

## SECTION 02300

### DIRECTIONAL DRILLING

#### PART 1 GENERAL

##### 1.1 DESCRIPTION OF REQUIREMENTS

- A. Provide all necessary tools, materials and equipment to successfully complete the installation of directionally, drilled piping as specified herein and shown on the drawings. The CONTRACTOR shall be responsible for the final constructed product, and for furnishing the qualified labor and superintendence necessary for this method of construction.
- B. Furnish all items necessary to perform the horizontal directional drilling operation and construct the pipe to the lines and grade shown on the drawings.
- C. Boring must use techniques of creating or directing a borehole along a predetermined path to a specified target location. This must involve use of mechanical and hydraulic deviation equipment to change the boring course and must use instrumentation to monitor the location and orientation of the boring head assembly along a predetermined course.
- D. Drilling must be accomplished with fluid-assist mechanical cutting. Boring fluids shall be a mixture of bentonite and water or polymers and additives. Bentonite sealants and water will be used to lubricate and seal the mini-tunnel. It is mandatory that minimum pressures and flow rates be used during drilling operation as not to fracture the sub-grade material around and or above the bore.
- E. The mobile drilling system shall utilize small diameter fluid jets to fracture and mechanical cutters to cut and excavate the soil as the head advances forward.
- F. Steering shall be accomplished by the installation of an offset section of drill stem that causes the cutterhead to turn eccentrically about its centerline when it is rotating. When steering adjustments are required, the cutterhead offset section is rotated toward the desired direction of travel and the drill stem is advanced forward without rotation.
- G. The mobile drilling system must be capable of being launched from the surface at an inclined angle and drilling a 2 inch to 3 inch diameter pilot hole. The pilot hole will then be enlarged with reamers as required.

##### 1.2 REFERENCE STANDARDS

- A. American Association of State Highway and Transportation Officials (AASHTO).

- B. Occupational Safety and Health Administration (OSHA).

### 1.3 DEFINITIONS

- A. CONTRACTOR's Construction Drawings shall be defined as drawings by which the CONTRACTOR proposes to construct, operate, build, etc., the referenced item. The submission of these drawings shall be required for the sole purpose of providing the sufficient details to verify that the CONTRACTOR's work in progress is in accordance with the intent of the design.

### 1.4 SUBMITTALS

- A. The ENGINEER will base the review of submitted details and data on the requirements of the completed work, safety of the work in regards to the public, potential for damage to public or private utilities and other existing structures and facilities, and the potential for unnecessary delay in the execution of the work. Such review shall not be construed to relieve the CONTRACTOR in any way of his responsibilities under the contract. CONTRACTOR shall not commence work on any items requiring CONTRACTOR's construction drawings or other submittals until the drawings and submittals are reviewed and accepted by the ENGINEER.

- B. The CONTRACTOR shall:

1. Submit for review complete construction drawings and/or complete written description identifying details of the proposed method of construction and the sequence of operations to be performed during construction, as required by the method of tunnel excavation approved. The drawings and descriptions shall be sufficiently detailed to demonstrate to the ENGINEER whether the proposed materials and procedures will meet the requirements of this specification. CONTRACTOR shall submit arrangement drawings and technical specifications of the machine and trailing equipment (including any modifications), three-year experience record with this type of machine and a copy of the manufacturer's operation manual for the machine.
2. CONTRACTOR's construction drawings shall be submitted on the following items.
  - a. Complete details of the equipment, methods and procedures to be used, including but not limited to primary lining installation, timing of installation in relation to the excavation plan and sequence, bulkheads, etc.
  - b. Grouting techniques, including equipment, pumping procedures, pressure grout types, mixtures and plug systems.
  - c. Method of controlling line and grade of excavation.
  - d. Details of muck removal, including equipment type, number, and disposal location.

- e. Proposed contingency plans for critical phases and areas of directional drilling.
  - C. Quality Control Methods. At least 10 days prior to the start of directional drilling, CONTRACTOR shall submit a description of his quality control methods he proposes to use in his operations to the ENGINEER. The submittal shall describe:
    - 1. Procedures for controlling and checking line and grade.
    - 2. Field forms for establishing and checking line and grade.
  - D. Safety. Procedures including, but not limited to, monitoring for gases encountered shall be submitted.
  - E. Hazardous chemical list as well as all MSDS and technical data sheets.
- 1.5 DESIGN CRITERIA
- A. Compatibility of Methods.
    - 1. The methods of excavation, lining, and groundwater control shall be compatible.
- 1.6 JOB CONDITIONS
- A. Safety Requirements
    - 1. Perform work in a manner to maximize safety and reduce exposure of men and equipment to hazardous and potentially hazardous conditions, in accordance with applicable safety standards.
    - 2. Whenever there is an emergency or stoppage of work which is likely to endanger the excavation or adjacent structures, operate a full work force for 24 hours a day, including weekends and holidays, without intermission until the emergency or hazardous conditions no longer jeopardize the stability and safety of the work.
  - B. Air Quality.
    - 1. Conduct directional drilling operations by methods and with equipment, which will positively control dust, fumes, vapors, gases or other atmospheric impurities in accordance with applicable safety requirements.
- 1.7 PERMITS
- A. Obtain any and all other permits required for prosecution of the work.

## PART 2 PRODUCTS

### 2.1 GENERAL

- A. Refer to Section 02620 for HDPE pipe material.

## PART 3 EXECUTION

### 3.1 GENERAL

- A. The CONTRACTOR shall be responsible for his means and methods of directional drilling construction and shall ensure the safety of the work, the CONTRACTOR's employees, the public, and adjacent property, whether public or private.
- B. Anticipate that portions of the drilled excavation will be below the groundwater table.
- C. Comply with all local, state and federal laws, rules and regulations at all times to prevent pollution of the air, ground and water.

### 3.2 EQUIPMENT

- A. Diesel, electrical, or air-powered equipment will be acceptable, subject to applicable federal and state regulations.
- B. Any method or equipment that the CONTRACTOR can demonstrate will produce the specified results will be considered.
- C. Employ equipment that will be capable of handling the various anticipated ground conditions. In addition, the equipment shall:
  - 1. Be capable of minimizing loss of ground ahead of and around the machine and providing satisfactory support of the excavated face at all times.
  - 2. Provide a system to indicate whether the amount of earth material removed is equivalent to that displaced by the advance of the machine such that the advance rate may be controlled accordingly.
- D. Provide adequate secondary containment for any and all portable storage tanks.

### 3.3 DIRECTIONAL DRILLING DATA

- A. Daily logs of construction events and observations shall be submitted on at least the following:
  - 1. Location and elevation of significant soil strata boundaries and brief soil descriptions.

2. Jacking pressures and torsional forces, if applicable.

### 3.4 CONTROL OF THE TUNNEL LINE AND GRADE

#### A. Construction Control.

1. Establish and be fully responsible for the accuracy of his own control for the construction of the entire project, including structures, tunnel line and grade.
2. Establish control points sufficiently far from the tunnel operation not to be affected by construction operations.
3. Maintain daily records of alignment and grade and shall submit three copies of these records to the ENGINEER. However, the CONTRACTOR remains fully responsible for the accuracy of his work and the correction of it, as required.
4. Check control for the bore alignment against an above ground undisturbed reference at least once each hour and once for each 50 feet of tunnel constructed, or more often as needed or directed by the ENGINEER.

### 3.5 DISPOSAL OF EXCESS MATERIAL

- A. Where such effort is necessary, cost for groundwater control during the course of the tunnel work shall be included in the unit contract price for the work.
- B. Dewatering required during the course of the project to lower water table, to remove standing water, surface drainage seepage, or to protect ongoing work against rising waters or floods shall be considered incidental to the work being performed.

END OF SECTION

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