

This specification outlines the requirements for excavation and backfill for the installation of pipe lines, conduits and appurtenances.

REFERENCES

This specification refers to the following standards, specifications, or publications:

ASTM International

- C117-13 Standard Test Method for Materials Finer than 75-muem (No.200) Sieve
in
Mineral Aggregates by Washing
- C136-06 Standard Test Method for Sieve Analysis of Fine and Coarse Aggregates
- D698-12 Standard Test Methods for Laboratory Compaction Characteristics of Soil
Using
Standard Effort (12 400 ft-lbf/ft³ (600 kN-m/m³)), Method D

PART 1 - GENERAL

1.1 MEASUREMENT FOR PAYMENT

- .1 Excavation to be measured in cubic metres in their original position and based on theoretical trench conditions. Payment for excavation shall include backfill with imported washed crushed stone pipe bedding material, backfill with existing excavated material, compaction, disposal of waste material off site, placing of excavated material at another location on site and all other items as outlined in this section. All excavation shall be considered as mass common excavation, and supply and placement of washed crush stone for the pipe bedding shall be considered as imported mass common fill, as per the description in the Combined Price Form.
- .2 Before commencing any excavation, take levels and cross-sections of the original ground surface and agree upon them with the Engineer.
- .3 Excavated quantities measured to be theoretical volume removed within the following limits unless otherwise detailed in this specification:
 - .1 Depth: Measured from original ground, less a deduction of 150 mm when grubbing required, to installed grade at bottom of trench as shown on the drawings. In areas of specified mass excavation, trench depth will be measured from the new ground elevation established after mass excavation.
 - .2 Width: Subject to subsection 1.6.3 of this specification, the width of main trench allowed for measuring purposes shall be the sum of the nominal diameters of the pipe in the trench plus pipe insulation plus 600 mm. In the case of service pipes the width of trench allowed shall be 1000 mm.

- .3 The minimum width of 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 between manholes on sewer line or at 100 m intervals along water main only trench. The width of 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.
- .5 Extra excavation required for manholes and/or the deflection of water mains and/or storm sewer pipes at manholes or other structures will be deemed to be included in the Contract Unit Price for trench excavation and backfill as detailed above. Trench width for measurement purposes will be that required for the number and size of pipes as specified, and assumed as one trench passing continuously through the manhole or other structures. Deflected pipes at or around structures will not be considered as separate trenches for measurement and payment purposes.
- .6 When rock is exposed by stripping the common material, the rock surface will be profiled. When rock is to be excavated by drilling from ground level, then rock will be measured by inspection of the sides of the excavation by measuring the height of the over burden on top of the rock.
- .7 Imported common backfill, specifically the washed crushed stone required for the pipe bedding, including compaction to be measured in cubic metres based on theoretical paylines for trenching.
- .8 Excavation and disposal of waste material to be paid under common excavation.
- .10 Sheet piling and bracing left in place on direction of the Engineer will be measured in square metres of surface area of plane surface of sheet piling.
- .11 Shoring, bracing, trench boxes, cofferdams, underpinning and de-watering of excavation will be incidental to work and will not be measured separately.
- .12 When separate payment is specified or indicated in the Schedule of Quantities and Prices for granular materials for pipe bedding and backfill, measurement widths and lengths shall be as specified for trench excavation and backfill. Measurement depth shall be actual depth installed up to limits shown on the contract drawings or as specified in this specification.
- .13 Rock underbedding will be measured compacted in place according to theoretical paylines specified and depth required. Payment includes all additional costs associated with type of materials and greater excavation depths required.

PART 2 - PRODUCTS

2.1 MATERIALS

- .1 Washed Crush Stone: gravel or crushed stone, free from shale, clay, friable materials, organic matter and other deleterious substances when tested to ASTM C136-06 and ASTM C117-13 and giving a smooth curve without sharp breaks when plotted on a semi-log grading chart. Minimum granular size of 19 mm, with maximum size of 60 mm.
- .2 Backfill Material: selected material from excavation or other sources, approved by the Engineer for use intended, unfrozen and free from rocks larger than 200 mm, cinders, ashes, sods, refuse or other deleterious materials.
- .3 Rock underbedding: Crushed stone consisting of durable crushed rock approximately 100 mm maximum size and consisting of angular fragments obtained by breaking and crushing solid or natural rock, reasonably free from thin, flat elongated or other objectionable pieces and fines. Material not to contain any organic soil or objectionable matter with not more than 10% by mass passing the #63 Canadian Metric sieve, including parties adhering to larger stone particles.

PART 3 - EXECUTION

3.1 SITE PREPARATION

- .1 Remove obstructions, ice and snow, from surfaces to be excavated within limits indicated.
- .2 Strip topsoil from within limits of excavation and stockpile as directed by the Engineer, for re-spreading after backfilling or for reinstatement in other parts of the work.
- .3 Cut pavement or side walk neatly along limits of proposed excavation or as specified in order that surface may break evenly and cleanly.

3.2 COFFERDAMS, SHORING, BRACING AND UNDERPINNING

- .1 Construct temporary works to depths, heights and locations as indicated or directed by the Engineer.
- .2 During backfill operation:
 - .1 Unless otherwise indicated or directed by the Engineer, remove sheeting and shoring from excavation.
 - .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 an elevation at least 500 mm above toe of sheeting.
 - .3 When sheeting is required to remain in place, cut off tops at elevations indicated or directed by the Engineer.
 - .4 Upon completion of substructure construction:
 - .1 Remove cofferdams, shoring and bracing.
 - .2 Remove excess materials from site and restore water courses to conditions indicated or as directed by the Engineer.
 - .5 Obtain permit from authority having jurisdiction for diversion of water course.

3.3 DEWATERING

- .1 Keep excavations free of water while work is in progress.
- .2 Protect open excavations against flooding and damage due to surface run-off.
- .3 Dispose of water in a manner not detrimental to public and private property, or any portion of work completed or under construction. Comply with all requirements of the Department of Environment and Climate Control and other regulatory agencies having jurisdiction regarding disposal of water from excavations.
- .4 Submit for the Engineer's review, details of proposed dewatering methods, such as dikes or well points.
- .5 Provide flocculation tanks, settling basins, or other treatment facilities to remove suspended solids or other materials before discharging to storm sewers, water courses or drainage areas.
- .6 Do not dewater during placing of concrete, or for a period of at least 24 hours thereafter, unless from a pump separated from concrete work by a watertight wall or other effective means.
- .7 Construct all sub-drains, sump holes, wells or the like required for dewatering the excavations so as not to endanger in any way the stability of the Works, and on completion of the work completely backfill and consolidate these excavations.

3.4 EXCAVATION

- .1 Advise the Engineer in advance of excavation operations to enable original cross sections to be taken.
- .2 Excavate to lines, grades, elevations and dimensions indicated.
- .3 Cut pavement or side walk neatly in a line along limits of proposed excavation or as specified in order that surface may break evenly and cleanly. The width removed along the normal trench for the installation of the pipe shall not exceed the width of the trench specified by more than 500 mm on each side of the trench. The width and length of the area removed for the installation of gate valves, specials, manholes, or other structures shall not exceed the maximum linear dimensions of such structures by more than 500 mm on each side. Wherever, in the opinion of the Engineer, existing conditions make it necessary or advisable, remove additional pavement, as directed by the Engineer, and receive extra compensation provided such additional work is not shown in the drawings or specified. Removal or damage to pavement or surfaces beyond these limits, shall be replaced or repaired at the expense of the Contractor.
- .4 Remove concrete, masonry, paving, walks, demolished foundations and rubble and other obstructions encountered during excavation.
- .5 Do not disturb soil within branch spread of trees or shrubs that are to remain. If excavating through roots, excavate by hand and cut roots with sharp axe or saw. Seal cuts with approved tree wound dressing.
- .6 Unless otherwise authorized by the Engineer 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 Dispose of waste material in accordance with Owner's requirements as indicated. The Engineer shall define waste material.
- .8 Do not obstruct flow of surface drainage or natural watercourses.
- .9 Earth bottoms of excavations to be undisturbed soil, level, free from loose, soft or organic matter.
- .10 Obtain Engineer approval of completed excavation.
- .11 Remove unsuitable material from trench bottom to extent and depth directed by the Engineer.
- .12 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 approved fill compacted to minimum of 95% corrected maximum dry density, maximum dry density to ASTM D698-12, method D.
- .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.
- .14 No extra payment shall be made for measures ordered by the Engineer to correct problems caused by unauthorized over-excavation.
- .15 No extra payment shall be made for construction methods required to keep the trench stable, free from disturbance, or dry, nor for crushed stone or other granular material used to facilitate drainage or dewatering during construction of the pipeline or for any extra excavation related thereto.
- .16 The use of mechanical excavators will be permitted except where their use in the opinion of the Engineer, will cause damage to property or structures above or below ground which property or structures must be preserved in accordance with the contract. The costs for hand excavation when the proximity of existing structures or other consideration render this necessary are deemed to be included in the Unit Price for trench excavation and backfill in the Unit Price Table.
- .17 Keep all surface materials which, in the opinion of the Engineer, are suitable for re-use in restoring the surface separate from the general excavation material.
- .18 Stockpile suitable material required for trench backfill in approved location.

3.5 TRENCH BOTTOM PREPARATION

- .1 Draw the attention of the Engineer to the nature and condition of the excavated surfaces which are to receive the foundations of the works. If in the opinion of the Engineer, the foundation is unsuitable to receive the structure as shown on the Drawings, the Engineer will issue written instructions for extra excavation, special filling or other extra work required to secure a proper foundation.
- .2 Where required due to removal of unsuitable material and/or unauthorized over excavation, bring bottom of excavation to design grade with approved granular material or rock underbedding as directed by the Engineer.

3.6 PRE-INSTALLATION INSPECTION

- .1 Excavations require inspection and approval prior to commencement of installation of pipe bedding and operations.

3.7 BACKFILLING

- .1 Do not proceed with backfilling operations until the Engineer has inspected and approved installations.
- .2 Areas to be backfilled and/or backfill material shall be free from debris, snow, ice, water or frozen ground. Do not use backfill material which is frozen or contains ice, snow or debris.
- .3 Backfilling around installations:
 - .1 Place bedding as specified and as detailed on the contract drawings.
 - .2 Do not backfill around or over cast-in-place concrete within 24 hours after placing.
 - .3 Place layers simultaneously on both sides of installed work to equalize loading.
 - .4 Where temporary unbalanced earth pressures are liable to develop on walls or other structures:
 - .1 Permit concrete to cure for minimum 7 days or until it has sufficient strength to withstand earth and compaction pressure and approval obtained from the Engineer or:
 - .2 If approved by the Engineer erect bracing or shoring to counteract unbalance, and leave in place until removal is approved by the Engineer.
 - .5 Place material by hand under, around and over installations until 600 mm of cover is provided. Dumping material directly on installations will not be permitted.
- .4 Place backfill material in uniform layers not exceeding 300 mm compacted thickness up to grades indicated. Compact each layer before placing succeeding layer.
- .5 Do not place backfill in freezing weather without written permission of the Engineer.
- .6 The foundation or underside of all structures and installations, including pipe bedding for pipes in trench shall bear on undisturbed ground or prepared surfaces as reinstated and approved by the Engineer.
- .7 Granular backfill materials:
 - .1 Beneath paved highways or within 1.5 metres of the edge of pavement and beneath paved areas, curbs, driveways or side walks use granular backfill

materials compacted to 95 percent of the maximum density as determined by ASTM D698-12 Method D. Compact using approved mechanical tamping devices.

3.8 RESTORATION

- .1 Remove waste materials and debris, trim slopes, and correct defects noted by the Engineer.
- .2 Replace topsoil as indicated or directed by the Engineer.
- .3 Reinstall pavement and side walks, lawns to condition and elevation which existed before excavation.
- .4 Clean and reinstall areas affected by work as directed by the Engineer.
- .5 Reinstall areas affected by equipment outside of planned area to condition which existed prior to commencement of work and leave site in rake-clean condition as directed.

3.9 BASIS OF PAYMENT

- .1 All costs associated with the work outlined in this specification shall be deemed to be included in the appropriate unit and lump sum prices quoted as outlined in subsection 1.1 Measurement for Payment and as included in the Schedule of Quantities and Prices.