Technical Specification 015

DIRECTIONAL DRILLING

1.0 General

a) The intent of this specification is to provide general technical guidance to the utility contractor for the installation of pipelines using horizontal directional drilling (HDD) techniques.

b) The utility contractor shall furnish all labor, materials, equipment, and incidentals required to successfully perform the installation of water, wastewater, and reclaimed water mains at locations shown on the plans by using horizontal directional drilling (HDD) methods.

c) The pipeline shall be complete with all accessories and shall have passed all required testing per the contract documents and other county requirements.

d) The utility contractor shall have made all inspections of the area(s) within the vicinity of the project and the immediate area of the work and become thoroughly familiar with the natural and manmade features encompassed about the project.

2.0 Quality Assurance

a) Requirements

1) At the discretion of Brunswick County, it may be required that the utility contractor be prequalified and approved through a prequalification process. The utility contractor must furnish references able to attest to his capabilities in accordance with the prequalification process.

2) The utility contractor shall comply with North Carolina OSHA Standards, Underwriter Laboratories standards, and other requirements of the Authority Having Jurisdiction (AHJ).

b) Reference Standards

1) Comply with applicable provisions and recommendations of the following, except as otherwise shown or specified:

a) ASTM D-1248 and D-3350
b) AWWA C901 or C906
c) NSF 61
d) ASTM D2683 or D3261

3.0 Required Submittals

The utility contractor shall submit the following items to the Engineer for review and approval:

a) Pipe material shop drawings

b) Manufacturer's Installation Manual

c) Certificates: Submit certificates of compliance with referenced standards where requested by the engineer

d) Field installation drawings indicating layout and depth of directionally drilled pipe.

e) Record Drawings: During progress of the work, keep an up to date set of drawings showing field and shop drawing modifications including the drilling logs. The drawings shall show all piping on plans and in sections, with all reference dimensions and elevations required for complete record drawings of the directionally drilled pipe including the drilling logs to be included on the record drawings.

f) Erosion control plan for the drilling mud pit work area

g) Frack out containment plan for the drilling area

h) Written verification of required pressure testing per county specifications

i) Work Plan: Prior to beginning work, the Contractor shall submit to the Engineer a work plan detailing the procedure and schedule to be used to execute the project. The work plan should include a description of all equipment to be used, down-hole tools, a list of personnel and their qualifications and experience (including back-up personnel in the event that an individual is unavailable), list of subcontractors, a schedule of work activity, a safety plan (including MSDS of any potentially hazardous substances to be used), traffic control plan (if applicable), an environmental protection plan and contingency plans for possible problems. Work plan should be comprehensive, realistic, and based on actual working conditions for this particular project. Plan should document the thoughtful planning required to successfully complete the project.

j) Equipment: the utility contractor shall submit specifications on directional drilling equipment to be used to ensure that the equipment will be adequate to complete the project. Equipment shall include but not be limited to: drilling rig, mud system, mud motors (if applicable), down-hole tools, guidance system, and rig safety systems. Calibration records for guidance equipment shall be included. Specifications for any drilling fluid additives that the utility contractor intends to use or might use will be submitted. Specifications on material to be used shall be submitted to engineer. Material shall include the pipe, fittings, and any other item which is to be an installed component of the project.

k) Guidance System: A Magnetic Guidance System (MGS) probe or proven gyroscopic probe and interface shall be used to provide a continuous and accurate determination of the location of the drill head during the drilling operation. The guidance shall be capable of tracking at all depths up to fifty (50) feet and in any soil condition, including hard rock. It shall enable the driller to guide the drill head by providing immediate information on the tool face, azimuth (horizontal direction) and inclination (vertical direction). The guidance system shall be accurate up to +/- 2% of the vertical depth and accurate to within two and one-half (2 ½) feet horizontally from the horizontal alignment shown on the drawings.

4.0 Materials

a) HDPE: Material shall be high-density polyethylene, extra high molecular-weight, PE3408 pressure rated 200 psi, minimum DR- 9, as manufactured by Plexco or equal.

b) Fusible PVC: Material shall be fusible C-900 or C-905 polyvinyl chloride (PVC), minimum DR-18, rated 150 psi (C900) or 235 psi (C905), as manufactured by Underground Solutions, Inc., or approved equal.

c) Pipe shall be heat fusion welded per the manufacturer's instructions.

d) Mechanical fittings shall be authorized by the manufacturer for use on HDPE and Fusible PVC and approved by the engineer.

5.0 Testing and Payment

a) Pipe shall be pressure tested after installation per Brunswick County Technical Specifications and Standard Details for either water distribution or sewer force main piping systems. If a pipe relaxation period is required, the minimum relaxation period shall be forty-eight (48) hours or the manufacturer's recommended relaxation period. After the pipe relaxation period the pipe may have its initial pressure test. If the initial pressure test is successful, the pipe shall also be connected to the water or sewer system to be tested again as part of the overall system pressure test. All connections shall be per county standard detail.

b) County staff, in addition to the engineer, shall be available during the testing for observation and documentation of the pressure test.

c) All unsuccessful pressure testing will be cause for correction by the utility contractor at no additional cost to Brunswick County.

d) All trenchless installations shall pass the initial hydrostatic pressure test per specifications and standard details prior to any payment to any contractor.

6.0 Storage and Handling

a) Handle all pipe and accessories carefully with approved handling devices. Do not

drop or roll pipe off trucks. Do not otherwise drop, roll or skid pipe. Materials cracked, gouged, chipped, dented or otherwise damaged will not be approved or accepted for use on county systems.

b) Pipe and appurtenances shall be unloaded opposite to or as close to the place where they are to be laid as is practical to avoid unnecessary handling. Interiors shall be kept completely free from dirt and foreign matter.

c) The utility contractor shall be responsible for the proper support of the piping to ensure that the pipe is not over stressed or damaged in any manner.

7.0 Installation

a) General

1) The work shall be performed by the Horizontal Directional Drill (HDD) Technique. Specific details of installation techniques are the responsibility of the utility contractor and must fully comply with the pipe manufacturer's installation recommendations. The county will not direct "means and methods" to the contractor to be used in installation of the directional drill pipe other than that pipe must be installed in accordance with the manufacturer specifications. In general, the work will proceed as follows:

a) Drill a pilot hole from one side of the crossing to the other. The pilot hole follows the design centerline of the pipe with the path recorded and controlled using a specially designed instrument package situated behind the drill bit.

b) A washover pipe is rotated over the pilot drill string behind the pilot drill bit and exits with the drill bit on the other side of the crossing.

c) The drill bit and drill string is withdrawn back through the washover pipe, leaving the washover pipe in place.

d) A series of tools are connected between the end of the washover pipe and the wastewater main and/or water main. The drilled hole is widened to its final diameter with the appropriate tool, head or cutter. Smooth the wall of the bore and direct bentonite to aid in the boring operation. A swivel is installed between the tool, head or cutter and the wastewater main and/or water main to ensure that no torque is transmitted to the pipe main.

e) After the tools are connected between the washover pipe and wastewater force main and/or water main, the drill rig will rotate and pull the washover pipe along the drilled path, with the pipe following slowly behind.

f) After the pipe is in place, and after the pipe relaxation period, if required, it shall be pressure tested per county specifications with a county representative present.

g) A twelve (12) gauge, steel reinforced, insulated copper locator wire shall run continuously with and shall be securely fastened to the water main or forcemain. Refer to county technical specifications for water mains and force mains, and county standard details for more information on the required locator wire.

b) Drill Path Geometry

1) The utility contractor is responsible for horizontal and vertical alignment of the pilot drill and final installed pipe. The pilot drill should conform to the pipeline alignment as shown on the contract drawings. The utility contractor shall submit all proposed changes to the vertical alignment shown on the drawings to the Engineer for approval prior to commencing work. Under no circumstances shall installed pipe be at a higher elevation than that shown on the drawings or vary by more than (2 ½) feet from the horizontal alignment shown on the drawings.

2) The accuracy of the drill exit point shall be within a (2 ½) foot horizontal radius of the design exit point.

3) Entry and exit points shall be located as shown on the contract drawings.

4) The utility contractor shall map to scale the location of each pilot drill string joint to a minimum horizontal and vertical scale of 1 inch equals 20 feet. The map shall be furnished to the Engineer.

5) Should the utility contractor exceed the limits described above, a new pilot drill shall be performed at the expense of the utility contractor and at no cost to the county. The utility contractor may elect to alter the horizontal geometry of the drilling subject to right-of-way restraints. However, payment limits are based upon stations given in the bid form, and payment for directional drilling will be limited to the prices bid therein.

6) If requested by the Engineer and / or County, the utility contractor shall provide a full explanation of details regarding any technical means, methods or equipment necessary to accomplish the work described herein.

c) Job Conditions

1) Existing Utilities: The contractor shall be responsible to field locate existing underground utilities in the areas of work.

a) Should uncharted or incorrectly charted piping or utilities be encountered during the work, consult piping or utility owner and engineer immediately for instructions. Cooperate with owner and

utility companies in keeping respective services and facilities in operation. Repair damaged utilities to satisfaction of utility owner.

b) Do not interrupt existing utilities serving facilities occupied and used by owner or others, except when permitted in writing by the engineer and then only after acceptable temporary utility services have been provided.

c) Coordinate with utility companies for shut-off of services, if required.

2) Do not bring explosives onto site or use in the work. Use of explosive materials is specifically prohibited.

3) The utility contractor shall conduct all of his operations and maintain the area of his activities, including sweeping and sprinkling of roadways, so as to minimize the creation and dispersion of dust.

d) Installation Specialist

1) The utility contractor shall provide the full-time services of a competent installation specialist during the directional drilling to assist in technical matters relating to the work. He shall advise the utility contractor on matters to include, but are not limited to, drilling, pipe support, mapping of the pipe location, quality assurance of the work, safety or other items as necessary. Installation specialist may be the contractor's superintendent.

e) Completion of Work

1) Interior of all pipe and fittings shall be inspected and all dirt, gravel, sand, debris, or other foreign material shall be completely removed from pipe interior. A bulkhead shall be attached to the end of the pipe prior to attaching the swivel and barrel reamer to ensure inside of pipe remains clear during pullback operation.

2) Install all pipes accurately to line and grade shown unless otherwise approved by the Engineer.

3) Any time that pipe work is not actively in progress the open ends of pipe shall be closed by a watertight cap.

4) Field cutting pipe, where required, shall be made with a machine specially designed for cutting piping. Cuts shall be carefully done, without damage to pipe, so as to leave a smooth end at right angles to the axis of pipe. Cut ends shall be tapered and sharp edges filed off smooth.

5) At completion of pipe installation, the utility contractor shall install transition fittings as required to the piping and then cap with watertight caps or plugs.

6) At completion of pipe installation, the utility contractor shall furnish accurate drill logs indicating placement of pipe as installed. The entire drill path shall be accurately surveyed with entry and exit stakes placed in the appropriate locations within areas indicated on drawings. If the utility contractor is using a magnetic guidance system, the drill path will be surveyed for any surface geomagnetic variations or anomalies.

8.0 Environmental Controls

a) Disposal of drilling mud:

1) The drilling mud cannot be disposed of on the project site.

2) Off-site disposal of the drilling mud is the utility contractor's responsibility.

3) The utility contractor shall comply with all applicable laws and regulations regarding the transport and off-site disposal of the drilling mud and all excess excavated materials.

4) All costs for proper transport and disposal of drilling mud and all excess excavated materials shall be included in the price bid for the work.

b) All operations involving drilling mud shall be controlled and monitored by the utility contractor to ensure containment:

1) The utility contractor shall establish bermed or sandbagged pits of sufficient sizes to accommodate the volume of drilling mud anticipated plus a two-foot freeboard. The bermed areas shall be maintained and designed by the utility contractor to ensure containment and prevent loss of drilling mud.

2) Transportation of the disposal materials off-site by public roads shall meet all North Carolina Department of Transportation requirements.

3) Transportation of materials by barge or scow shall be in accordance with the Corps of Engineers and U.S. Coast Guard requirements.

9.0 Asbuilt / Record Drawings

a) The utility contractor shall deliver the drilling logs to the engineer for inclusion in the final as-built drawings for the project. The design profile for the directional drill installation shall be updated with the drilling log data. The drilling logs shall be incorporated in the final as-built drawings provided by the engineer.