

SECTION 33 05 24
UTILITY HORIZONTAL DIRECTIONAL DRILLING

PART 1 GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Excavation and backfill for approach trenches and pits.
 - 2. Horizontal directional drilling.
 - 3. Pipe and accessories.
 - 4. Testing of Pipe

- B. Related Sections:
 - 1. Section 03 30 10 - Cast-In-Place Concrete.
 - 2. Section 31 23 15 - Excavation and Fill.
 - 3. Section 31 23 17 - Trenching: Excavating and backfilling access pits.
 - 4. Section 33 01 32 - Sewer and Manhole Testing.
 - 5. Section 33 11 13 - Water Utility Distribution Piping.
 - 6. Section 33 13 00 - Disinfecting of Water Utility Distribution.
 - 7. Section 33 31 00 - Sanitary Utility Sewerage Piping.
 - 8. Section 33 34 00 - Sanitary Utility Sewerage Force Mains.

1.2 REFERENCES

- A. American Water Works Association:
 - 1. AWWA C901 - Polyethylene (PE) Pressure Pipe and Tubing, 1/2 in. through 3 in. for Water Service.

- B. ASTM International:
 - 1. ASTM F1962 - Standard Guide for Use of Maxi-Horizontal Directional Drilling for Placement of Polyethylene Pipe or Conduit Under Obstacles, Including River Crossings.

- C. National Utility Contractors Association:
 - 1. NUCA - HDD Installation Guidelines.

1.3 DESIGN REQUIREMENTS

- A. Design Criteria:
 - 1. Drilling Steering System: Remote with continuous electronic monitoring of boring depth and location.
 - 2. Directional Change Capability: 90 degree with 35 foot radius curve.
 - 3. Minimum distance for single bores and between boring pits:

Pipe Size	Boring Distance
1 to 1-1/2 inches	400 feet
2 to 2-1/2 inches	350 feet
3 to 6 inches	300 feet

- 4. Ratio of Reaming Diameter to Pipe Outside Diameter:
 - a. Nominal Pipe Diameter of 6 Inches and Smaller: 1.5 maximum.
 - b. Nominal pipe diameter larger than 6 Inches: Submit recommended ratio and reaming procedures for review.

1.4 SUBMITTALS

- A. Section 01 33 00 - Submittal Procedures: Requirements for submittals.
- B. Shop Drawings:
 - 1. Submit technical data for equipment, method of installation, and proposed sequence of construction.
 - 2. Include information pertaining to pits, dewatering, method of spoils removal, equipment size and capacity, equipment capabilities including installing pipe on radius, type of drill bit, drilling fluid, method of monitoring line and grade and detection of surface movement, name plate data for drilling equipment, and mobile spoils removal unit.
- C. Product Data:
 - 1. Identify source of water used for drilling.
 - 2. Submit copy of approvals and permits for use of water source.
- D. Installer Qualifications: Submit history of previous work completed of equivalent nature and scope. Include qualification and experience of key personnel.
- E. Manufacturer's Certificate: Certify products meet or exceed specified requirements.

1.5 CLOSEOUT SUBMITTALS

- A. Section 01 70 00 - Execution and Closeout Requirements: Requirements for submittals.
- B. Project Record Documents: Record actual locations of pipe and invert elevations.
- C. Identify and describe unexpected variations to subsoil conditions or discovery of uncharted utilities.
- D. Record actual depth of pipe at 25 feet intervals.
- E. Record actual horizontal location of installed pipe.
- F. Show depth and location of abandoned bores.
- G. Record depth and location of drill bits and drill stems not removed from bore.

1.6 QUALITY ASSURANCE

- A. Perform work in accordance with the following:
 - 1. NUCA HDD Installation Guidelines.
 - 2. ASTM F1962.
- B. Maintain one copy of documents on site.

1.7 QUALIFICATIONS

- A. Installer: Company specializing in performing work of this Section with minimum 5 years documented experience.
 - 1. Work Experience: Include projects of similar scope and conditions.
 - 2. Furnish list of references upon request.

1.8 DELIVERY, STORAGE, AND HANDLING

- A. Section 01 60 00 - Product Requirements: Requirements for transporting, handling, storing, and protecting products.
- B. Provide temporary end caps and closures on piping and fittings until pipe is installed.
- C. Protect pipe from entry of foreign materials and water by temporary covers, completing sections of work, and isolating parts of completed system.
- D. Accept products on site in manufacturer's original containers or configuration. Inspect for damage.
- E. Use shipping braces between layers of stacked pipe. Stack piping lengths no more than three layers high.
- F. Store field joint materials indoors in dry area in original shipping containers. Maintain storage temperature of 60 to 85 degrees F.
- G. Support pipes with nylon slings during handling.

1.9 ENVIRONMENTAL REQUIREMENTS

- A. Section 01 60 00 - Product Requirements: Environmental conditions affecting products on site.
- B. Conduct operations so as not to interfere with, interrupt, damage, destroy, or endanger integrity of surface or subsurface structures or utilities, and landscape in immediate or adjacent areas.

PART 2 PRODUCTS

2.1 DRILLING FLUID

- A. Drilling Fluid: Liquid bentonite clay slurry; totally inert with no environmental risk.

2.2 PIPE

- A. Polyethylene Pipe: AWWA C901 for 160 psig pressure rating:
 - 1. Fittings: AWWA C901 molded or fabricated.
 - 2. Joints: Butt fusion.

2.3 FILL MATERIALS

- A. Backfill: Excavated subsoil or granular fill per Section 31 23 17.

2.4 WATER SOURCE

- A. Water: Potable.

2.5 UNDERGROUND PIPE MARKERS

- A. Trace Wire: Electronic detection materials for non-conductive piping products.
 - 1. Unshielded 10 gage copper wire.
 - 2. Conductive tape.

2.6 GROUT

- A. Fill and Seal Grout at Pipe Ends: Mortar conforming to Division 700 of SCDOT Standard Specifications proportioned as described below. Do not add more water than is necessary to make a workable mixture.
 - 1. Mix No. 1: 1 part Portland cement, 1/4 part hydrated lime, 3-3/4 parts mortar sand (maximum).
 - 2. Mix No. 2: 1 part Portland cement, 1 part masonry cement, 6 parts mortar sand (maximum).
- B. Pressure Grout Mix: One part Portland cement, and six parts mortar sand mixed with water to consistency applicable for pressure grouting.

PART 3 EXECUTION

3.1 EXAMINATION

- A. Section 01 30 00 - Administrative Requirements: Verification of existing conditions before starting work.
- B. Verify connection to existing piping system size, location, and invert elevations are in accordance with Drawings.

3.2 PREPARATION

- A. Call Local Utility Line Information service at number shown on Drawings not less than three working days before performing Work.
 - 1. Request underground utilities to be located and marked within and surrounding construction areas.
- B. Locate, identify, and protect utilities indicated to remain from damage.
- C. Notify utility company to remove and relocate utilities.
- D. Identify required lines, levels, contours, and datum locations.
- E. Protect plant life, lawns, rock outcroppings and other features remaining as portion of final landscaping.
- F. Protect bench marks, survey control points, existing structures, fences, sidewalks, paving, and curbs from excavating equipment and vehicular traffic.
- G. Establish minimum separation between utilities in accordance with applicable code.
- H. Establish pipe elevations with not less than 3 feet of cover.

3.3 DEWATERING

- A. Intercept and divert surface drainage, precipitation, and groundwater away from excavation through use of dikes, curb walls, ditches, pipes, sumps or other means.
- B. Develop and maintain substantially dry subgrade during drilling and pipe installation.
- C. Comply with State and Municipal requirements for discharging water to watercourse, preventing stream degradation, and erosion and sediment control.

3.4 EXISTING WORK

- A. Maintain access to existing facilities and services indicated to remain. Modify pipe installation to maintain access to existing facilities.

3.5 EXCAVATION

- A. Excavate subsoil as specified in Section 31 23 17 – Trenching.
- B. Excavate approach trenches and pits in accordance with shop drawings and as site conditions require. Minimize number of access pits.
- C. Provide sump areas to contain drilling fluids.
- D. Install excavation supports as specified in Section 31 23 17.
- E. Restore areas after completion of drilling and carrier pipe installation.

3.6 DRILLING

- A. Drill pilot bore with vertical and horizontal alignment as indicated on shop drawings.
- B. Guide drill remotely from ground surface to maintain alignment by monitoring signals transmitted from drill bit.
 - 1. Monitor depth, pitch, and position.
 - 2. Adjust drill head orientation to maintain correct alignment.
- C. Inject drilling fluid into bore to stabilize hole, remove cuttings, and lubricate drill bit and pipe.
- D. Continuously monitor drilling fluid pumping rate, pressure, viscosity, and density while drilling pilot bore, back reaming, and installing pipe to ensure adequate removal of soil cuttings and stabilization of bore.
 - 1. Provide relief holes when required to relieve excess pressure.
 - 2. Minimize heaving during pullback.
- E. Calibrate and verify electronic monitor accuracy during first 50 feet of bore in presence of Engineer before proceeding with other drilling. Excavate minimum of four test pits spaced along first 50 feet bore to verify required accuracy. When required accuracy is not met, adjust equipment or provide new equipment capable of meeting required accuracy.
- F. After completing pilot bore, remove drill bit.

3.7 DRILLING OBSTRUCTIONS

- A. When obstructions are encountered during drilling, notify Engineer immediately. Do not proceed around obstruction without Engineer's approval.
- B. For conditions requiring more than 3-foot deviation in horizontal alignment, submit new shop drawings to Engineer for approval before resuming work.
- C. Maintain adjusted bore alignment within easement or right-of-way.

3.8 PIPE INSTALLATION

- A. After completing pilot bore, remove drill bit. Install reamer and pipe pulling head.
 - 1. Select reamer with minimum bore diameter required for pipe installation.
- B. Attach pipe to pipe pulling head. Pull reamer and pipe to entry pit along pilot bore.
- C. Inject drilling fluid through reamer to stabilize bore and lubricate pipe.
- D. Install piping with horizontal and vertical alignment as shown on Drawings.
- E. Protect and support pipe being pulled into bore so pipe moves freely and is not damaged during installation.
- F. Do not exceed pipe manufacturer's recommended pullback forces.
- G. Install trace wire continuous with each bore. Splice trace wire only at intermediate bore pits. Tape or insulate trace wire to prevent corrosion and maintain integrity of pipe detection.
 - 1. Terminate trace wire for each pipe run at structures along pipe system.
 - 2. Provide extra length of trace wire at each structure, so trace wire can be pulled 3 feet out top of structure for connection to detection equipment.
 - 3. Test trace wire for continuity for each bore before acceptance.
- H. Provide sufficient length of pipe to extend past termination point to allow connection to other pipe sections.
- I. Allow minimum of 24 hours for stabilization after installing pipe before making connections to pipe.
- J. Mark location and depth of bore with spray paint on paved surfaces, and wooden stakes on non-paved surfaces at 25-foot intervals.

3.9 SLURRY REMOVAL AND DISPOSAL

- A. Contain excess drilling fluids at entry and exit points until recycled or removed from site. Provide recovery system to remove drilling spoils from access pits.
- B. Remove, transport and legally dispose of drilling spoils off site.
 - 1. Do not discharge drilling spoils in sanitary sewers, storm sewers, or other drainage systems.
 - 2. When drilling in suspected contaminated soil, test drilling fluid for contamination before disposal.
- C. When drilling fluid leaks to surface, immediately contain leak and barricade area from vehicular and pedestrian travel before resuming drilling operations.
- D. Complete cleanup of drilling fluid at end of each work day.

3.10 BACKFILL

- A. Install backfill and compact as specified in Section 31 23 17.
- B. Backfill approach trenches and pits with subsoil fill to contours and elevations indicated on Drawings or of surrounding existing grade.

3.11 ERECTION TOLERANCES

- A. Maximum Variation From Horizontal Position: 12 inches.
- B. Maximum Variation From Vertical Elevation: 2 inches.
- C. Minimum Horizontal and Vertical Clearance from Other Utilities: 12 inches.
- D. When pipe installation deviates beyond specified tolerances, abandon bore, remove installed pipe, re-bore, and reinstall pipe in correct alignment.
- E. Fill abandoned bores greater than 3 inches in diameter with grout or flowable fill material.

3.12 FIELD QUALITY CONTROL

- A. Section 01 40 00 - Quality Requirements: Field inspecting, testing, adjusting, and balancing.
- B. Leakage Testing: Upon completion of pipe installation, test pipe in accordance with the following:
 - 1. Sanitary Sewer force Mains Testing: 33 34 00.
 - 2. Water Distribution Pipe Testing: Section 33 11 00.
- C. Disinfection of Water piping: As specified in Section 33 13 00.
- D. Compaction Testing: As specified in Section 31 23 17.
- E. When tests indicate Work does not meet specified requirements, remove Work, replace and retest.

3.13 CLEANING

- A. Upon completion of drilling and pipe installation, remove drilling spoils, debris, and unacceptable material from approach trenches and pits. Clean up excess slurry from ground.
- B. Restore approach trenches and pits to original condition.
- C. Remove temporary facilities for drilling operations in accordance with Section 01 50 00 - Temporary Facilities and Controls.

END OF SECTION