Installation of Underground Piping and Electrical Services

FCS002-SECTION 02

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1 Scope
This Section of the Specification for Facility Construction covers the civil related requirements of the installation of underground piping and underground electrical cables.

2 Related Standards, Definitions and Abbreviations

2.1 Industry Standards
Work in this section shall be governed by the applicable provisions of the current editions of the following standards and regulations:

- ASTM D698: Test Method for Laboratory Compaction Characteristics of Soil Using Standard Effort
- CSA / C22.3-94: Underground Systems
- Provincial Occupational Health and Safety Regulations

3 Trenching

3.1 General
The Contractor shall carry out all required trench excavation for the installation of underground piping and electrical cables. In general, this includes:
- removal of existing surface materials and facilities;
- excavation from the trench of all materials of whatever kind encountered so that underground piping and electrical services can be placed to alignment and grade as shown on the Drawings or as directed by the Inspector;
- support of the adjoining ground or structures;
- stockpiling and disposal of excess excavated material;
- control of surface and subsurface water in trenches;
- temporary railings, coverings and enclosures to excavations; and
- removal and replacement of unsuitable material.

3.2 Trench Excavation
Unless shown otherwise on the Drawings or directed by the Inspector for multiple pipe installations in a common trench, the clearances specified in Table 3.1 below shall apply.

<table>
<thead>
<tr>
<th>Outside Diameter of Larger Pipe</th>
<th>Clearance Between Pipes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Up to and including 500mm</td>
<td>500mm</td>
</tr>
<tr>
<td>600mm to 900mm</td>
<td>750mm</td>
</tr>
<tr>
<td>Over 900mm</td>
<td>900mm</td>
</tr>
</tbody>
</table>

The Contractor shall ensure accurate depth of trench to maintain design grade of pipe or electrical service and proper thickness of bedding. Recesses shall be provided as required at pipe joints to ensure full bearing along barrel of pipe.
Unless it contravenes the Provincial Occupation Health and Safety Regulations trench walls shall be vertical to a height of 300mm above the top of the pipe. Back slopes above this level shall be as shown on the Drawings or in accordance with safety regulations. Where piping is to be installed in an embankment, the trench shall be excavated only after completing the embankment to at least a level of 300mm above the top of the pipe to be installed.

The length of open trench shall be only as far in advance of pipe laying as safety, traffic conditions, and site operations permit and as approved by the Inspector.

Excavated material which will be used to backfill the trench may be windrowed alongside the trench in authorized working areas in a manner that will not endanger the Work, hinder local traffic, block surface drainage or obstruct access to other utilities. Where excavated material cannot be piled along the trench in compliance with the above restrictions, it shall be stockpiled at a location approved by the Inspector for return to the trench for backfill.

4 Preparation of Trench Bottom

The Contractor shall remove all rock, boulders and large stones, debris, snow, ice, and frozen soil or hard clay lumps from the trench and re-compact loosened soil at the trench bottom due to excavation activities to a density equivalent to the acceptable in-situ soil density.

Where rock, stones, boulders and/or other hard materials are in the bottom of the trench and, in the opinion of the Inspector, will damage the pipe or pipe coating, and are impractical to remove, the bottom of the trench shall be padded with appropriate bedding materials in accordance with Section 01 - Site Preparation and Earthwork and to such a depth that after lowering-in the pipe there is a minimum of 150mm clearance of all protruding objects, while maintaining the minimum specified cover or elevation.

The Contractor shall notify the Inspector when soil at the proposed elevation of trench bottom appears unsuitable for the installation of piping or electrical services. When the trench bottom is deemed by the Inspector to be unsuitable for providing an adequate support for the pipe or electrical service, the Contractor shall replace this unsuitable material with granular material compacted to 98% of Maximum Dry Density - ASTM D698 as directed by the Inspector. Where the bottom of the trench is unstable and over-excavation is judged by the Inspector to be uneconomical the Contractor shall construct special supports of timber, concrete or other material, as designed and ordered by the Company. Timber shall be removed before backfilling unless otherwise directed by the Inspector. All backfilled timber shall be treated to the satisfaction of the Inspector.

The finished trench bottom should be contoured as near as practicable to the radius of the pipe. If approved by the Inspector, a layer of loose earth, free from any damaging materials, may be left in the bottom of the trench for the bedding pipe. Wherever practicable, in the opinion of the Inspector, this bedding material may be sorted from the available trench spoil pile.

Removal of water from trenches, regardless of origin is the Contractor's responsibility. In the event that the trench bottom becomes softened due to the presence of water in the trench and construction activities, this unstable material shall be replaced by granular material compacted to 98% of Maximum Dry Density- ASTM D698 as directed by the Inspector and costs related to this shall be borne by the Contractor.
5 Installation of Piping and Electrical Services

5.1 Piping Installation

The Contractor shall install all underground piping to the grades, lines and elevations shown on the Drawings or as directed by the Inspector.

Special care shall be taken to not damage coated pipe and/or fittings during handling. When stringing alongside a pipe trench, pipe shall be supported on well padded timber or sand-filled sacks supported by skids in such a way as to prevent damage to the exterior surface of the pipe. Sacks filled with straw shall not be used as padding.

Pipe and fittings shall be carefully lowered into the trench by means of derricks, nylon slings, ropes, or other approved tools or equipment in a manner that will prevent damage to the pipe and injury of workers.

Precaution shall be taken to ensure that displacement of underground pipe does not occur through soil displacement or flotation due to the presence of water in the trench. Pipe that has been displaced shall be removed from the trench and re-laid after the trench is dewatered and reshaped as necessary.

5.2 Installation of Electrical Services

The contractor shall install all underground cables to the lines, grades and elevations shown on the Drawings or as directed by the Inspector. Refer to Section 10 – Electrical: Power, Lighting, Heating, Alarm and Control.

The Contractor shall exercise all precautionary measures to prevent damage to cables during handling and installation operation.

For cable runs parallel to main pipelines, a clearance of three metres shall be maintained between the cable and the pipeline.

Cables shall cross at right angles to and below mainline piping. Ensure a minimum spacing of 300mm.

Cables shall not be installed across any backfill areas until backfill has been compacted to 98% Maximum Dry Density - ASTM D698 for the full width of the trench.

6 Bedding for Pipes and Electrical Services

6.1 Pipe Bedding

Unless otherwise shown on the Drawings or approved by the Inspector, all piping shall be bedded in sand conforming to the requirements detailed in Section 01 - Site Preparation and Earthwork.

Sand shall also be used for backfill of the pipe zone, defined as that portion of the trench 150mm below the pipe and up to a level 300mm above the top of the pipe.

Sand shall be used for the full width of the trench for the pipe bedding and the pipe zone. Bedding sand shall be placed and compacted to give full uniform support of the pipe barrel. Bedding sand shall be brought up evenly on both sides of the pipe and be compacted to 95% Maximum Dry Density - ASTM D698 in maximum lifts of 150mm by mechanical tampers.
In the event of a trench of excessive width, the width of pipe bedding may be limited to 300mm each side of the pipe provided approval compacted common backfill beyond this width to both trench walls is brought up simultaneously with the bedding.

In the event that bedding sand is not available, the Inspector may authorize the use of native backfill.

6.2 Bedding for Electrical Services

Unless otherwise shown on the Drawings or approved by the Inspector all underground cables shall be bedded in sand conforming to the requirements detailed in Section 01 - Site Preparation and Earthwork.

7 Crossings

This clause specifies the civil requirements for pipelines and electrical services which are to run beneath public roads, railway tracks and second party easements or right-of-ways.

Casings shall be standard wall carbon steel pipe or other as indicated on the Drawings.

8 Tolerances

Unless specified otherwise on the Drawings or directed by the Inspector the following tolerances apply:

- Underground piping shall be within 75mm of specified line and within 50mm of specified grade, with no sags or high spots;
- Stub-up and stub-up risers shall be within 25mm in any direction, of the location shown on the Drawings;
- Top of native backfill in trenches shall be within 50mm of design level where additional upper layers of fill are to be provided; and
- Top of final backfill surface shall be flush with the adjacent ground surface as it existed prior to excavation.

9 Cleanup and Restoration

Upon completion of work the Contractor shall remove all surplus materials and debris, trim slopes, repair defects, clean and reinstate the site to the satisfaction of the Inspector.