

## Section 2300

### Horizontal Directional Drilling (HDD)

#### **PART 1: General**

- 1.1 *General Description of Work* – This section governs the installation of water and sewer mains sized 4 inches in diameter and larger using horizontal directional drilling. This section also governs the casing of pipe.
- 1.1.1 *Requirements* – The Contractor shall furnish all labor, equipment, materials, and supplies and shall perform all work necessary to provide ECUA with a complete, finished installation. The proposed alignment, length, profile, and grade to which the HDD shall be installed are noted on the applicable drawings. Casing pipe, if applicable, are shown on drawings.
- 1.2 *Quality Assurance* –
- 1.2.1 The requirements set forth in this Specification outline a wide range of procedural precautions necessary to insure that the basic, essential aspects of a proper Directional Bore installation are adequately controlled. The Contractor is ultimately responsible for the satisfactory completion of the drilling.
- 1.2.2 The Contractor shall perform the work in general conformance with all pipe Manufacturer's requirements for handling, storage, maximum longitudinal and bending stresses, etc. for the selected pipe material. For polyethylene pipe installations, the work shall be in general conformance with ASTM Standard F1962-05, current edition, "Standard Guide for Use of Maxi-Horizontal Directional Drilling for Placement of Polyethylene Pipe of Conduit under Obstacles, Including River Crossings".
- 1.2.3 HDD equipment operators shall be trained to operate the specific horizontal directional drilling equipment for ECUA's project with at least 3 years experience in directional drilling obtained within the last five years. All pipe of similar type and material shall be furnished by a single manufacturer.
- 1.3.0 Perform HDD operations under the constant direction of a drilling supervisor who shall remain on site and be in responsible charge throughout the drilling operation. The drilling supervisor shall have supervised directional drilling of a minimum of 5,000 linear feet of pipe of a similar or greater diameter, of similar material, over similar lengths, and with similar subsurface conditions.
- 4.41.3 *Submittals* – Prior to beginning work, the Contractor shall submit to the Engineer five (5) copies of a report to include the following:
- 4.4.1.3.1 *Soil Analysis* – Contractor shall make statement that he has reviewed any ECUA supplied soils analysis, along with any soils analysis as obtained by the Contractor. The Contractor is solely responsible for verifying soil conditions as necessary to ensure well-informed bore planning.
- 4.4.21.3.2 *Equipment/Procedure/Materials List* – Contractor shall submit to ECUA the rig size with rated maximum pullback force and maximum allowable pullback force of pipe and

shall make statements as to how the pipe pullback forces will not be exceeded by the rig. The Contractor shall also submit a list of other equipment, procedures, and materials expected to be used for the Directional Bore.

1.4.31.3.3 *Schedule* – Contractor shall submit to ECUA a time schedule for completing the Directional Bore, including any delays due to anticipated soil conditions.

1.4.41.3.4 *Contingency Plan* – Contractor shall submit to ECUA a Contingency Plan clearly defining methods for management of unplanned releases of drilling mud. The plan shall address monitoring, immediate response plan, and anticipated mitigation techniques.

1.4.51.3.5 *Staging/Maintenance of Traffic Plan* – A Staging/Maintenance of Traffic (MOT) Plan shall be submitted to ECUA that delineates staging areas for pipe storage, fusing operations, pits, etc.

1.51.4 *Drilling Hours* – All drilling operations shall be accomplished during daylight hours. In emergency situations, or where delay would increase the likelihood of a failure, night work may be allowed to complete a delayed [crossing horizontal directional drill](#).

## **PART 2: Products**

### **2.1 *Equipment* –**

2.1.1 *General* – All equipment for the Directional Bore shall have the capacity, stability, and necessary safety features required to fully comply with the specifications and requirements of this section without showing evidence of undue stress or failure. It shall be the responsibility of the Contractor to assure that the equipment to be used in the Directional Bore is in sound operating condition. Backup equipment shall be required in the event of an equipment breakdown and where the condition of the equipment to be used indicates that routine component replacement or repair will likely be necessary during the Directional Bore.

2.1.2 *Spoils Equipment* – The Contractor shall be responsible for the offsite disposal of all surplus bentonite mixture, cuttings, soil, and debris generated by the project. The surplus materials shall be removed, hauled, and disposed of in accordance with all regulatory agencies having jurisdiction.

2.1.3 *Stoppages* – If equipment breakdown or other unforeseen stoppages occur and forward motion of the directional cutting head is halted at any time other than for reasons planned in advance (addition of drill stems, etc.), the boring path shall be filled with a proper bentonite solution immediately, or as directed by the Engineer.

2.1.4 *Pipe Materials* – Pipe materials shall be per plans. Pipe markings will include nominal size, material, classification (i.e. DIPS), designation (i.e. AWWA C900), dimension ratio, pressure class, Manufacturer's name and date, etc. Sewer pipe shall be green in color, or shall be black with three coextruded green stripes for its full length. Water pipe shall be blue in color or shall be black with three coextruded blue stripes for its full length.

2.1.4.1 *End Connections* –

2.1.4.1.1 HDPE – Terminate all HDPE bore pipe with fusion welded HDPE/PVC mechanical joint adapters and kit.

2.1.4.1.2 PVC/Ductile Iron – Terminate all bore pipe with restraints as shown in ECUA Detail(s) D-62 and/or D-63.

2.1.4.2 Casing End Seals – Install Wrap-Around or Pull-On end seal manufactured of 1/8-inch thick HDPE special end termination cap as manufactured by ISCO or approved equals synthetic rubber including T-304 stainless steel bands.

2.1.4.3 Casing Pipe –

2.1.4.3.1 Materials – Casing Pipe materials shall be per plans. Casing Pipe markings will include nominal size, material, classification (i.e. DIPS), designation (i.e. AWWA C900), dimension ratio, pressure class, Manufacturer's name and date, etc. Sewer pipe shall be green in color, or shall be black with three coextruded green stripes for its full length. Water pipe shall be blue in color or shall be black with three coextruded blue stripes for its full length. The Casing Pipe shall meet the requirements specified in the "Pipe Material Summary Chart."

2.1.4.3.2 Size – Casing Pipe inside diameter shall be of adequate size to provide a minimum of two (2) inches of annular space around the largest outside diameter of the carrier pipe or accommodate pipe restraints, whichever is larger.

### PART 3: Execution

#### 3.1 Personnel Requirements –

3.1.1 *Supervisor* – A competent and experienced supervisor representing the Drilling Contractor shall be present at all times during actual operations. A responsible representative, who is thoroughly familiar with the equipment and type work to be performed, must be in direct charge and control of the operation at all times. In all cases, the supervisor must be continually present at the job site during the actual Directional Pilot Hole, over reaming and pullback operations.

3.1.2 *Mud Mixing and Recycle Unit Operator* – The Drilling Contractor shall have an experienced and competent mud mixing and recycle unit operator to monitor the viscosity, sand/small fines, mud weight, gel strengths, filtration control and other fluid conditions to ensure optimal performance during pilot hole, over reaming and pullback operations.

3.1.3 Number of Workers Present – The Contractor shall have a sufficient number of competent workers on the job at all times to ensure the Directional Bore is made in a timely and satisfactory manner. Adequate personnel for carrying out all phases of the actual Directional Bore operation must be on the job site at the beginning of work.

3.1.4 Fusion Technician Requirements - ~~Welders Fusing Operator~~ – ~~H~~ HDPE or PVC pipe thermal butt fusion welding to be completed by a welder Fusing Operator certified by the Manufacturer of the pipe or pipe welding equipment. The Fusing Operator fusing

technician - must be knowledgeable and trained to ASTM F2620 – 4209 and ASTM F3124 – 23a15e1.

3.1.4.1 Any fusion technician who operates fusion equipment on the project shall have current manufacturer's certification for the equipment on the project.

3.1.4.2 Prior to the start of the project a copy of the manufacturer's certification of each fusion technician to be used on the project shall be submitted to the project owner.

3.1.4.3 Any fusion technician who operates fusion equipment on the project must have an infrared or contact pyrometer.

3.1.4.4 Any fusion technician who operates fusion equipment on the project must be capable of operating a fusion data recording device.

3.1.3-13.1.4.5 Any fusion technician who operates fusion equipment on the project shall use a data recording device for any fusion made on the project.

## 3.2 Installation –

3.2.1 *Maintenance of Traffic Plan* – The Contractor shall be responsible for providing a Maintenance of Traffic (MOT) Plan to the Engineer and local traffic law enforcement agency for review. The MOT Plan shall show the location of all barricades, signs, devices, and alternate routes for local traffic and pedestrian safety. Erection of the appropriate safety and warning devices in accordance with the USDOT/FHWA “Manual of Uniform Traffic Control Devices” (MUTCD) shall be completed prior to beginning work and maintained until all construction is completed and the site restored.

3.2.2 *Excavation* – All excavation for entry and recovery pits and any other excavation necessitated by the Directional Bore shall be as specified in FDOT's Standard Specifications for Road and Bridge Construction, latest edition. All excavations shall comply with the requirements of the Occupational Health and Safety Administration.

3.2.3 *Restoration Costs* – The Contractor is responsible for the cost of restoring pavement, curb, sidewalk, driveways, lawns, storm drains, etc., and other landscaped facilities unless otherwise noted.

3.2.4 *Process Outline* – The following is a general outline of steps for the Directional Bore operation:

3.2.4.1 Contractor shall clear the right-of-way and temporary work space as shown on the drawings. Contractor to install and maintain all soil erosion and sediment control devices, until project completion with approved permanent site stabilization.

3.2.4.2 Contractor shall haul, string, assemble restrained pipe, and air test the pipeline in one section, above ground, unless otherwise approved by Engineer. The Contractor shall provide adequate site security and shall be responsible for the integrity of the pipe until after the pullback, final test of the pipeline, and acceptance of the work by the Owner.

3.2.4.3 All assembled pipe sections shall be securely plugged at the end of each workday. The pipe interior is to be protected at all times against dirt, dust, drilling mud, pipe cuttings, debris, animal access, and other sources of contamination.

- 3.2.4.4 Contractor shall provide adequate support rollers for the pipeline during pullback of the pipe string into the pre-drilled hole. The rollers and cradles shall be of a type that will prevent damage to the pipe and will be of sufficient number, as recommended by pipe Manufacturer, to prevent over stressing due to sagging and/or bends during the pullback procedure. The pipe shall be supported at all times, including pullback, to maintain a free stress arc which limits pipe bending and internal hoop stresses to within Manufacturer's limits.
- 3.2.4.4.1 Pipe which is not properly protected and supported and shows indications of excessive stressing, gouges, cuts, abrasions or other damage which may affect the operational performance intended for the pipe, as recommended by pipe Manufacturer, shall be removed from the site and replaced at no additional cost as directed by the Owner or Engineer.
- 3.2.4.5 Contractor will mobilize the drilling equipment, erect the rig, drill a pilot hole, enlarge the hole as necessary to a minimum diameter of 1.5 times the nominal diameter of the pipe, and pullback the prefabricated pipe string under the waterway crossing.
- 3.2.4.6 Contractor will supply portable mud tanks or construct temporary mud pits to contain excess drill fluids during construction. Mud pits are to be protected at all times against unauthorized access and be stabilized at all times against surface water runoff and containment berm failure. Contractor will pump, haul, and dispose of any drill cuttings and excess drill fluids in a manner consistent with the local and state regulations at no additional cost to the Owner.
- 3.2.4.7 The bore pipe will be pulled back in one continuous section and contractor must utilize a swivel to minimize the rotation of the product pipe during pullback. Swivel shall utilize lubricated internal bearings, which are fully protected from external contamination and over lubrication. Contractor must select a swivel of a capacity to continuously support all live, static and friction loads during pullback and demonstrate swivel operation prior to pullback.
- 3.2.4.8 During pullback, the Contractor shall maintain records for submission to Engineer indicating job, date, time, constant pipe footage progress, mud flow rates, pulling forces required and torque readings.
- 3.2.4.9 Engineer shall have access at all times to any measuring or gauging devices used for the horizontal drill as well as any drilling logs maintained by the Contractor.
- 3.2.4.10 In the event that the Contractor must abandon the drill hole before completion of the crossing horizontal directional drill, the Contractor will seal the borehole with neat cement grout starting at the low point or end of the drill hole (Rule 62-532.500(4) F.A.C.) and redrill the crossing horizontal directional drill at no extra cost to Owner.

### 3.2.5 Fusion Unit Requirements

- 3.2.5.1 All fusion equipment, whether new or used, rented or owned, shall be approved by the owner or his representative. The butt fusion equipment used shall be capable of meeting all normal butt fusion requirements: alignment, heating, trimming and fusion pressure.

3.2.5.2 If the contractor owns butt fusion equipment, the equipment must be serviced within 1 month prior to use on this project. The fusion machine shall be in satisfactory working order. The hydraulic system must be leak free. The pressure gauge and thermometer must be checked for accuracy before the start of the project.

### 3.2.6 Fusion Unit Data Recording Device Requirements

3.2.6.1 The data record includes information about how the heat butt fusion joint was made (heater temperature, pressures and times for heating, fusion and cooling steps) and other important information about the process, job, equipment used, etc. The device record is compared to the specific heat butt fusion procedure parameters to determine if the procedure followed correctly. For comparison purposes, a graph of time versus pressure is generated from the data record to show pressure changes that occur during the butt fusion process. At the owner or his representative's request, these records may be downloaded from the device and provided to the owner for storage.

3.2.6.2 The device must have been calibrated within the last year and, at the owner or his representative's request, a copy of the most recent calibration must be provided to the owner.

3.2.6.3 The device shall be capable of collecting the following information:

- the heater temperature at the beginning of the heat cycle and the pressures applied during the heating, fusing and cooling cycle. time for each stage of the process from the beginning of the heat cycle through the end of the cool cycle
- the operators name or identification number, or both
- the job number
- joint number
- the date and time
- the equipment manufacturer
- equipment model and serial number used
- the heat butt fusion procedure or standard used
- the pipe/fitting manufacturer
- the pipe OD and DR
- pipe material and material designation
- drag pressure
- the interfacial pressure used (unless already included in the gauge pressure determination)
- plus any notes about the job that would help evaluate the record such as:
- weather conditions: ambient temperature, wind speed
- job set-up issues
- use of an enclosure

## 3.3 Pipeline Alignment and Profile Tolerances –

3.3.1 *Entry and Exit Angles* – Ground entry and exit angles shall be as listed on the Contract drawings. Should none be listed, then maximum angles shall be based on drilling rigs and/or pipe Manufacturer's recommendations.

- 3.3.2 *Bend Stress* – Stresses induced by bending shall not exceed 72 percent of the Manufacturers specified minimum yield strength of the pipe. Design bending radii shall be planned accordingly.
- 3.3.3 *Exit Point* – The actual exit point shall be sufficiently close to the design exit point as to not require additional fittings, conflicts with other utilities, or detrimental alteration of existing utility alignment. The actual exit point shall be no more than 10 feet in front of or 20 feet beyond of the proposed exit point.
- 3.3.4 *Depth* – The vertical profile as shown on the drawings is the minimum depth to which the pipeline shall be installed. Pipelines installed under waterways shall maintain a minimum of 15-foot depth below the deepest part of the channel the entire width of the waterway unless otherwise directed by ECUA. Contractor may, at his option and with the permission of Owner, elect to install the pipe at a greater depth than shown on the drawings, at no additional cost to the Owner.
- 3.3.5 *Pull Force* – Contractor shall limit the longitudinal pull force on the pipe to not exceed pipe Manufacturer’s recommended bending or tensile stress of the pipe, unless otherwise approved by the pipe Manufacturer or authorized representative. Contractor will continuously monitor and record the longitudinal pulling forces during pipeline pullback to ensure that Manufacturer’s recommended maximum stresses are not exceeded.
- 3.3.6 *Pipe Relaxation* – After pullback, pipe shall be allowed to relax at least 24 hours or per Manufacturer’s recommendations, whichever is greater, prior to any testing or connections.
- 3.4 *Field Quality Control* –
- 3.4.1 *Flushing* – The newly installed distribution or transmission main shall be flushed with potable water, and/or swabbed as may be specified for the carrier pipe, to remove any sediment, solids, and/or foreign material prior to any in place testing. Owner’s representative shall be notified 48 hours prior to flushing.
- 3.4.2 *Hydrostatic Test (In ground - After Pipe Pullback)* – Testing shall be in accordance with the applicable section of the ECUA Engineering manual for the specific type of carrier pipe.
- 3.5 *Water for Construction and Testing* – The Contractor shall be responsible for all permits, fees, temporary meter rental/provisions, temporary back flow preventer rental/provision, and other water utility requirements for supplying water during construction. The Contractor shall use the existing water system only at locations, times and conditions as set forth by the system owner or its representatives.
- 3.6 *As-Built Records* –
- 3.6.1 *Welds* – All welds shall be made using a data logger which records temperature, time, and pressure in accordance with ASTM F3124 – 15e1. Weld recording data shall be submitted as part of the as-built record drawings.
- 3.6.2 *Pipe Location* – Pipe location shall be determined with the use of an electronic walkover tracking system or a magnetic guidance system probe. Location data shall include station,

offset, depth, and pipe elevation every 50 feet and at major points of distinction (i.e. edge of pavement, center creek, etc.).

- 3.6.3 *Submittal Format* – Where AutoCAD plans are available, Contractor shall submit info on AutoCAD drawings. Where AutoCAD plans are not available, Contractor shall submit info as noted on plans in a clear and legible format.
- 3.7 *Measurement* – Straight line field measurement from HDPE/MJ adapter to HDPE/MJ adapter or first bell restraint at each end of the bore. Contractor shall adjust unit prices to compensate for additional piping as needed for vertical alignment.
- 3.8 *Payment* – Compensation shall be for all pipe, materials, labor, equipment, drill mud haul and disposal, and all other incidental work and testing required by the plans and specifications for a complete and fully functional system.

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