

**1. GENERAL**

1.1 RELATED WORK

- .1 Section 31 23 00 – Excavation, Trenching and Backfilling.
- .2 Section 33 14 13 – Watermains.
- .3 Section 33 14 17 – Building Services.
- .4 Section 33 31 11 – Sewer Mains.

1.2 COMPLIANCE REQUIREMENTS

- .1 Contractors are required to comply with applicable legislation, regulations, acts, codes, and policies, including, but not limited to the Alberta and Saskatchewan Occupational Health and Safety, Worker's Compensation Board Standards, industry standards, and municipal requirements while completing horizontal directional drilling operations.
- .2 In any case of conflict or discrepancy, the higher standard shall apply.

1.3 DIRECTIONAL DRILLING METHOD

- .1 Directional Drilling Method
  - .1 Definitions:
    - .1 A horizontal directional drilling rig is a mechanical drilling device used to create a horizontal borehole through which a pipe or conduit is installed.
    - .2 Return and spoils are the drilling mud and cuttings collected in the entry and exit pits as well as any fluid which escapes from the borehole to the surface.
  - .2 General Description:
    - .1 Directional drilling is the installation of a pipe by drilling a pilot bore from the entry pit to a predetermined exit location. The drilling head is then replaced with the reamer and the drilling string is pulled back to the entry hole, enlarging the hole while simultaneously pulling the pipeline product into place.
  - .3 Design Submittal:
    - .1 Submit a methodology, specific to each crossing, complete with the design and construction details for the proposed directional drilling operation to the Engineer for review and approval prior to commencing drilling operations. Such design submittals shall be submitted to the Engineer a minimum of five (5) Days prior to the initiation of any directional drilling operations.

1.4 CONSTRAINTS

- .1 Obtain all necessary permits or authorizations to carry out construction activities near or across all buried pipelines and conduits.
- .2 Submit to the Engineer for review and approval the proposed methods to control, collect, transport and dispose of drilling fluids and spoils.

## 1.5 SUBMITTALS

- .1 Provide the following to the Engineer within five (5) working Days of the award of contract:
  - .1 Complete methodology, specific to each crossing, including:
    - .1 equipment specifications and capabilities;
    - .2 size of pilot hole;
    - .3 number and size of pre-reams;
    - .4 use of rollers, baskets and side booms to suspend and direct pipe during pull back;
    - .5 type and capabilities of the tracking system; and
    - .6 the number of sections in which the product is to be installed.
  - .2 Schedule of work.
  - .3 Drawing of the work site, including the location and footprints of equipment, and the locations of the entry, exit and slurry containment pits.
  - .4 Drawing of the pullback installation showing any partial or full closure of roadways and their approximate duration.
  - .5 Drilling fluid management plan, including the drilling fluid containment, recycling and/or transport, and the approved disposal site.
  - .6 Emergency procedures for inadvertently boring into a live power line, natural gas line, water line, sewer line or fibre optic cables. These procedures must comply with applicable regulations.
  - .7 Method of dealing with inadvertent returns or surface seepage of drilling fluids and spoils.
- .2 At least two (2) weeks prior to commencing the Work submit to the Engineer data from the manufacturer regarding the tensile strength and recommended maximum bending radius of the pipe to be installed.

## 1.6 MEASUREMENT AND PAYMENT

- .1 Pipe installed in a directional drilled hole will be measured in a horizontal plane in metres from centre to centre between manholes or from a required initiation to a required termination point, where applicable, as specified within the Bid Forms. Payment shall be compensation in full for all equipment, materials, tools, labour and supervision, saw cutting, excavation of entry, exist, and slurry pits, drilling operations, sewer inspection by televising, other testing, dewatering, pipe supply, assembly and installation, proper disposal of spoils and drilling fluids, backfill, compaction as specified and road restoration, and all other items deemed incidental to the satisfactory completion of the Work.
- .2 Include in the unit rates within in the Bid Forms the cost of all consultants, plant, labour and supervision, material and services for the following:
  - .1 Preparation of the Site including removal of vegetation, verifying the location of all existing utilities along the proposed alignment, locating and daylighting of all utility crossings, excavation of entry, exit and slurry containment pits.
  - .2 Testing of the installed section in accordance with the applicable technical specifications and restoration of all disturbed surfaces to their pre-construction conditions, unless otherwise accounted for within the Bid Forms or directed by the Engineer.

**2. PRODUCTS** (Not Applicable)

**3. EXECUTION**

3.1 EQUIPMENT

- .1 The Contractor shall be responsible for selecting the directional drilling method and equipment. The Contractor shall confirm that the drilling rig and mud mixing system have the capacity required to successfully complete the installation, knowing the length of the crossing and product type and diameter, and considering ground and groundwater conditions that can be reasonably foreseen.
- .2 The operating range and degree of accuracy of the proposed tracking system shall be adequate to meet the project conditions. Tracking/steering equipment shall allow for continuous monitoring of the drilling head along the entire proposed alignment. If a poor contact with sound is expected to occur at any section, this should be communicated to the Engineer prior to commencement of construction.
- .3 The drilling unit must be equipped with an electrical strike safety package. The package should include warning sound alarm, grounding mats and protective gear.

3.2 PRE-COMMENCEMENT

- .1 Notify owners of subsurface utilities along and on either side of the proposed drill path of the impending Work. All utilities along and on either side of the proposed drill path are to be located prior to commencing the Work. Confirmation of notification shall be submitted to the Engineer prior to the initiation of any directional drilling operations.
- .2 All utility crossings shall be exposed using hydro-excavation, hand excavation or another approved method to confirm depth.
- .3 The proposed drill path shall be determined and documented, including its horizontal and vertical alignments and the location of buried utilities and substructures along the path.
- .4 Excavations for entrance and exit pits are to be of sufficient size to avoid a sudden radius change of the pipe and resultant excessive deformation.

3.3 INSTALLATION PROCEDURES

- .1 General:
  - .1 Only trained operators will be permitted to operate the drilling equipment, and the manufacturer's operating instructions and safety practices shall always be followed.
  - .2 Drilling and mud pressure in the borehole should not exceed that which can be supported by the overburden to prevent heaving or hydraulic fracturing of the soil ("Frac-out").
  - .3 The entrance and exit angles of the drill string should range between 8° and 20° and 5° and 10° respectively. Any deviation from these values shall first be approved by the Engineer.
  - .4 If a drilled hole beneath an artificial surface must be abandoned, the hole shall be filled with grout or bentonite to prevent future subsidence.

- .5 Pipe installation should be performed in a manner that minimizes over-stressing and straining of the pipe.
- .6 The Contractor shall carry out any ground monitoring activities required to minimize the risk of damage to adjacent structures.
  
- .2 Drilling and Back-Reaming:
  - .1 Drilling mud may be used during drilling and back-reaming operations, pending the approval of a fluids management plan.
  - .2 A sufficient number of pre-reams shall be utilized as to avoid heaving while enlarging the hole to the desired diameter.
  - .3 During back-reaming, the conduit must be sealed at either end with a cap or lug to prevent water, drilling fluids and other foreign materials from entering the pipe.
  - .4 Pipe rollers, skates or other protective devices should be used in the installation of products 150mm outside diameter or larger.
  - .5 Where possible, and unless otherwise approved by the Engineer, the product pipeline will be fused, welded or connected into one string prior to commencement of the pull-back operation.
  - .6 The pilot hole shall be back-reamed to accommodate and permit free sliding of the product inside the borehole according to the following specifications:

<b>Nominal Pipe Diameter (mm)</b>	<b>Back-Reamed Hole Diameter (mm)</b>
50	75-100
75	100-150
100	150-200
150	250-300
200	300-350
250	350-400
≥300	Minimum of 1.5 times product pipe outside diameter

**3.4 DRILLING FLUIDS – COLLECTION AND DISPOSAL PRACTICES**

- .1 Excess drilling mud slurry shall be contained in a lined pit or containment pond at the exit and entry points until recycled or removed from the Site. Entrance and exit pits shall be of sufficient size to contain the expected return of drilling mud and spoils.
- .2 When working in an area of contaminated ground, the slurry shall be tested for contamination and disposed of in a manner that meets all regulatory requirements, or as directed by the Engineer.
- .3 Precautions shall be taken to keep drilling fluids out of the streets, manholes, sanitary and storm sewers, and other drainage systems including streams and rivers.
- .4 Recycling drilling fluids is an acceptable alternative to disposal, provided the material is not contaminated.
- .5 The Contractor shall make a diligent effort to minimize the amount of drilling fluids and cuttings spilled during the drilling operation and shall clean up all drilling mud overflows or spills.

### 3.5 ACCEPTANCE

- .1 The Contractor shall provide a set of as-built drawings including both alignment and profile. Drawings should be produced from actual field readings. Raw survey data shall be submitted upon the Engineer's request.
- .2 Pipeline product shall be installed within the pre-specified alignment and grade tolerance as shown on the Drawings and provided within the applicable project Specifications.
- .3 In addition to 3.5.1, the Contractor shall provide a directional drilling log identifying the station of the reading as well as the depth from the original ground surface to the pipe to be installed. The frequency of the readings shall be at a minimum of every 15m, unless otherwise directed by the Engineer. The directional drilling log shall be provided to the Engineer no later than twenty-four (24) hours after the drilling of the pipe alignment. Under no circumstance does the Owner or the Engineer take responsibility for costs associated with the removal and re-drilling of the pipe if the requirements of the applicable technical specifications with respect to depth and grade are not adhered to if identified through the review of the directional drilling log.

### 3.6 SURFACE TOLERANCES

- .1 The Contractor shall ensure that the possibility of ground settlement is reduced to a minimum underneath any roadway within or near the pipeline alignment. Surface settlements shall not exceed 10mm over a 3.0m straight edge for the period from construction start to end of the Warranty Period.
- .2 The contractor shall ensure that the possibility of ground bulging is reduced to a minimum underneath any roadway within or near the pipeline alignment. Surface bulging shall not exceed 10mm of a 3.0m straight edge for the period from construction start to end of the Warranty Period.
- .3 Should settlement or bulging exceed the specified tolerance, the Contractor shall make the necessary surface grade correction. The method of correction shall be approved by the Engineer. All surface restoration costs shall be borne by the Contractor.
- .4 If through the Warranty Period, settlements and bulging outside a roadway alignment within or near the pipeline alignments installed through the directional drilling method are identified, these areas shall be reviewed by the Engineer and a determination made with respect to the severity and remediation measures required. At a minimum nominal settlement and bulging outside of the pipeline alignments, within 50mm above or below the original ground surface, will be deemed acceptable permitted that positive surface drainage is maintained. Settlements or bulging in excess of this will be deemed a deficiency to the Contractor and will require immediate remediation, unless otherwise directed by the Engineer. All surface restoration costs shall be borne by the Contractor.

### **END OF SECTION**