

SECTION 02310
DIRECTIONAL BORING OF PRESSURE SEWER, WATER MAINS AND GRAVITY SEWERS

1.0 GENERAL

A. Description

8/9/10 The pressure sewer, water main or gravity sewer shall be located within the easement and within 1 foot horizontally and 2 inches vertically of the alignment shown on the contract plans and shall be installed by directional boring. Directional boring shall be conducted so as to minimize the number and size of excavation holes.

B. Operating Expertise

The Contractor or his Subcontractor shall demonstrate expertise in trenchless methods by providing the Commission a list of ten utility references for whom similar work has been performed within the last three years prior to the Pre-Construction meeting. The references shall include a name and telephone number where contact can be made to verify the contractor capability. The Contractor shall provide documentation showing successful completion of the projects used for reference. The Pre-Construction meeting may not be scheduled until after the Commission approves of the above expertise. Conventional trenching experience will not be considered applicable.

C. Submittals

1. The Contractor shall submit technical data for equipment, method of installation, and proposed sequence of construction for approval by the Commission. The submittal shall include information pertaining to working and receiving shaft, dewatering, method of spoils removal, size and capacity of equipment, capabilities for installing pipes on a curve, type of cutter head, drilling fluid type, method of monitoring line and grade, and detection of surface movement.
2. Prior to the pre-construction meeting and Commission approval to perform the directional boring, the Contractor shall submit the names of supervisory field personnel and historical information of directional boring experience. In addition, the Contractor shall submit for approval the name plate data for the drilling equipment and mobile spoils removal unit and MSDS information for the drilling slurry compounds.

D. Related Work Specified Elsewhere

1. Trench Excavation, Backfill and Compaction: Section 02250
2. Low Pressure Sewer Systems: Section 02566
3. Sewage Grinder Pumping Units: Section 11307

E. Quality Assurance

The Commission will inspect all materials before, during and after installation to ensure compliance with the Contract Documents.

2.0 MATERIALS

- A. Materials shall be in accordance with Section 02566.

3.0 EXECUTION

A. Installation

1. Installation shall be in trenchless manner producing a continuous bore. The number of access pits shall be kept to a minimum. The maximum continuous bore lengths is not to exceed 400 feet. If the bore length is greater than 400 feet then multiple pits will be required.
2. The drilling system shall be remotely steerable and permit electronic monitoring of tunnel depth and location. Accurate placement of pipe at up to eight feet deep, within a \pm 2-inch vertical tolerance is required. The drilling device shall be capable of drilling a 90 degree, 35-foot radius curve.
 - a. For gravity sewers, the drilling system shall be remotely steerable and permit electronic monitoring of tunnel depth and location. Accurate placement of pipe at depth shown on the drawings, with a 0.1% pitch resolution is required.

3. The equipment must be capable of boring the following lengths in single bores, and successive boring pits will not be allowed to be any closer than the following distances:

<u>Pipe Size</u>	<u>Boring Distance</u>
1 in. to 1 ½ in.	400 feet
2 in. to 2 ½ in.	350 feet
3 in. to 6 in.	300 feet

- a. For gravity sewers, the equipment must be capable of completing boring for the proposed pipe size at a minimum length from manhole to manhole in a single bore.
4. Drilling shall be performed by a fluid cutting process (high pressure/low volume), utilizing a liquid/clay slurry, i.e. bentonite. The clay slurry shall be totally inert. The Contractor shall provide a vacuum spoils recovery vehicle on site to remove the drilling spoils from the access pits. The spoils shall then be transported from the job site and be properly disposed of. Under no circumstance will the drilling spoils be permitted to be disposed of into sanitary, storm, or other public or private drainage systems.
5. Mechanical, pneumatic, or water jetting methods will be considered unacceptable due to the possibility of surface subsidence.
6. Upon Owner request, the Contractor shall prove the accuracy of the electronic monitor every fifty (50) feet of directional bore in the presence of the Owner during directional drilling operations via test pit every 50 feet of bore. If the above accuracy is not met, the Contractor shall adjust or provide the necessary equipment which will meet the accuracy requirements. All such calibration costs shall be at no cost to the Owner.

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7. After an initial bore has been completed, a reamer head shall be installed at the termination pit, and the pipe and reamer head shall be pulled back to the starting pit. The reamer must also be capable of discharging liquid clay to facilitate the installation of the pipe into a stabilized and lubricated tunnel. Reaming diameter shall not exceed 1.5 times the outside diameter of the pipe being installed.
 8. The pipe being pulled into the tunnel shall be protected and supported so that it moves freely and is not damaged by stones and debris on the ground during installation.
 9. Pullback forces shall not exceed the manufacturer's recommended allowable pulling force for the product pipe.
 10. The Contractor shall allow sufficient lengths of pipe to extend past the termination point to allow connections to adjacent pipe sections. Pulled pipe shall be allowed a minimum of twenty-four (24) hours of stabilization prior to making tie-ins. The extra length of pipe shall be sufficient to make all necessary connections and tests.
 11. Upon completion of boring and pipe installation, the Contractor shall remove all spoils from the starting and termination pits. All pits shall be compacted as per Commission and contract documents and be restored to their original condition. Disposal of excess drilling fluid and spoils shall be the responsibility of the Contractor.
- B. Safety
1. Because the directional boring may encounter existing buried electrical lines, the following safety requirements shall be met.
 - a. All drilling equipment shall have a permanent inherent alarm system capable of detecting an electrical current. The ground system shall be equipped with an audible alarm to warn the operator when the drill head nears electrified cable.
 - b. All crews shall be provided with grounded safety mats, heavy gauge ground cables with connectors, and hot boots and gloves.
 - c. All supervisory personnel shall be adequately trained and have direct supervisory experience in directional boring.
- C. Obstruction/Alignment
1. The bore shall not deviate from the horizontal alignment shown on the drawings by more than one (1) foot. If obstructions are encountered during the drilling operation, the Owner shall be notified immediately. With approval of the Owner, the Contractor shall attempt to go around the obstruction. If a deviation of more than three (3) feet from the horizontal alignment is required to bypass the obstruction, the Owner shall be immediately consulted to determine if adjustments in the alignment are required. At no time shall the alignment be allowed to exit the sewer easement or right-of-way. To prevent dips and high points in the pipeline profile, a vertical deviation in the pipeline profile may not exceed two (2) inches.
 2. The Contractor shall employ all means necessary to complete the pipe installation as specified at no additional cost to the Owner. Any deviation from the

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previously approved means and methods shall be approved by the Owner prior to the implementation.

3. The Contractor shall mark the location and depth of the alignment with spray paint on paved surfaces and wooden stakes on non-paved surfaces at twenty-five (25) foot intervals. The Contractor shall record the depth of the sewer at the twenty-five (25) foot intervals and provide a copy of the record to the Owner upon completion of the installation of each bore. The Contractor shall measure or survey locations where the horizontal alignment deviates from the proposed alignment and incorporate the changes in the as-built drawings.
4. If the bore pipe installation has deviated beyond the specified tolerances, it shall be the Owner's option to require the Contractor to abandon the bore, or remove the installed pipe, and rebore or reinstall the pipe on the correct alignment at no additional cost to the Owner.
5. Alignment of gravity sewer pipe: Laser technology shall be used to align the pipe to the proper accurate grade. The Contractor is responsible to monitor the line and grade horizontally and vertically in order to assure proper quality control and maintain laser alignment.

D. Detection

- 8/9/10
1. Tracer Wire: All non-metallic pipes shall have #8 AWG tracer wire marked for direct burial use installed with the pipe secured with duct tape to the top of the pipe. The wire shall be continuous for the full length of the pipeline. Underground splice connections shall be made with solderless split bolt connectors and taped to pipe.
 2. Detector wire shall be terminated from each pipe run in each structure along the system, i.e. flushing connection vaults, air release vaults, service valve assembly vaults, etc. Allow adequate length of each wire in the structure, so it may be pulled one (1) foot out of the top of the structure for connection of detection equipment.
 3. The detection wire shall be tested for continuity for each bored installation before acceptance by the Owner.

4.0 METHOD OF MEASUREMENT

The amount of directional boring of pressure sewer shall be measured in accordance with Section 02566.

5.0 BASIS OF PAYMENT

Payment for directional boring of pressure sewer will not be made, as it shall be included in the unit price item for low pressure sewer Section 02566.

****END OF SECTION 02310****