

## **PART 1 - GENERAL**

### **1.1 RELATED SECTIONS**

- .1 Section 01 74 21 - Construction/Demolition Waste Management and Disposal.
- .2 Section 01 33 00 - Submittal Procedures.

### **1.2 REFERENCES**

- .1 American Society for Testing and Materials (ASTM)
  - .1 ASTM D 4791-10, Standard Test Method for Flat Particles, Elongated Particles, or Flat and Elongated Particles in Coarse Aggregate.

### **1.3 SAMPLES**

- .1 Submit samples in accordance with Section 01 33 00 - Submittal Procedures.
- .2 Allow continual sampling by Departmental Representative during production.
- .3 Provide Departmental Representative with access to source and processed material for sampling.
- .4 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.
- .5 Pay cost of sampling and testing of aggregates which fail to meet specified requirements.
- .6 Provide water and electric power to Departmental Representative laboratory trailer at production site as requested.

### **1.4 WASTE MANAGEMENT AND DISPOSAL**

- .1 Divert unused granular materials from landfill to load facility to satisfaction of Departmental Representative.

## **PART 2 - PRODUCTS**

### **2.1 MATERIALS**

- .1 Aggregate quality: sound, hard, durable material free from soft, thin, elongated or laminated particles, organic material, clay lumps or minerals, or other substances that would act in deleterious manner for use intended.
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- .2 Flat and elongated particles of coarse aggregate: to ASTM D 4791.
  - .1 Greatest dimension to exceed five times least dimension.
- .3 Fine aggregates satisfying requirements of applicable section to be one, or blend of following:
  - .1 Natural sand.
  - .2 Manufactured sand.
  - .3 Screenings produced in crushing of quarried rock, boulders, gravel or slag.
- .4 Coarse aggregates satisfying requirements of applicable section to be crushed rock:
  - .1 Gravel or crushed gravel will not be acceptable.
  - .2 River or beach gravels will not be acceptable.
  - .3 Salt water submerged deposits will not be acceptable.

## **2.2 SOURCE APPROVAL AND QUALITY CONTROL**

- .1 Source(s) of materials to be incorporated into work or stockpiled to be to satisfaction of Departmental Representative.
- .2 Inform Departmental Representative of proposed source of aggregates and provide access for sampling within four (4) weeks of commencing production.
- .3 If, in opinion of Departmental Representative, materials from proposed source do not meet, or cannot reasonably be processed to meet, specified requirements, locate an alternative source or demonstrate that material from source in question can be processed to meet specified requirements.
- .4 Advise Departmental Representative four (4) weeks in advance of any change in material source to allow sampling, testing and approval.
- .5 The Contractor will pay all costs associated with sampling, testing, and approval of any material source change made after approval of the initial source.
- .6 Acceptance of material at source does not preclude future rejection if it is subsequently found to lack uniformity, or if it fails to conform to requirements specified, or if its field performance is found to be unsatisfactory.

## **PART 3 - EXECUTION**

### **3.1 PREPARATION**

- .1 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 to the satisfaction of the Departmental Representative.
    - .2 Clear, grub and strip area ahead of quarrying or excavating operation
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- sufficient to prevent contamination of aggregate by deleterious materials.
    - .3 When excavation is completed, dress sides of excavation to nominal 1:1 slope, and provide drains or ditches as required to prevent surface standing water.
    - .4 Trim off and dress slopes of waste material piles and leave site in neat condition.
  - .2 Processing
    - .1 Process aggregate uniformly using methods that prevent contamination, segregation and degradation.
    - .2 Blend aggregates, if required, to obtain gradation requirements, percentage of crushed particles, or particle shapes, as specified. Use methods and equipment to the satisfaction of Departmental Representative.
    - .3 Wash aggregates, if required to meet specifications. Use only equipment satisfactory to Departmental Representative.
    - .4 When operating in stratified deposits, use excavation equipment and methods that produce uniform, homogeneous aggregate.
  - .3 Handling
    - .1 Handle and transport aggregates to avoid segregation, contamination and degradation.
  - .4 Stockpiling
    - .1 Stockpile aggregates on site in locations as directed by Departmental Representative. Do not stockpile on completed pavement surfaces.
    - .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 Except where stockpiled on acceptably stabilized areas, provide compacted sand base not less than 300 mm in depth to prevent contamination of aggregate. Stockpile aggregates on ground but do not incorporate bottom 300 mm of pile into Work.
    - .5 Separate different aggregates by strong, full depth bulkheads, or stockpile far enough apart to prevent intermixing.
    - .6 Do not use intermixed or contaminated materials. Remove and dispose of rejected materials as directed by Departmental Representative within 48 h of rejection.
    - .7 Stockpile materials in uniform layers of thickness as follows:
      - .1 Max 1.5 m for coarse aggregate and base course materials.
      - .2 Max 1.5 m for fine aggregate and sub-base materials.
      - .3 Max 1.5 m for other materials.
    - .8 Uniformly spot-dump aggregates delivered to stockpile in trucks and build up stockpile as specified.
    - .9 Do not cone piles or spill material over edges of piles.
    - .10 Do not use conveying stackers.
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- .11 During winter operations, prevent ice and snow from becoming mixed into stockpile or in material being removed from stockpile.

### **3.2 CLEANING**

- .1 Leave aggregate stockpile site in tidy, well drained condition, free of standing surface water.
- .2 Leave any unused aggregates in neat compact stockpiles as directed by Departmental Representative.
- .3 For temporary or permanent abandonment of aggregate source, restore source to condition meeting requirements of authority having jurisdiction.

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## **PART 1 - GENERAL**

### **1.1 RELATED SECTIONS**

- .1 Section 01 35 43 Environmental Procedures.

### **1.2 REFERENCES**

- .1 U.S. Environmental Protection Agency (EPA)/Office of Water
  - .1 EPA 832R92005, Storm Water Management for Construction Activities: Developing Pollution Prevention Plans and Best Management Practices.
- .2 Environment Canada.
- .3 When conflicts occur between EPA and Environment Canada, the more stringent requirement shall apply.

## **PART 2 - PRODUCTS**

### **2.1 NOT USED**

- .1 Not Used.

## **PART 3 - EXECUTION**

### **3.1 TEMPORARY EROSION AND SEDIMENTATION CONTROL**

- .1 Inspect, repair, and maintain erosion and sedimentation control measures during construction until stabilization has been established.
- .2 Remove erosion and sedimentation controls and restore and stabilize areas disturbed during removal when approved by Departmental Representative.

### **3.2 STRIPPING OF TOPSOIL**

- .1 Ensure that procedures are conducted in accordance with applicable federal, provincial and municipal requirements.
  - .2 Remove topsoil before construction procedures commence to avoid compaction of topsoil.
  - .3 Handle topsoil only when it is dry and warm.
  - .4 Remove vegetation from targeted areas by non-chemical means and dispose of stripped vegetation by alternative disposal.
  - .5 Remove brush from targeted area by non-chemical means and dispose of through
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alternative disposal.

- .6 Strip topsoil to satisfaction of Departmental Representative.
  - .1 Avoid mixing topsoil with subsoil.
- .7 Pile topsoil in berms in locations as directed by Departmental Representative.
  - .1 Stockpile height not to exceed 2 m.
- .8 Dispose of unused topsoil as directed by Departmental Representative and in accordance with all applicable federal, municipal and provincial regulations.
- .9 Protect stockpiles from contamination and compaction.
- .10 Cover topsoil that has been piled for long term storage with anchored waterproof and insulated tarps, as required to resist wind, water and winter conditions. Place straw bales around the stockpile to filter sediment entering or exiting the pile.

### **3.3 PREPARATION OF GRADE**

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

### **3.4 PLACING OF TOPSOIL**

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

### **3.5 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.

## **PART 1 - GENERAL**

### **1.1 RELATED SECTIONS**

- .1 Section 31 23 33.01 - Excavating, Trenching and Backfilling.

### **1.2 REFERENCES**

- .1 American Society for Testing and Materials (ASTM)
  - .1 ASTM D 698-12, Standard Test Method for Laboratory Compaction Characteristics of Soil Using Standard Effort (12400 ft - 1bf/ ft<sup>3</sup> (600 KN-m/m<sup>3</sup>)).

### **1.3 EXISTING CONDITIONS**

- .1 Size, depth and location of existing utilities and structures as indicated are for guidance only. Completeness and accuracy are not guaranteed.
- .2 Refer to dewatering in Section 31 23 33.01 - Excavating Trenching and Backfilling.

### **1.4 PROTECTION**

- .1 Protect existing fencing, trees, landscaping, natural features, bench marks, buildings, pavement, surface or underground utility lines which are to remain. If damaged, restore to original or better condition unless directed otherwise by Departmental Representative.
- .2 Maintain access roads to prevent accumulation of construction related debris on roads.

## **PART 2 - PRODUCTS**

### **2.1 MATERIALS**

- .1 Fill material: in accordance with Section 31 23 33.01 - Excavating, Trenching and Backfilling.

## **PART 3 - EXECUTION**

### **3.1 STRIPPING OF TOPSOIL**

- .1 Do not handle topsoil while in wet or frozen condition or in any manner in which soil structure is adversely affected as determined by Departmental Representative.
  - .2 Commence topsoil stripping of areas as directed by Departmental Representative
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after area has been cleared of brush, weeds and grasses and removed from site.

- .3 Strip topsoil to depths as directed by Departmental Representative. Avoid mixing topsoil with subsoil.
- .4 Stockpile in locations as directed by Departmental Representative. Stockpile height not to exceed 2 m.
- .5 Dispose of unused topsoil off site.

### **3.2 GRADING**

- .1 Rough grade to levels, profiles, and contours allowing for surface treatment as directed by Departmental Representative.
- .2 Rough grade to depths as indicated. Proof roll exposed subgrade.
- .3 Slope rough grade away from building as indicated.
- .4 Grade ditches to depth required for maximum run-off as indicated.
- .5 Prior to placing fill over existing ground, scarify surface to depth of 150 mm. Maintain fill and existing surface at approximately same moisture content to facilitate bonding.
- .6 Do not disturb soil within branch spread of trees or shrubs to remain.

### **3.3 PROOF ROLLING**

- .1 For proof rolling use standard roller of 45400 kg gross mass with four pneumatic tires each carrying 11350 kg and inflated to 620 kPa. Four tires arranged abreast with centre to centre spacing of 730 mm maximum.
- .2 Obtain approval from Departmental Representative to use non standard proof rolling equipment.
- .3 Proof roll at level in subgrade as indicated. If non standard proof rolling equipment is approved, Departmental Representative to determine level of proof rolling.
- .4 Make sufficient passes with proof roller to subject every point on surface to three separate passes of loaded tire.
- .5 Where proof rolling reveals areas of defective subgrade:
  - .1 Remove subgrade material to depth and extent as directed by Departmental Representative.
  - .2 Backfill excavated subgrade in accordance with Section 31 23 33.01 - Excavating, Trenching and Backfilling.
- .6 Where proof rolling reveals areas of defective subgrade remove and replace in



accordance with this section at no extra cost.

### **3.4 STOCKPILING**

- .1 Pile excavated fill, suitable for re-use as approved by Departmental Representative, in locations as directed by Departmental Representative.
  - .1 Stockpile height not to exceed 2 m.
- .2 Protect stockpiles from contamination and compaction.
- .3 Cover fill that has been piled for long term storage with anchored water proof and insulated tarps, as required, to resist wind, water and winter conditions. Place straw bales around the stockpile to filter sediment entering or exiting the pile.

### **3.5 TESTING**

- .1 Quality control testing shall be conducted and paid for by Contractor. Submit results of quality control testing to Departmental Representative for review when requested. Quality assurance inspection and testing will be carried out by a third party designated by the Departmental Representative. Costs of these tests will be paid by Departmental Representative.

### **3.6 SURPLUS MATERIAL**

- .1 Remove surplus material and material unsuitable for fill, grading or landscaping off site to satisfaction of Departmental Representative.

## **PART 1 - GENERAL**

### **1.1 RELATED SECTIONS**

- .1 Section 01 33 00 - Submittal Procedures.
- .2 Section 31 22 13 - Rough Grading.
- .3 Section 32 11 16.01 - Granular Sub-Base.
- .4 Section 32 11 23 - Aggregate Base Courses.
- .5 Section 33 05 13 - Manholes and catchbasin structures.
- .6 Section 33 11 16 - Sitewater Utility Distribution.
- .7 Section 33 41 00 - Storm Utility Drainage Piping.

### **1.2 REFERENCES**

- .1 American Society for Testing and Materials International (ASTM)
  - .1 ASTM C 117-04, Standard Test Method for Material Finer than 0.075 mm (No.200) Sieve in Mineral Aggregates by Washing.
  - .2 ASTM C 136-06, Standard Test Method for Sieve Analysis of Fine and Coarse Aggregates.
  - .3 ASTM D 422-63(2007), Standard Test Method for Particle-Size Analysis of Soils.
  - .4 ASTM D 698-12, Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Standard Effort (12,400 ft-lbf/ ft<sup>3</sup>) (600 kN-m/m<sup>3</sup>).
  - .5 ASTM D 4318-10, 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 Nova Scotia Department of Transportation and Infrastructure Renewal (NSTIR)
  - .1 Standard Specification - Highway Construction and Maintenance (2011).

### **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 m<sup>3</sup> and which cannot be removed by means of heavy duty mechanical excavating equipment. 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 Topsoil:
  - .1 Material capable of supporting good vegetative growth and suitable for use in top dressing, landscaping and seeding.
  - .2 Material reasonably free from subsoil, clay lumps, brush, objectionable weeds, and other litter, and free from cobbles, stumps, roots, and other objectionable material larger than 25 millimeters in any dimension.
- .3 Waste material: excavated material unsuitable for use in Work or surplus to requirements.
- .4 Borrow material: material obtained from locations outside area to be graded, and required for construction of fill areas or for other portions of Work.
- .5 Recycled fill material: material, considered inert, obtained from alternate sources and engineered to meet requirements of fill areas.
- .6 Unsuitable materials:
  - .1 Weak, chemically unstable, and compressible materials.
  - .2 Frost susceptible materials:
    - .1 Fine grained soils with plasticity index less than 10 when tested to ASTM D 4318, and gradation within limits specified when tested to ASTM D 422 and ASTM C 136: Sieve sizes to CAN/CGSB-8.2. Table: Sieve Designation % Passing 2.0 mm 100 0.10 mm 45 - 100 0.02 mm 10 - 80 0.005 mm 0 - 45
    - .2 Coarse grained soils containing more than 20 % by mass passing 0.075 mm sieve.
- .7 Unshrinkable fill: very weak mixture of cement, concrete aggregates and water that resists settlement when placed in utility trenches, and capable of being readily excavated.

#### **1.4 SUBMITTALS**

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

- .3 Samples:
  - .1 Submit samples in accordance with Section 01 33 00 - Submittal Procedures.
  - .2 Inform Departmental Representative at least 4 weeks prior to beginning Work, of proposed source of fill materials and provide access for sampling.
  - .3 Submit 70 kg samples of type of fill specified including representative samples of excavated material
  - .4 Ship samples prepaid to Departmental Representative, in tightly closed containers to prevent contamination and exposure to elements.

### **1.5 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.

### **1.6 EXISTING CONDITIONS**

- .1 Buried services:
  - .1 Departmental Representative to process and provide clearance to dig permit. Clearance to dig permit to be provided by and available from Departmental Representative.
  - .2 Maintain copies of the approved clearance to dig permit and associated drawings on site during the work. Ensure all workers, trades and sub-contractors are aware of existing utilities.
  - .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, Departmental Representative and applicable authorities having jurisdiction establish location and state of use of buried utilities and structures. Ensure such locations are clearly marked to present disturbance during work.
  - .5 Confirm locations of buried utilities by careful test excavations methods.
  - .6 Maintain and protect from damage, water, sewer, gas, electric, telephone and other utilities and structures encountered as directed by Departmental Representative.
  - .7 Where utility lines or structures exist in area of excavation, obtain direction of Departmental Representative before removing re-routing or otherwise disturbing utilities or structures. Pay Costs for such work.
  - .8 Record location of maintained, re-routed and abandoned underground lines.
  - .9 Confirm locations of recent excavations adjacent to area of excavation.

- .3 Existing buildings and surface features:
  - .1 Conduct, with Departmental Representative, condition survey of existing buildings, trees and other plants, lawns, fencing, service poles, wires, rail tracks, pavement, survey bench marks and monuments which may be affected by Work.
  - .2 Protect existing buildings and surface features from damage while Work is in progress. In event of damage, immediately make repair as directed by Departmental Representative.

## **PART 2 - PRODUCTS**

### **2.1 MATERIALS**

- .1 Type 1 fill: Type 1 gravel to Division 3, Section 2 of NSTIR Standard Specification - Highway Construction and Maintenance (2011).
- .2 Type 2 fill: Type 2 gravel to Division 3, Section 2 of NSTIR Standard Specification - Highway Construction and Maintenance (2011).
- .3 Type 3 fill: Type C5 clear stone to Division 3, Section 4 of NSTIR Standard Specification - Highway Construction and Maintenance (2011).
- .4 Type 4 fill: Selected material from excavation or other sources, approved by the Departmental Representative for use intended, unfrozen and free from rocks larger than 75 mm, cinders, ashes, sod, refuse, debris and other deleterious materials.
- .5 Rip Rap: Quarried stone, sound, durable and free from defects. Shall be resistant to weathering and water action and shall not consist of slate, shale or sandstone. At least 70% of rip-rap shall be 50 kg with a depth of 600 mm.

### **2.2 UNDERGROUND UTILITY WARNING TAPE**

- .1 Plastic warning tape colour coded and labeled for the type of services to be installed below it, 150 mm and 75 mm widths, heavy duty polyethylene colour coded as follows:
    - .1 Colour Orange; wording CAUTION: BURIED CABLE TV LINE BELOW.
    - .2 Colour Red; wording CAUTION: BURIED ELECTRICAL BELOW, 150 mm wide for primary and 75 mm wide for secondary.
    - .3 Colour Yellow; wording CAUTION: BURIED GAS LINE BELOW.
    - .4 Colour Green; wording CAUTION: BURIED SEWER LINE BELOW.
    - .5 Colour Orange; wording CAUTION: BURIED TELEPHONE BELOW.
    - .6 Colour Blue; wording CAUTION: BURIED WATERLINE BELOW.
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### **PART 3 - EXECUTION**

#### **3.1 SITE PREPARATION**

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

#### **3.2 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 satisfaction of Departmental Representative.
- .4 Protect natural and man-made features required to remain undisturbed. Unless otherwise directed 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.

#### **3.3 STRIPPING OF TOPSOIL**

- .1 Begin topsoil stripping of areas as directed by Departmental Representative. After area has been cleared of vegetation and removed from site.
- .2 Strip topsoil to satisfaction of Departmental Representative.
  - .1 Do not mix topsoil with subsoil.
- .3 Stockpile in locations as directed and to satisfaction of Departmental Representative.
  - .1 Stockpile height not to exceed 2 m and should be protected from erosion.
- .4 Dispose of unused topsoil as directed by Departmental Representative and in accordance with all applicable federal, municipal and provincial regulations.

#### **3.4 STOCKPILING**

- .1 Stockpile fill materials in areas designated by Departmental Representative.
    - .1 Stockpile granular materials in manner to prevent segregation.
  - .2 Protect fill materials from contamination.
  - .3 Implement sufficient erosion and sediment control measures to prevent sediment release off construction boundaries and into water bodies.
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### **3.5 DEWATERING**

- .1 Keep excavations free of water while Work is in progress.
- .2 Provide for Departmental Representative's review approval details of proposed dewatering or heave prevention methods, including dikes, well points, and sheet pile cut-offs.
- .3 Protect open excavations against flooding and damage due to surface run-off.
- .4 Dispose of water in accordance with applicable federal, municipal and provincial regulations 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.
- .5 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.

### **3.6 EXCAVATION**

- .1 Maintain sides and slopes of excavations in safe condition by appropriate methods and in accordance with Health and Safety Act for the Province of Nova Scotia.
  - .2 Excavate to lines, grades, elevations and dimensions as indicated.
  - .3 Remove concrete, masonry, paving, walks, demolished foundations and rubble and other obstructions encountered during excavation.
  - .4 Excavation must not interfere with bearing capacity and normal 1:1 (H:V) splay of adjacent foundations.
  - .5 Do not disturb soil within branch spread of trees or shrubs that are to remain.
  - .6 For trench excavation, unless otherwise authorized by Departmental Representative in writing, do not excavate more than 30 m of trench in advance of installation operations and do not leave open more than 15 m at end of day's operation.
  - .7 Keep excavated and stockpiled materials safe distance away from edge of trench.
  - .8 Restrict vehicle operations directly adjacent to open trenches.
  - .9 Dispose of surplus and unsuitable excavated material offsite in accordance with applicable federal, municipal and provincial regulations.
  - .10 Do not obstruct flow of surface drainage or natural watercourses.
  - .11 Earth bottoms of excavations to be undisturbed soil, level, free from loose, soft or
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organic matter.

- .12 Obtain Departmental Representative approval of completed excavation.
- .13 Remove unsuitable material from trench bottom including those that extend below required elevations to extent and depth as directed by Departmental Representative.
- .14 Correct unauthorized over-excavation as follows and to satisfaction of Departmental Representative:
  - .1 Fill under bearing surfaces and footings with Type 1 or 2 fill compacted to not less than 98% of corrected Standard Proctor maximum dry density.
  - .2 Fill under other areas with Type 4 fill compacted to not less than 95 % of corrected Standard Proctor maximum dry density.
- .15 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.

### **3.7 FILL TYPES AND COMPACTION**

- .1 Use types of fill and compaction specified below unless indicated otherwise on drawings. Compaction densities are percentages of maximum densities obtained from ASTM D 698.
  - .1 Exterior side of perimeter walls: use Type 1 fill to subgrade level. Compact to 95 % of maximum dry density.
  - .2 Within building area: use Type 4 fill to underside of base course for floor slabs. Compact to 98% of maximum dry density.
  - .3 Under concrete slabs: use Type 1 fill to underside of slab. Compact base course to 100% of maximum dry density.
  - .4 Under concrete footings: use Type 1 fill to underside of footings. Compact to 100% of maximum dry density.
  - .5 Under sidewalks/pathways:
    - .1 Use Type 4 fill to underside of base course. Compact to 95% of maximum dry density.
    - .2 Use Type 1 fill to underside of sidewalk/pavement. Compact to 100% of maximum dry density.

### **3.8 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 and Section 33 41 00 - Storm Utility Drainage Piping.
  - .2 Place bedding and surround material in unfrozen condition.
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### **3.9 BACKFILLING**

- .1 Vibratory compaction equipment: as required to achieve specified compaction throughout layer. Lighter equipment to be used immediately adjacent structures.
- .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.
- .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 300 mm compacted thickness up to grades indicated. Compact each layer before placing succeeding layer. Thinner layers will be required where light compaction equipment is required.
- .6 Backfilling around installations:
  - .1 Place bedding and surround material as specified elsewhere.
  - .2 Do not backfill around or over cast-in-place concrete within 24 hours after placing of concrete.
  - .3 Place layers simultaneously on both sides of installed Work to equalize loading.

### **3.10 RESTORATION**

- .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 Departmental Representative.
- .2 Replace topsoil and landscaping as required and to satisfaction of Departmental Representative.
- .3 Reinstate pavements and sidewalks disturbed by excavation to thickness, structure and elevation which existed before excavation.
- .4 Clean and reinstate areas affected by Work to Departmental Representative's satisfaction.
- .5 Protect newly graded areas from traffic and erosion and maintain free of trash or debris.

## **PART 1 - GENERAL**

### **1.1 RELATED SECTIONS**

- .1 Section 33 18 00 – Salt Water Intake.
- .2 Section 33 41 00 – Storm Utility Drainage Piping.

## **PART 2 - PRODUCTS**

### **2.1 STONE**

- .1 Hard, dense with relative density 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 70% (min) of stone shall be 50 kg.
    - .2 Remaining rip-rap (sub gravel bedding) with depth of 600 mm composed of Type C1 and C2 gravels.
- .2 Rip-rap to be clean, inorganic, non ore-bearing, non-toxic material from a non-watercourse source. It shall be hard, resistant to weathering and angular in shape.
- .3 Where specified for stream beds, rip-rap shall be placed in lifts and washed following placement.
- .4 Sub Gravel Bedding:
  - .1 300 mm Type C2 clear gravel.
  - .2 200 mm Type C1 clear gravel.

## **PART 3 - EXECUTION**

### **3.1 PLACING**

- .1 Fine grade area to be rip-rapped to uniform, even surface. Fill depressions with suitable material and compact to provide firm bed.
  - .2 Place rip-rap to thickness and details as indicated.
  - .3 Place stones in manner approved by Departmental Representative to secure surface and create a stable mass. Place larger stones at bottom of slopes.
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- .4 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.