

**Part 1 General**

**1.1 REFERENCES**

- .1 American Society for Testing and Materials (ASTM)
  - .1 ASTM D698-91(1998), Test Method for Laboratory Compaction Characteristics of Soil Using Standard Effort (600 kN-m<sup>3</sup>).

**1.2 EXISTING CONDITIONS**

- .1 Verify location of underground and surface utility lines and buried objects prior to construction.
- .2 Refer to dewatering in Section 31 23 10 - Excavating Trenching and Backfilling.

**1.3 PROTECTION**

- .1 Maintain access roads to prevent accumulation of construction related debris on roads.

**Part 2 Execution**

**2.1 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 Engineer.
- .2 Commence topsoil stripping of areas as indicated after area has been cleared of brush and removed from site.
- .3 Strip topsoil to depths as indicated.
- .4 Stockpile in locations as required.
- .5 Dispose of unused topsoil.

**2.2 GRADING**

- .1 Rough grade to levels, profiles, and contours allowing for surface treatment as indicated.
- .2 Grade ditches to depth as indicated.
- .3 Compact filled and disturbed areas to maximum dry density to ASTM D698, as follows:
  - .1 85% under landscaped areas.
  - .2 95% under paved and walk areas.
- .4 Do not disturb soil within branch spread of trees or shrubs to remain.

**2.3 SURPLUS MATERIAL**

- .1 Remove surplus material and material unsuitable for fill, grading or landscaping.

**END OF SECTION**

**Part 1 General**

**1.1 SCOPE**

- .1 This section includes the furnishing of all equipment, labour and materials for performing all operations necessary to complete:
  - .1 Excavation of all types of material encountered for structures, including trenches for pipelines and appurtenances inside and outside the structures.
  - .2 Backfilling and compaction of excavated and imported fill types for structures and site, including trenches.
  - .3 Sheet piling, shoring, trench box and bracing to support trench walls, sides of excavations, existing structures or utilities.
  - .4 Disposal of unsuitable and surplus materials.

**1.2 RELATED WORK**

- .1 Section 03 30 00 – Cast-In-Place Concrete.

**1.3 DEFINITIONS**

- .1 Solid Rock:
  - .1 Material excavated from solid masses of igneous, sedimentary or metamorphic rock which, prior to its removal, was integral with its parent mass, which cannot be excavated with a CAT 235 excavator with a ripper or its equivalent.
  - .2 Boulders or rock fragments having individual volume in excess of 1 cubic meter.
- .2 Common Material:
  - .1 Materials of whatever nature, which are not included under the definition of solid rock, including dense tills, hardpan, frozen materials and partially cemented materials which can be ripped and excavated with a CAT 235 excavator with a ripper or its equivalent.
- .3 Topsoil:
  - .1 Material capable of supporting good vegetative growth and suitable for use in top dressing, landscaping and seeding.
- .4 DTIR:
  - .1 Refers to latest edition of the PEI Department of Transportation and Infrastructure Renewal Specifications for Highway Construction.

**1.4 PROTECTION**

- .1 Existing Buried Utilities:
  - .1 Prior to commencing any excavation work, notify the Owner or Utility Authorities, establish location and state of use of buried services. Clearly mark such locations to prevent disturbance during work.
  - .2 Maintain and protect from damage water, sewer, gas, electric, telephone and other utilities encountered.
  - .3 Obtain direction of Owner or Utility before moving or otherwise disturbing utility.
- .2 Existing Surface Features:
  - .1 Protect existing buildings, trees, and other plants, lawns, fencing, survey monuments, property pins, service poles, wires, surface features to remain and

- paving located within right-of-ways or adjoining properties from damage while work is in progress and repair damage resulting from work.
- .2 Where excavation necessitates root or branch cutting, do so only as approved by Engineer.
  - .3 Shoring and Bracing:
    - .1 Whenever shoring, sheeting, timbering and bracing of excavations is required, engage services of a Professional Engineer to design and assume responsibility for adequacy of shoring and bracing.
    - .2 When requested, submit for review drawings and calculations signed and stamped by the Professional Engineer responsible for their preparation.
    - .3 Shoring and bracing shall be inspected by the Professional Engineer responsible for their preparation.
    - .4 Closed sheeting, when required, shall be designed and constructed to prevent adjacent soil from entering excavation and to control water infiltration.
    - .5 Protect open excavation against flooding and damage from surface water runoff.

**Part 2 Products**

**2.1 MATERIALS**

- .1 Type 1 Fill:
  - .1 Common term: Class "A" Gravel. (Imported)
  - .2 Aggregate Quality: sound, hard, durable material free from soft, thin, elongated or laminated particles, organic material or other deleterious substances.
  - .3 Flat and elongated particles are those whose greatest dimension exceeds five times their least dimension.
  - .4 Type 1 Fill shall meet the following requirements:
    - .1 Gradation to be within the following limits when tested to ASTM C136 and giving a smooth curve without sharp breaks and when plotted on a semi-log grading chart.

<u>ASTM Sieve Designation</u>	<u>% Passing by Mass</u>
31.5 mm	100
25.0 mm	95 - 100
12.5 mm	50 - 83
4.75 mm	30 - 60
1.18 mm	15 - 40
600 um	10 - 32
300 um	5 - 22
75 um	3 - 9

- .5 Los Angeles Abrasion to ASTM C131 maximum percent loss by mass: 35.

- .6 The crushed material shall be a minimum of 75 percent by mass retained on a 4.75 mm sieve having 2 or more mechanically fractured faces.
- .7 Petrographic number (max.): 150 (as per PEI Dept. of Transportation and Infrastructure Renewal Standards).
- .8 A minimum of 13 percent retained between the 4.75 mm and 600 um sieves.

.2 Type 2 Fill:

- .1 Common Term: Select Borrow
- .2 Type 4 Fill shall be composed of clean uncoated particles free from lumps of clay and other deleterious material.
- .3 Type 4 Fill shall have a maximum particle size of 100 mm.
- .4 A maximum of 25 percent of the material passing the 4.75 mm sieve shall pass the 75 um sieve.

.3 Type 3 Fill:

- .1 Common Term: Sand.
- .2 Type 5 Fill shall be a clean, washed, coarse sand, free from clay, shale or organic matter.
- .3 Type 5 Fill shall meet the following requirements:
  - 1. Gradation to be within the following limits when tested to ASTM C136 and giving a smooth curve without sharp breaks and when plotted on a semi-log grading chart.

<u>ASTM Sieve Designation</u>	<u>% Passing by Mass</u>
9.5 mm	100
2.36 mm	80 – 90
600 um	25 – 75
300 um	10 – 35
150 um	0 – 17
75 um	0 – 5

.4 Type 4 Fill:

- .1 Common Term: Common Borrow.
- .2 Type 4 Fill shall be material excavated on site or other sources that is free from organic and frozen material and no stones or rocks shall have any dimension greater than 100 mm.
- .3 A maximum of 35% passing the 75 um sieve.
- .4 Regardless of the properties, use of common borrow shall be subject to approval of the Engineer.

**Part 3 Execution**

**3.1 STOCKPILING**

- .1 Stockpile fill materials in area designated by the Owner. Stockpile granular materials in

manner to prevent segregation.

- .2 Protect fill materials from contamination.
- .3 Protect fill materials from freezing.
- .4 In addition to above, follow DTIR General Provisions for Highway Construction Manual for excavation, processing, handling and stockpiling.

### 3.2 DEWATERING

- .1 Keep excavations dry while work is in progress.
- .2 Protect open excavations, trenches and completed installations against drainage due to rainwater, surface runoff, spring water, groundwater and all other water. Provide silt fencing and equipment as necessary for such protection. Refer to Section 01 35 43.
- .3 Dispose of water in a manner not detrimental to public health, environment, public and private property, or any portion of the work completed or under construction.

### 3.3 EXCAVATION

- .1 Excavate to lines, grades, elevations and dimensions as indicated and to complete the work.
- .2 Excavation must not interfere with normal 45 degree splay of bearings from bottom of any footing unless directed by the Structural Engineer.
- .3 Saw pavement or sidewalk neatly along limits of proposed excavation in order that surface may break evenly and cleanly.
- .4 Notify Structural Engineer when soil at proposed elevation of trench bottom appears unsuitable for foundation of installation.
- .5 Remove unsuitable material from bottom of excavation to extent and depth as directed by the Structural Engineer.
- .6 Unless otherwise authorized by the Engineer in writing, do not excavate more than 30m of trench in advance of installation operations. Trenching is to be covered over at the end of each day's Work.
- .7 Stockpile suitable excavated materials required for trench backfill in approved location.
- .8 Dispose of surplus and unsuitable excavated material off site.
- .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. Tamp the bottom of excavation before placing the concrete for footings.
- .11 Where required, due to unauthorized over excavation, correct as follows:
  - .1 Fill under bearing surfaces and footings with concrete specified for footings.
  - .2 Fill under other areas with Type 5 Fill compacted to a minimum of 100% maximum dry density to ASTM-D698.

- .12 Hand trim, make firm and remove loose material and debris from excavations. Where material at bottom of excavation is disturbed, compact foundation soil to density at least equal to undisturbed soil.
- .13 Rock Excavation – For the purpose of bidding, it is assumed that solid rock will not be encountered during the work of this section.

### 3.4 FILL TYPES AND COMPACTION

- .1 Except where otherwise noted, compact all fill types to 100% Standard Proctor Density.
- .2 Use fill of types indicated or specified below (dimensions specified in the following items are minimum dimensions after compaction).
  - .1 Under Concrete Slab within Building Area:
    - .1 Within building area: use Type 2
    - .2 Place Type 2 fill as required to attain required grade.
    - .3 Place 100 mm of Type 1 fill under all areas within building area (UNO). Add insulation as required. Do not permit Type 1 fill to become saturated.
    - .4 Place vapour barrier to underside of concrete slab. (See drawings for details.) Adjust construction technique as required to ensure vapour barrier is not damaged at any time.
  - .3 Under Exterior Concrete Pads:
    - .1 as per drawings.
  - .4 Exterior Side of Perimeter Walls:
    - .1 Unless other materials are specified elsewhere, place Type 2 fill from underside of footing elevation to underside of surface material (ie., to underside of topsoil elevation) for the entire perimeter of the building.

### 3.5 BACKFILLING

- .1 Use approved common or granular backfill material as indicated or directed.
- .2 Areas to be backfilled to be free from debris, snow, ice, water or 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 thicknesses up to grades indicated. Compact each layer before placing succeeding layer.
- .5 Backfilling around installations:
  - .1 Do not backfill around or over cast-in-place concrete within 24 hours after placing and until Structural Engineer has inspected the installation.
  - .2 Place layers simultaneously on both sides of installed work to equalize loading.
  - .3 Areas to be backfilled to be free from debris, snow, ice, water or frozen ground material by hand under, around and over installations until 300 mm of cover is provided. Dumping material directly on installations will not be permitted.
- .6 Where temporary unbalanced earth pressures are liable to develop on walls or other

structures:

- .1 Permit concrete to cure for minimum 14 days or until it has sufficient strength to withstand earth and compaction pressure and approval obtained from the Structural Engineer.
- .2 If approved by the Engineer, erect bracing or shoring to counteract unbalance and leave in place until removal is approved by Engineer.
- .7 Compact common backfill materials where permissible:
  - .1 In non-pavement areas, to a density at least equal to density of adjacent, undisturbed soil.
  - .2 In pavement areas, compact to 100% Standard Proctor.
- .8 Compact using approved mechanical tamping devices, or by hand tamping to achieve specified compaction.

### 3.6 INSPECTION AND TESTING

- .1 Owner will pay costs for inspection and testing, in accordance with Section 01 29 83, Testing Laboratory Services.

### 3.7 RESTORATION

- .1 Upon completion of work, remove surplus materials and debris, trim slopes and correct defects noted by the Construction Manager.
- .2 Reinstate pavement and sidewalks to condition and elevation which existed before trenching.
- .3 Clean and reinstate areas affected by the work.

### 3.8 WINTER PROTECTION

- .1 Protect footing trenches, wall footings and spread footings from cold weather. Protection to be equivalent to four feet of protection, including soil and insulations. Provide required protection to prevent frost penetration before trenches are filled.

END OF SECTION