

## **Part 1           General**

### **1.1               RELATED REQUIREMENTS**

- .1     Section 01 33 00 – Submittal Procedures.
- .2     Section 01 45 00 – Quality Control.
- .3     Section 31 14 13 – Soil Stripping and Stockpiling.
- .4     Section 31 32 19.01 – Geotextiles.

### **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 D422-632002, 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 (600 kN-m<sup>3</sup>).
  - .5     ASTM D1557-02e1, Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Modified Effort (2,700 kN-m<sup>3</sup>).
  - .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-8.2-M88, Sieves, Testing, Woven Wire, Metric.
- .3     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.
- .4     Nova Scotia Transportation and Infrastructure Renewal (NSTIR) Standard Specification for Highway Construction and Maintenance.

### **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 1.0 m<sup>3</sup> and which cannot be removed by means of heavy duty mechanical excavating equipment with 0.95 to 1.15 m<sup>3</sup> 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 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-8.2.
    - .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.

#### **1.4 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 - 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 methods as described in PART 3 of this Section.
  - .3 Submit to Departmental Representative written notice at least 7 days prior to excavation work.

- .4 Submit to Departmental Representative written notice when bottom of excavation is reached.
- .5 Submit to Departmental Representative testing results as described in PART 3 of this Section.
- .3 Preconstruction Submittals:
  - .1 Submit construction equipment list for major equipment to be used in this section prior to start of Work.
  - .2 Submit records of underground utility locates, indicating: location plan of existing utilities as found in field and location plan of relocated and abandoned services, as required.

## **1.5 QUALITY ASSURANCE**

- .1 Submit design and supporting data at least 2 weeks prior to beginning Work.
- .2 Design and supporting data submitted to bear stamp and signature of qualified professional Engineer licensed in the Province of Nova Scotia.
- .3 Keep design and supporting data on site.
- .4 Engage services of qualified professional Engineer who is licensed in the Province of Nova Scotia in which Work is to be carried out to design and inspect cofferdams, shoring, bracing and underpinning if required for Work.

## **1.6 EXISTING CONDITIONS**

- .1 Examine soil report bound to this specification.
- .2 Buried services:
  - .1 Before commencing work verify or establish location of buried services on and adjacent to site by careful test excavations. Location of services shown on utilities plan is approximate only and not deemed accurate.
  - .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 establish location and state of use of buried utilities and structures.
  - .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 before removing or re-routing. Costs for such Work to be paid by Owner.
  - .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 a 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.

## **Part 2 Products**

### **2.1 MATERIALS**

- .1 Backfill: Type 1 or Type 2 granular in accordance with NSTIR specifications.
- .2 Select (common) Fill: Common material from site which is free of stumps, trees, roots, organics, boulders and masonry larger than 200 mm in any dimension and other deleterious materials as approved by the Departmental Representative.
- .3 Utility/Pipe Bedding and Surround: Type 1 granular in accordance with NSTIR specifications.
- .4 19mm Clear Stone: Crushed and screened, hard, durable stone, free from clay and organic matter, and graded as follows:

Sieve Size (mm)	Percent Passing
28	100
19	90 – 100
9.5	0 – 40
4.75	0 – 10

- .5 Unshrinkable fill: proportioned and mixed to provide:
  - .1 Maximum compressive strength of 0.4 MPa at 28 days.
  - .2 Maximum cement content of 25 kg/m<sup>3</sup>.
  - .3 Minimum strength of 0.07 MPa at 24 h.
  - .4 Concrete aggregates: to CSA-A23.1/A23.2.
  - .5 Cement: Type GU.
  - .6 Slump: 160 to 200 mm.
- .6 Geotextiles: to Section 31 32 19.01 - Geotextiles.

**Part 3 Execution**

**3.1 TEMPORARY EROSION AND SEDIMENTATION CONTROL**

- .1 Provide temporary erosion and sedimentation control measures to prevent soil erosion and discharge of soil-bearing water runoff or airborne dust to adjacent properties according to requirements of authorities having jurisdiction.
- .2 Inspect, repair, and maintain erosion and sedimentation control measures during construction until permanent vegetation has been established.
- .3 Remove erosion and sedimentation controls and restore and stabilize areas disturbed during removal.

**3.2 SITE PREPARATION**

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

**3.3 PREPARATION/PROTECTION**

- .1 Keep excavations clean, free of standing water, and loose soil.
- .2 Where soil is subject to significant volume change due to change in moisture content, cover and protect to Departmental Representative approval.
- .3 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.
- .4 Protect buried services that are required to remain undisturbed.

**3.4 STRIPPING OF TOPSOIL AND STOCKPILING**

- .1 Do topsoil stripping and stockpiling in accordance with Section 31 14 13 – Soil Stripping and Stockpiling.

**3.5 COFFERDAMS, SHORING, BRACING AND UNDERPINNING**

- .1 Maintain sides and slopes of excavations in safe condition by appropriate methods and in accordance with the Provincial Health and Safety Act.
- .2 Obtain permit from authority having jurisdiction for temporary diversion of water course if required.
- .3 Construct temporary Works to depths, heights and locations as approved by Departmental Representative.
- .4 During backfill operation:
  - .1 Unless otherwise indicated or directed 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.

### **3.6 DEWATERING AND HEAVE PREVENTION**

- .1 Keep excavations free of water while Work is in progress.
- .2 Provide for Departmental Representative approval the 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 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, geotubes or other treatment methods and 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 7 days in advance of excavation operations.
- .2 Excavate to lines, grades, elevations and dimensions as indicated.
- .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, do not excavate more than 30 m of trench in advance of installation operations. All excavations shall be filled at end of work day prior to leaving site.
- .6 Keep excavated and stockpiled materials safe distance away from edge of trench as directed by Departmental Representative.
- .7 Restrict vehicle operations directly adjacent to open trenches.
- .8 Dispose of surplus and unsuitable excavated material in approved location.

- .9 Do not obstruct flow of surface drainage or natural watercourses.
- .10 Earth bottoms of excavations to be undisturbed soil, level, free from loose, soft or organic matter.
- .11 Notify Departmental Representative when bottom of excavation is reached.
- .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:
  - .1 Fill under bearing surfaces and footings with Type 2 granular fill compacted to not less than 100% of SPMDD.
  - .2 Fill under other areas with Type 2 granular or common fill compacted to not less than 95 % of SPMDD.
- .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.
  - .2 Clean out rock seams and fill with concrete mortar or grout to approval of Departmental Representative.
- .16 Install geotextiles in accordance with Section 31 32 19.01 - Geotextiles.

### **3.8 FILL TYPES AND COMPACTION**

- .1 Use types of fill as indicated or specified below.
  - .1 Exterior side of structure walls: use Type 2 granular fill to subgrade level. Compact to 95% of SPMDD.
  - .2 Under concrete slabs: use Type 2 granular fill to underside of base course for concrete slabs. Compact to 98 % of SPMDD.
  - .3 Under concrete slabs: provide 150 mm compacted thickness base course of Type 1 granular fill to underside of slab. Compact base course to 98 % SPMDD.
  - .4 Place unshrinkable fill in areas as indicated.

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

- .1 Hand place material in uniform layers not exceeding 150 mm compacted thickness as indicated.
- .2 Place bedding and surround material in unfrozen condition.

### **3.10 BACKFILLING**

- .1 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.
- .2 Areas to be backfilled to be free from debris, snow, ice, water and frozen ground.
- .3 Do not use backfill material which is frozen or contains ice, snow or debris.
- .4 Place backfill material in uniform layers not exceeding 150 mm compacted thickness up to grades indicated. Compact each layer before placing succeeding layer.
- .5 Backfilling around installations:
  - .1 Place bedding and surround material as specified elsewhere.
  - .2 Do not backfill around or over cast-in-place concrete within 24 hours after placing of concrete.
  - .3 Place layers simultaneously on both sides of installed Work to equalize loading. Difference not to exceed 300 mm.
- .6 Place unshrinkable fill in areas as indicated.
- .7 Consolidate and level unshrinkable fill with internal vibrators.

### **3.11 TESTING**

- .1 Quality control testing of bedding, surround and backfill shall be carried out and paid for by the Contractor. Submit satisfactory compaction testing results to Departmental Representative for review and approval as results become available.
- .2 Departmental Representative may conduct quality assurance testing at own cost to verify testing results of contractor.

### **3.12 RESTORATION**

- .1 Replace topsoil as indicated.
- .2 Reinstate lawns to elevation which existed before excavation.
- .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 as directed by Departmental Representative.
- .5 Use temporary plating to support traffic loads over unshrinkable fill for initial 24 hours.
- .6 Protect newly graded areas from traffic and erosion and maintain free of trash or debris.

**END OF SECTION**