

## **1. General**

### **1.1 Section Includes**

- 1.1.1 The requirements for trench excavation and backfill for the installation of pipelines, conduits, valves and other appurtenances.
- 1.1.2 The requirements for the excavation and backfilling within the footprint of buildings or structures and for distances of two (2) meters beyond the perimeter.
- 1.1.3 The requirements for the backfill from sub-grade level to within 250 mm below finished floor grade in fill.

### **1.2 Related Sections**

Section 01 33 00 – Submittal Procedures.  
Section 03 30 00 – Cast-In-Place Concrete.  
Section 26 05 34 – Conduits, Conduit Fastenings and Conduit Fittings.  
Section 33 11 16 – Site Water Utility Distribution Piping.  
Section 33 31 13 – Sanitary Utility Sewage Piping.  
Section 33 34 00 – Sanitary Utility Sewage Force Mains.

### **1.3 References**

- 1.3.1 ASTM C 117- 87, Test Method for Material Finer Than: 0.075 mm Sieve in Mineral Aggregates by Washing.
- 1.3.2 ASTM C 136- 84a, Method for Sieve Analysis of Fine and Coarse Aggregates.
- 1.3.3 ASTM D 698-78, Test Methods for Moisture Density Relations of Soils and Soil Aggregate Mixtures Using 2.49 kg Rammer and 304.8 mm Drop.
- 1.3.4 ASTM D1557-78, Test Methods for Moisture Density Relations of Soils and Soil-Aggregate Mixtures Using 4.54 kg Rammer and 457 mm Drop.
- 1.3.5 CAN/CGSB-8.2-M88, Sieves, Testing, Woven Wire, Metric.

### **1.4 Definitions**

#### **1.4.1 Waste material:**

- Excavated material unsuitable for use in work or surplus to requirements.

#### **1.4.2 Topsoil:**

- Material capable of supporting good vegetative growth and suitable for use in top dressing, landscaping and seeding.

- 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 mm any dimension.

1.4.3 Borrow material:

- Material obtained from locations outside area to be graded, and required for construction of fill areas or for other portions of work.

1.4.4 Unsuitable material:

- Organic overburden as indicated in the test pit logs.
- In-situ granular materials having silt content of greater than 20%, i.e. passing 0.075 mm sieve.
- Weak and compressible materials under excavated areas.
- Frost susceptible materials under excavated areas.

1.4.5 Common excavation:

- Excavation of materials of whatever nature, which are not included under definitions of rock excavation, including dense tills, hardpan, frozen materials, soft or previously blasted rock which can be ripped and excavated with heavy construction equipment.

1.4.6 Rock excavation:

- Excavation of materials from solid beds or masses of igneous, sedimentary or metamorphic rock which, prior to its removal was integral with its parent mass, and which cannot normally be excavated without blasting, and boulders or rock fragments having individual volume in excess of 1.0 m<sup>3</sup> determined from three mutually perpendicular dimensions.

**1.5 Submittals**

1.5.1 Make submittals: in accordance with Section 01 33 00 – Submittal Procedures.

1.5.2 Quality Control.

- Submit to the Departmental Representative written notice at least seven (7) days prior to the start of excavation work.
- Submit to the Departmental Representative, written notice of excavation to sub-grade and request, in writing, Departmental Representative's written acceptance of sub-grade conditions.
- Submit to the Departmental Representative all testing and inspection results and reports as described in Part 3 of this Section.

1.5.3 Samples:

- Submit samples in accordance with Section 01 33 00 – Submittal Procedures.
- Inform the Departmental Representative at least one (1) week prior to commencing work, of proposed source of imported fill materials and provide access for sampling by testing agency.
- Submit 70 kg samples of type of fill specified including representative samples of excavated material.
- Ship samples prepaid to designated testing laboratory, in tightly closed containers to prevent contamination.

**1.6 Waste Management and Disposal**

- 1.6.1 Separate waste materials for reuse and recycling in accordance with Section 01 74 21 – Construction/Demolition Waste Management and Disposal.

**1.7 Existing Conditions**

- 1.7.1 Examine soil reports available from the Departmental Representative.

1.7.2 Buried Services:

- Before commencing work verify the location of buried services on the site.
- Arrange with the owner for relocation of buried services that interfere with the execution of the work.
- Remove obsolete buried services and cap cut-offs.
- Prior to beginning excavation Work, notify applicable authorities having jurisdiction to establish location and state of use of buried utilities and structures. Authorities having jurisdiction to clearly mark such locations to prevent disturbance during Work.
- Confirm locations of buried utilities by careful test excavations.
- Maintain and protect from damage, water, sewer, electric and other utilities and structures encountered.
- Where utilities or structures exist in area of excavation, obtain direction from the Departmental Representative and authorities having jurisdiction prior to commencement of Work. The costs of re-routing and moving of any utilities shall be paid by the Owner.
- Record the location of maintained, re-routed and abandoned underground utilities.

## **2. Products**

### **2.1 Materials**

#### **2.2 Type 1 and Type 2 Bedding specified requirements:**

- Clean, hard, durable sand, gravel or crushed stone, free from shale, clay, friable materials, organic matter or other deleterious substances and graded as per the following limits.
- Gradations to be within limits specified when tested to ASTM C 136 and ASTM C 117. Sieve sizes to CAN/CGSB-8.1.

**Table: Bedding Materials**

<b>ASTM Designation</b>	<b>Sieve</b>	<b>Type 1 Bedding % Passing</b>	<b>Type 2 Bedding % Passing</b>
25.000 mm		100	-
19.000 mm		75-100	-
9.500 mm		50-100	100
4.750 mm		30-70	50-100
2.000 mm		20-45	30-90
0.425 mm		10-25	-
0.075 mm		3-8	0-10

##### **2.2.1 Backfill Material:**

- Selected material from excavation or other sources, approved by Departmental Representative for use intended, unfrozen and free from rocks larger than 150 mm, cinders, ashes, sods, refuse or other deleterious materials. Backfill material reused from the excavation will not be measured for payment. Imported Backfill Material will be paid as per the unit price for Imported Common Backfill in the Schedule of Quantities and Prices.

##### **2.2.2 Rock Under Bedding:**

- Durable crushed rock containing approximately 100 mm maximum particle size and consisting of angular fragments obtained by breaking or crushing solid or natural rock, reasonably free from thin, elongated particles. Free from organics and other objectionable material, and not more than 10 % by mass passing the #63 Canadian Metric Sieve.

##### **2.2.3 Marking Tape:**

- Heavy Gauge Polyethylene, 150 mm wide indicating the type of service buried.

**3. Execution**

**3.1 Temporary Erosion and Sedimentation Control**

- 3.1.1 Provide temporary erosion and sedimentation control measures to prevent soil erosion and discharge of soil-bearing water runoff or airborne dust to adjacent properties, water bodies and watercourses.
- 3.1.2 Inspect, repair, and maintain erosion and sedimentation control measures during construction.
- 3.1.3 Remove erosion and sedimentation controls and restore and stabilize areas disturbed during removal.

**3.2 Site Preparation**

- 3.2.1 Remove all obstructions, including ice and snow, from surfaces to be excavated. No separate payment will be made for this item.

**3.3 Preparation/Protection**

- 3.3.1 Protect existing features in accordance with applicable health, safety and environmental regulations.
- 3.3.2 Keep excavations clean, free of standing water, and loose soil.
- 3.3.3 Protect buried services that are required to remain undisturbed.

**3.4 Stripping of Topsoil**

- 3.4.1 Begin topsoil stripping of areas upon approval of Departmental Representative after the area has been cleared of brush and all grubbed material has been removed from the site.
- 3.4.2 Strip topsoil to depths indicated or as directed by the Departmental Representative. Do not mix topsoil with subsoil.
- 3.4.3 Stockpile topsoil in locations indicated or as directed by the Departmental Representative for reuse in other portions of the Work. Stockpiles to be protected from erosion.

**3.5 Stockpiling**

- 3.5.1 Stockpile fill materials in approved areas. Stockpile granular materials in manner to prevent segregation.
- 3.5.2 Protect fill materials from contamination.

**3.6 Cofferdams, Shoring, Bracing and Underpinning**

- 3.6.1 Maintain sides and slopes of excavation in safe condition by appropriate methods and in accordance with Section 01 35. 29.06 – Health and Safety Requirements, and the Occupational Health and Safety Act for the Province of Newfoundland and Labrador, the more stringent conditions to apply.

**3.7 Dewatering**

- 3.7.1 Maintain a copy of all permits and letters of advice on site at all times, readily available for review by the Departmental Representative and regulatory agencies.
- 3.7.2 Prior to the start of excavation carefully review and adhere to the conditions of the permits or letters of advice, if applicable, that outlines the precautions necessary to maintain and protect the integrity of all environmental and fisheries habitat.
- 3.7.3 Keep excavations free of water while work in progress.
- 3.7.4 Take adequate precautions when excavating below groundwater table. Construct ditches and pits to keep water below excavation level.
- 3.7.5 Protect open excavations against flooding and damage due to surface run-off.

**3.8 Excavation**

- 3.8.1 All excavation work as per Occupational Health and Safety Guidelines or the site specific Health and Safety Plan, more stringent conditions to apply.
- 3.8.2 Advise Departmental Representative at least seven (7) days in advance of excavation operations.
- 3.8.3 Excavate to lines, grades, elevations and dimensions as indicated.
- 3.8.4 For trench excavation, unless otherwise authorized in writing by the Departmental Representative, do not excavate more than 30 m of trench in advance of installation operations and do not leave open more than 15 m at the end of each day's operation.
- 3.8.5 Restrict vehicle operations directly adjacent to open trenches.
- 3.8.6 Stockpile surplus and unsuitable excavated material at an approved location on site.
- 3.8.7 Earth bottoms of excavations to be undisturbed soil, level, free from loose, soft or organic matter.
- 3.8.8 Notify the Departmental Representative when bottom of excavation is reached.
- 3.8.9 Obtain Departmental Representative approval of completed excavation prior to installation of granular bedding or pipe.

- 3.8.10 Remove unsuitable material from trench bottom to extent and depth as directed by Departmental Representative. Bring bottom of excavation to design grade with approved Backfill Material or Rock Under Bedding as directed by the Departmental Representative.
- 3.8.11 Correct unauthorized over-excavation as follows:
- Fill with Type 2 Bedding compacted to not less than 95% of maximum Standard Proctor dry density.
- 3.8.12 No separate payment will be made for over-excavation by the Contractor or for the granular material and compaction required to bring the excavation back to design grade.
- 3.8.13 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.

### **3.9 Backfilling**

- 3.9.1 Vibratory compaction equipment: To be approved by the Departmental Representative.
- 3.9.2 Do not proceed with backfilling operations until Departmental Representative has inspected and approved excavated surface.
- 3.9.3 Areas to be backfilled to be free from debris, snow, ice, water or frozen ground.
- 3.9.4 Do not use backfill material which is frozen or contains ice, snow or debris.
- 3.9.5 Place bedding and backfill materials in uniform layers not exceeding 150 mm compacted thickness to grades indicated. Use vibratory roller/compactors or mechanical tampers to compact each layer of material.

### **3.10 Restoration**

- 3.10.1 Upon completion of work, remove waste materials and debris, trim slopes, and correct defects as directed by the Departmental Representative.
- 3.10.2 Clean and reinstate areas affected by work as directed by the Departmental Representative.

## **4. Measurement and Basis for Payment**

### **4.1 Measurement for Payment**

- 4.1.1 Trench excavation shall be measured in cubic meters in its original position. Payment per cubic meter of excavation will include backfilling and compaction with excavated

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- trench material, disposal of waste material off site, and the placing of excess excavated material at another location on the site.
- 4.1.2 In areas requiring excavation, the Contractor shall survey the pertinent elevations for the purposes of calculating excavation and backfill quantities, prior to commencing the excavation operations.
- 4.1.3 This Section does not cover mass excavation or mass backfill. These items are covered under separate Sections.
- 4.1.4 For payment purposes the trench length for piping shall be measured up to but not including any structures. Any excavation and backfill required for the installation of structures is deemed to be included in the supply and installation unit price for these structures in the Schedule of Quantities and Prices.
- 4.1.5 Sanitary and Water Line Installation
- The excavation parameters for underground main line and service piping shall be as follows:
    - ♦ Depth: Measured from the top of sub grade within road limits and from finished grade outside of road limits. It shall be measured to the installed grade at the bottom of the trench as shown on the Contract Drawings.
    - ♦ Width: Subject to the parameters outlined in the following note for this section, the width of main trench allowed for measuring purposes shall be the sum of the nominal diameters of the pipe in the trench plus 600 mm. In the case of service pipes the width of the trench allowed shall be 1000 mm.
    - ♦ The minimum width of the main trench shall be: 1500 mm where the average depth is 0 to 4 m; 2000 mm where the average depth is greater than 4 m to 6 m; 2500 mm where the average depth is greater than 6 m. The average depth shall be calculated on sanitary sewer lines between fittings and at 10 m intervals along the water main trench. The width of the service trench shall increase by 500 mm where the average depth is greater than 4 m and by an additional 500 mm where the average depth is greater than 6 m.
- 4.1.6 If unsuitable or waste material has been encountered during the excavation process and there is a requirement for the importation of common backfill material, then this material, including compaction, shall be measured in cubic meters based on the actual calculated quantities required to bring the excavation to the lines and grades as shown on the Contract Documents.
- 4.1.7 Excavation of unsuitable or waste material within the trench shall be measured in cubic meters based on the actual calculated quantities required to bring the excavation to the lines and grades as shown on the Contract Documents and will include its' disposal and shall be paid under common excavation unit price quoted in the Schedule of Quantities and Prices.
- 4.1.8 Shoring, bracing, trench boxes, cofferdams, underpinning and dewatering of the excavations are considered to be incidental to the work and will not be measured for payment.



4.1.9 Measurements for payment shall be made for the supply and installation of granular bedding for pipes. The length, width and depth shall be that as shown on the Contract Documents or as directed by the Departmental Representative. The volume of pipe installed will be subtracted from the L x W x D volume.

4.1.10 Sewer forcemain marking tape will be paid by the linear meter installed.

4.1.11 Water line marking tape will be paid by the linear meter installed.

#### **4.2 Basis for Payment**

4.2.1 Unless otherwise noted, all costs associated with work specified in this Section shall be deemed to be included in the appropriate unit and lump sum price quoted in the Schedule of Quantities and Prices.