion.
 - .2 Protect stockpiled topsoil.
 - .3 Prevent sedimentation of storm water and receiving streams.
 - .4 Prevent pollution of the air with dust and particulate matter.

1.3 References

- .1 United States Environmental Protection Agency Office of Water
 - .1 Documents EPA 832-R-92-005 (September 1992) Stormwater Management for Construction Activities, Chapter 3 Sedimentation and Erosion Control.

1.4 Definitions

- .1 Erosion: deterioration, displacement, or transportation of land surface by wind or water, intensified by land-clearing practices related to construction activities.
- .2 Sediment: particulate matter transported and deposited as a layer of solid particles within a body of water.

1.5 Submittals

- .1 Provide requested information in accordance with Section 01 33 00.
- .2 Prepare and submit, prior to project start-up, 2 copies of the Erosion and Sedimentation Control Plan.
- .3 Perform the following activities each week:

- .1 Weekly inspection records of ESC measures implemented on site.
- .2 Construction site photos of ESC measures implemented.

1.6 Erosion and Sedimentation Control (ESC) Plan

- .1 Develop and implement an Erosion and Sedimentation Control Plan.
- .2 The use of materials as containing few fine matters as possible for the filling of the excavations must be prioritized.
- .3 Meet or exceed best management practices of the USEPA Document EPA-832/R92-005 for sediment and erosion control as outlined in chapter of Stormwater Management for Construction Activities.
- .4 If local standards are more stringent than those of the USEPA, these must be followed.
- .5 Designate an on-site Erosion and Sedimentation Control (ESC) Coordinator responsible for implementing and maintaining the ESC plan during all phases of the Work.
 - .1 ESC Coordinator will be responsible for inspecting the silt fence after each rainfall and:
 - .1 Repair areas where runoff has eroded channels under or around the fence, or areas where the fence may have sagged or collapsed.
 - .2 Remove and properly dispose of sediment trapped behind the fence.
 - .3 Replace areas where the fabric has been clogged with sediment and no longer allows runoff to flow through the fence.
- .6 The ESC plan shall include but not be limited to:
 - .1 Evaluation of existing conditions:
 - .1 Services (ditch);
 - .2 Site slope;
 - .3 Proximity of water bodies;
 - .4 Soil types.
 - .2 Summary of proposed completed site, stating that no areas with potential for erosion will remain after construction completion.
 - .3 Environmental Procedures:
 - .1 Cleaning of truck wheels when vehicles leave site;
 - .2 Aggregate cover for temporary roadways;
 - .3 Dust control measures. Use dust control agent at the time of the realization or work in order to minimize dust and contaminants in the air;
 - .4 The public roadways used for the transport of materials which can leave accumulation of dust must be cleaned;
 - .5 The grounds excavated and filling materials must be covered during transport;
 - .6 Sediment control:
 - .1 Structural control measures;
 - .2 Stabilization measures.
 - .4 Construction sequencing:
 - .1 The Contractor shall sequence site construction operations to limit disturbance to areas required for the construction to proceed in an orderly and efficient manner.
 - .2 The Contractor shall ensure the prompt removal of any excess materials from the construction site after the stockpiles have sufficiently dried.

- .3 The Contractor shall ensure that construction material which are susceptible to erosion and are stored on site, are protected from the wind and rain.
- .4 The excavated grounds and the filling materials stored on the site must be covered with a membrane.
- .5 During the excavations, emergent water will have to be pumped in a approved sedimentation basin.

2.0 PRODUCTS

2.1 Materials

- .1 Temporary mulching:
 - .1 Temporary mulching are measures consisting of mulching, and matting utilized to reduce erosion. All cut and fill slopes include waste sites and borrow pits shall be seeded when and where necessary to eliminate erosion.
- .2 Baled hay or straw checks:
 - .1 Baled hay or straw erosion, checks are temporary measures to control erosion and prevent siltation. Bales shall be either hay or straw containing 5 cubic feet or more of material.
 - .2 Baled hay or straw checks shall be used where the existing ground slopes toward or away from the embankment along the toe of slopes, in ditches, or other areas where siltation erosion or water runoff is a problem.
- .3 Sediment barriers (Temporary silt fences)
 - .1 Sediment barriers (Silt fences) are temporary measures utilizing geotextile material attached, attached to the upstream side of the fence to retain the suspended silt particles in the runoff water.

3.0 EXECUTION

3.1 General

- .1 Before starting work, the Contractor must provide Erosion and Sedimentation Control Plan. This plan must be approved by the Departmental Representative. This plan must respect the boundary of work and the protection of ecosystem.
- .2 The Contractor shall submit a spill prevention plan to the Departmental Representative for review. The contents of this spill prevention plan shall depend on what types of chemicals, lubricants and fuels will be used and if these will be stored on site. As a minimum, if no fuel or lubricants or other chemicals are stored on site, either temporarily in vehicular tanks or in skid or trailer mounted tanks, a plan shall be supplied which directs all employees of the Contractor in the proper procedures to be followed should a spill occur. For more complex chemical storage requirements, a more complex plan will be required.
- .3 Install and maintain erosion control measures as required by the erosion control plan throughout phases of the project. Notify Departmental Representative of modifications to the erosion control plan as dictated by Contractor's means and methods, construction phasing or by differing site conditions.
- .4 Contractor shall provide all erosion measures necessary to prevent and manage polluted runoff from the construction site and discharge of sediment onto adjacent property, into waters of the Nunavut.
- .5 Contractor must install a sedimentation barrier (silt fence) all around the zones of the work.
- .6 Perform all work in accordance with manufacturer's instruction where these specifications do not specify a higher requirement.
- .7 The Departmental Representative has the authority to limit, the surface of erodible earth material exposed by excavation, borrow and fill operations and to direct the Contractor to provide immediate permanent or temporary pollution control measures to prevent contamination of adjacent streams, or other watercourses, lakes, ponds, or other water impoundment. Such work may involve the use of temporary mulches, mats, or other control devices or methods as necessary to control erosion. Cut and fill slopes shall be covered with proposed materials as the excavation proceeds to the extent directions by the Departmental Representative.
- .8 The Contractor shall be required to incorporate all permanent erosion control features into the project at the earliest practicable time as outlined in his accepted schedule. Temporary pollution control measures shall be used to correct conditions that develop during construction that were not foreseen during the preconstruction stage; that are needed prior to installation of permanent pollution control features; or that are needed temporarily to control erosion that develops during normal construction practices; but are not associated with permanent control features on the project.
- .9 The Departmental Representative will limit the area of excavation, borrow, and embankment operations in progress commensurate with the Contractor's capability and progress in keeping the finish grading, mulching, and other such permanent pollution control measures current in accordance with the accepted schedule.

Should seasonal limitations make such coordination unrealistic, temporary erosion control measures shall take immediately to the extent feasible and justified.

- .10 In the event of conflict between these requirements and pollution control laws, rules or regulations, or other Federal State, or Local agencies, the more restrictive laws, rules, or regulation shall apply.

3.2 Grading and Earthwork

- .1 Install temporary or permanent erosion control measure applicable to each phase of grading or land disturbance prior commencing on that phase.
- .2 Do not stockpile soil within 8 metres of any roadway, parking lot, or drainage structure or channel. Provide temporary erosion control measures on disturbed areas and soil stockpiles which will remain for a period of more than 7 consecutive calendar days.
- .3 Remove surplus excavation materials from the site immediately after rough grading to an approved disposal site.

3.3 Drainage

- .1 Divert roof drainage and runoff from all undisturbed areas upslope of the site around disturbed areas. Minimize runoff on exposed soil. Provide measures to remove sediment and debris.
- .2 Convey clean or treated runoff to the nearest adequate stormwater facility. Do not discharge water in a manner that will cause erosion or sedimentation of the site or receiving stormwater facility.
- .3 Provide ditch checks to in swales or ditches to reduce the velocity of water in the channel.
- .4 Dewatering discharge shall be routed to a sedimentation basin to reduce the discharge of sediments to meet the requirements. Do not discharge water in a manner that will cause erosion or sedimentation of the site or receiving stormwater facility.

3.4 Tracking Control

- .1 Construct and maintain Tracking Pads. Provide each entrance to the site with a stone tracking pad at least 15 m in length with a minimum thickness of 300 mm. The tracking pad shall be the full width of the egress point. Inspect tracking pads on a daily basis and replace aggregate when no longer effective.
- .2 If necessary, provide a crushed aggregate paved parking area.
- .3 If applicable, wash water shall be discharged to sedimentation basins, sedimentation vessels, or other such control areas. Untreated wash water shall not be routed to storm sewers or waters of the state.

3.5 Maintenance

- .1 Inspection
 - .1 Inspect weekly Erosion and Sedimentation Control measures to ensure that they are functioning properly and not damaged.

- .1 Photograph observations during weekly inspections. The public highways must be photographed with every day.
 - .2 Record damages or deficiencies in ESC measures.
 - .3 Record actions taken to correct damages and deficiencies in ESC measures.
 - .4 Record significant weather events: heavy rain, long continuous periods of rain, strong winds, snow, above-freezing temperatures when snow or ice is present on site.
- .2 Contractor shall inspect all erosion control measures within 24 hours of the end of each rainfall event that exceed 6 mm, or daily during periods of prolonged rainfall, or weekly during periods without rainfall. Immediately repair and/or replace any and all damaged, failed, or inadequate erosion control measures.
- .3 Maintain records of all inspections and any remedial actions taken on-site.
- .4 Remove any sediment reaching a public or private roadway, parking lot, sidewalk, or other pavement. Do not remove tracked sediments by flushing. Completely remove any accumulations not requiring immediate attention at least once daily at the end of the workday.
- .5 Frequently disposes of all waste and unused construction materials in licensed solid waste or wastewater facilities. Do not bury, dump, or discharge any garbage, debris, cleaning wastes, toxic materials, or hazardous materials on the site, on the land surface or in detention basin, or sedimentation basins, or otherwise allow materials to be carried off the site by runoff onto adjacent lands or into receiving waters or storm sewer systems.

3.6 Cleaning

- .1 Clean in accordance with Section 01 74 11.
- .2 After the construction of work, the Contractor must clean the ditches and the sedimentation basins.

End of Section

1.0 GENERAL**1.1 Measurement and Payment**

- .1 The cost of geotextile is included in lump sum of civil works.

1.2 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 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.

1.3 Action and Informational Submittals

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

1.4 Delivery, Storage and Handling

- .1 Deliver, store and handle materials in accordance with manufacturer's written instructions.

- .2 Storage and handling requirements:
 - .1 Store materials 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 ones.

2.0 PRODUCTS

2.1 Material

.1 Properties:

- .1 Geotextile: non-woven synthetic fibre fabric, supplied in rolls.
 - .1 Width: 3.5 m minimum.
 - .2 Length: 100 m minimum.
 - .3 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 2.0 mm.
 - .2 Mass per unit area: to CAN/CGSB-148.1, No.2, minimum 250 g/m².
- .3 Hydraulic properties:
 - .1 Filtration opening size (FOS): to CAN/CGSB-148.1 No.10, OPSS 1860: 53–93 micrometres.
 - .2 Permittivity: to ASTM D4491, 0.7 pers.
- .4 Securing pins and washers: to CSA G40.21, Grade 300W, hot-dipped galvanized with minimum zinc coating of 600 g/m² to ASTM A123/A123M.
- .5 Factory seams: sewn in accordance with manufacturer's recommendations.
- .6 Thread for sewn seams: equal or better resistance to chemical and biological degradation than geotextile.

3.0 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 Department Representative.
 - .2 Inform Department 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 Department Representative.

3.2 Installation

- .1 Place geotextile material by unrolling onto graded surface in orientation, manner and locations indicated and retain in position with pins and washers as requested by the Department Representative.
- .2 Place geotextile materials smooth and free of tension stress, folds, wrinkles and creases.
- .3 Place geotextile materials 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 Pin successive strips of geotextile as indicated by Department Representative with securing pins at 1,000 mm interval at midpoint of lap.
- .6 Protect installed geotextile material from displacement, damage or deterioration before, during and after placement of material layers.
- .7 After installation, cover with overlying layer within 4 hours of placement.
- .8 Replace damaged or deteriorated geotextile to approval of Department Representative.
- .9 Place rip-rap on geotextile according to Section 31 37 00.
- .10 Place clear stone 50-75 mm according to Section 31 37 00.

3.3 Cleaning

- .1 Progress cleaning: clean in accordance with Section 01 74 11.
 - .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.

3.4 **Protection**

- .1 Vehicular traffic not permitted directly on geotextile.

End of Section

1.0 GENERAL**1.1 Related Requirements**

- .1 Not used.

1.2 Scope of work

- .1 Contractor must install rip-rap as indicated in the plans and specifications or the Professional Engineer.
- .2 Rip-rap is installed on geotextile in compliance with Section **31 32 19.01** and waterproof stone protective revetment.

1.3 Measurement Procedures

- .1 Rip-rap is paid as lump sum for each work. The price includes excavation, disposal of excavated material, shaping of the walls and bottom, compaction, geotextiles and overlays, supply and installation of rip-rap, and all incidental expenses.

1.4 References

- .1 Bureau de la normalisation du Québec
 - .1 NQ 2560-114 "Travaux de génie civil – Granulat".

1.5 Submittals for Approval

- .1 Submit required documents and samples in compliance with Section **01 33 00** – Submittal Procedures.
- .2 Data sheets (certificates of conformity by accredited laboratory)
 - .1 Submit required data sheets and manufacturer's instructions and documentation for rip-rap. Data sheets shall indicate product characteristics, performance criteria, dimensions, limitations and finish
 - .2 Rip-rap shall be inert and non acid-generating.

2.0 PRODUCTS

2.1 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 plans and specifications requirements.
- .2 Meet the requirements of « Bureau de normalisation du Québec, norme NQ 2560-114, Travaux de génie civil – Granulats ».
- .3 Inerte, non-potentially acid generator and fractured stones.

2.2 Geotextile

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

3.0 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 or geomembrane. Vehicular traffic over geotextile not permitted.
- .4 Place rip-rap to thickness and details as indicated.
- .5 Place stones in manner approved by Professional Engineer 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