



## **DIVISION 33 – UTILITIES**

### **SPECIFICATION 330523: HORIZONTAL DIRECTIONAL DRILLING**

#### **PART 1.0 GENERAL**

##### **1.1 DESCRIPTION**

- 1.1.1 The directional drilling method is a multi-stage process that involves site preparation and restoration; equipment set-up; drilling a pilot hole as shown on an approved pilot bore plan, then enlarging the pilot hole to not larger than 1.5 times the outer diameter of the pullback pipe or pipe joint/coupling; and then pulling the product back through the drilled space.
- 1.1.2 This specification covers Poly-Vinyl Chloride (PVC) pipe and Ductile Iron (DI) pipe in nominal size(s) four-inch through 30-inch installed in accordance with the approved NASTT “HDD Good Practices Guideline”. Pipe is intended for use as a pressure rated potable water, reclaimed water, or wastewater delivery system.

##### **1.2 REFERENCE DOCUMENTS**

- American National Standards Institute (ANSI)
- American Society of Testing Materials (ASTM)
- American Water Works Association (AWWA)
- Florida Department of Transportation (FDOT)
- National Utility Contractors Association (NUCA)
- North American Society for Trenchless Technology (NASTT)
- NSF International (NSF)

##### **1.3 RELATED WORK**

- All specifications of Division 33
- Hillsborough County Public Utilities Department (PUD) Technical Manual
- Hillsborough County Utility Accommodation Guide (UAG)

##### **1.4 WARRANTY**

- 1.4.1 A one-year warranty for the pipe shall be included from the General Contractor, and shall cover the cost of the replacement pipe and freight to the project site, should the pipe have any defects in material or workmanship.
- 1.4.2 In addition to the standard pipe warranty, the HDD Contractor shall provide in writing a warranty for a period of one year for all fusion joints, including formation, installation, and pressure testing, if applicable.
- 1.4.3 Unless otherwise specified, the warranty periods shall begin at Substantial Completion for County projects, and at Project Acceptance by the PUD Records Group for County dedicated projects.

##### **1.5 SUBMITTALS**



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- 1.5.1 HDD Contractor's Experience Record: Furnish documentation supporting the directional drilling Contractor's qualifications and experience. This shall include a list of all equipment to be used and a list of personnel and their qualifications and experience. The equipment listing shall include the directional drilling equipment, guidance system, drilling fluid system, and all other equipment to be used.
- 1.5.2 Shop Drawings: Submit all pipe submittals as per the applicable water service technical specification of the pipe to be used for this project.
- 1.5.3 Work Plan: This shall include a schedule of work activity, a safety plan (including MSDS of all substances to be used), an environmental protection plan and contingency plan for possible problems.
- 1.5.4 Bore Plan: A bore plan shall be prepared by the drilling contractor and submitted as required by Specifications 331001, 333002, and 339001. The plan shall show the finished grade along the bore path, the deflection and radii of the pilot bore, the length of each bore, and the vertical and horizontal clearances between the bored pipe and any existing/proposed conflicting pipes, conduits, or obstructions. Clearances shall not be less than the guidance system's accuracy tolerance.
- 1.5.5 Record Drawings: The HDD locations and elevations shall be shown on the Record Drawing. The General Contractor's Surveyor shall locate the beginning, ending and the surface locations of the driller's log readings, and the locations shall be indicated on the record drawings. The HDD Contractor shall provide a certified report and bore log indicating the horizontal and vertical location at least every 10 linear feet along the pipe. The information provided by the HDD Contractor shall be depicted on the record drawing and identified as having been provided by the HDD Contractor.
- 1.5.6 Submit a copy of any design exception prior to installation. Design exceptions are issued by the section manager of the Utility Design Section Manager. Any deviation from the specifications requires a design exception.

## **PART 2.0 PRODUCTS**

### **2.1 GENERAL**

- 2.1.1 Products intended for contact with potable water shall be evaluated, tested, and certified for conformance with NSF Standard 61.
- 2.1.2 Products used in directional drilling applications shall comply with the size/material requirements listed in Specification 331001 (potable water), 333002 (wastewater force mains), and 339001 (reclaimed water) and as listed in Appendix B.
- 2.1.3 Restrained joints that may be used at valves, tees, bends, and other fittings shall comply with Appendix B.

### **2.2 POLYVINYL CHLORIDE PIPE AND COUPLINGS (PVC)**

- 2.2.1 Products delivered under this specification shall be manufactured only for water distribution pipe and couplings conforming to ANSI/AWWA C900 or C905. Restrained joint pipe shall also meet all performance requirements ANSI/AWWA C900 or C905.



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- 2.2.2 Blue pipe shall be supplied for the potable water system (refer to Specification 331001), purple pipe shall be supplied for the reclaimed water system (refer to Specification 339001), and green pipe shall be supplied for wastewater system (refer to Specification 333002).
- 2.2.3 Nominal outside diameters and wall thickness of pipe shall conform to the requirements of ANSI/AWWA C900 or C905.
  - 2.2.3.1 Pipe shall be DR-18 (minimum).
  - 2.2.3.2 Pipe shall be furnished in standard laying lengths of 20 feet one inch, or shall be 40 feet (typically) for fusible PVC.
- 2.2.4 Pipe shall be homogeneous throughout and be free of visible cracks, holes, foreign material, blisters, or other visible deleterious faults.
- 2.2.5 Fusion Joints: Unless otherwise specified, fusible PVC pipe lengths shall be assembled in the field with butt-fused joints as required by the applicable PUD specifications.
- 2.2.6 Restrained Joint Couplings
  - 2.2.6.1 All restrained couplings shall be furnished in DR-14.
  - 2.2.6.2 Pipe shall be joined using nonmetallic restrained type couplings. Pipe and couplings shall be designed as an integral system and shall be provided by a single manufacturer for maximum reliability and interchangeability.
  - 2.2.6.3 Pipe and couplings shall be joined using high-strength flexible plastic splines inserted into mating precision-machined grooves, which align when the pipe is fully inserted providing a full 360° restraint with evenly distributed loading. No external pipe-to-pipe restraining devices that clamp onto or otherwise damage the pipe surface as a result of point-loading shall be permitted.
  - 2.2.6.4 Couplings shall be designed as minimum for use at the rated pressures of the pipe with which they are utilized, and shall incorporate twin elastomeric sealing gaskets meeting the requirements of ASTM F477. Assembled joints shall meet the leakage test requirements of ASTM D3139.
  - 2.2.6.5 Allowable axial jacking loads shall be supplied by the manufacturer. The Engineer and Contractor shall utilize appropriate instrumentation to insure that these loads are never exceeded.
  - 2.2.6.6 Only experienced personnel shall be used to install pipe. Coupling edges shall be beveled to reduce drag force when pipe is installed by HDD. Assembly of joints shall be accordance with the manufacturer's instructions.
  - 2.2.6.7 Restrained Joint Couplings for C900 & C905/RJ pipe shall be supplied by the manufacturer.
    - a) Spline: High strength Polyamide Thermoplastic.
    - b) Gaskets: Vulcanized SBR in accordance with ANSI/AWWA C111/A21.11.
    - c) Tee Bolts: Shall meet requirements as described in ANSI/AWWA C111/A21.11.

## 2.3 DUCTILE IRON PIPE AND FITTINGS

- 2.3.1 Products delivered under this specification shall be manufactured only for water distribution pipe and couplings conforming to ANSI/AWWA C151/A21.51. Restrained joint pipe shall also meet all performance requirements ANSI/AWWA C151/A21.51.
- 2.3.2 Nominal outside diameters and wall thickness of thrust-restrained pipe shall conform to the requirements of ANSI/AWWA C151/A21.51. Restrained pipe shall be CL50 minimum. Pipe shall



be furnished in standard laying lengths of 20 feet one inch.

- 2.3.3 Ductile Iron Fittings: Fittings for bends, tees, etc., shall be ductile iron fittings as specified in Specification 331001, 333002, or 339001 (ANSI/AWWA C153/A21.53).

## **PART 3.0 EXECUTION/INSTALLATION**

### **3.1 DESCRIPTION**

- 3.1.1 Furnish all material, equipment, transportation, tools, and labor to install pipe by directional drilling method, or direct trenchless pipe installation as required, and all related work for a complete installation.
- 3.1.2 For installations not within the jurisdiction of the Hillsborough County, the HDD Contractor shall comply with regulations of the governing authority. State highway casing installations shall be as specified in the Florida Department of Transportation "Utility Accommodation Manual" as supplemented by the Florida Department of Transportation permit, Florida Department of Environmental Protection permit, and/or CSX Railway permit.
- 3.1.3 The General Contractor shall submit shop drawings, working drawings, schedules and samples in accordance with the Specifications 331001, 333002, or 339001, as applicable.
- 3.1.4 The recommended Safe Pulling Force shall be supplied by the pipe manufacturer. The HDD Contractor shall utilize appropriate instrumentation to insure that these loads are never exceeded. Coupling edges shall be beveled to reduce drag force on the pipe when fusible PVC is not used.
- 3.1.5 Only experienced personnel shall be used to install pipe. A qualified HDD Contractor must have at least 3 years of experience involving work of a similar nature. This includes the foreman, drill technician, and locator. A competent and experienced supervisor for the HDD Contractor must be present at all times during the actual drilling operations. A responsible representative who is thoroughly familiar with the equipment and type of work to be performed must be in direct charge and control of the operation at all times.
- 3.1.6 The General Contractor shall have all applicable permits in hand prior to construction and all work shall be performed in the presence of the County representative.
- 3.1.7 It shall be the HDD Contractor's responsibility to perform the directional drilling work in strict conformance with the requirements of the agency in whose right-of-way or easement the work is being performed. Any special requirements of the agency such as insurance, flagmen, etc., shall be strictly adhered to during the performance of work. The special requirements shall be performed by the General Contractor at no additional cost to the Owner.
- 3.1.8 Directional Drilling Operations
- 3.1.8.1 Pipe shall be handled, stored and joined in accordance with manufacturer's specifications and County Specifications.
- 3.1.8.2 Survey the entire drill path with entry and exit stakes placed at the appropriate locations as indicated on the drawings. A pipe marker (example PVC pipe/conduit) shall be inserted by the HDD Contractor at the beginning and end of each horizontal directional drill (HDD). The HDD Contractor shall provide a report and bore log, certified by an authorized company representative, to the Engineer of Record for Construction



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- indicating the horizontal and vertical location every 10 linear feet or less along the pipe.
- 3.1.8.3 Excavation
- a) Required directional drilling pits shall be excavated and maintained to minimum dimension. Said excavations shall be adequately barricaded, sheeted, braced and dewatered, as required, in accordance with the applicable portions of these Specifications.
  - b) Excavation adjacent to the road pavement shall be performed in a manner to adequately support these facilities.
  - c) Pre-excavate pipe entry and receiving areas to provide a gradual entry of the pipe without stress to the pipe or joints and to allow free movement into the bore hole at an acceptable depth. Carefully guide pipe in such a manner as to avoid deformation of, or damage to, the pipe. Do not use chains, cables or hooks inserted into the pipe ends. Handle the pipe in such a manner that the pipe is not damaged by dragging it over sharp and cutting objects. Slings or pipe rollers shall be used for pipe assembly during final product pull back.
- 3.1.8.4 Guidance System
- a) The Guidance system shall use an electronic “walkover” tracking system, a Magnetic Guidance System (MGS), or a proven gyroscopic probe and interface for a continuous and accurate determination of the location of the drill head during the drilling operation.
  - b) The guidance system shall be capable of tracking 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 system must be capable to be remotely steered and permit electronic monitoring of tunnel depth and location.
  - c) The guidance system must be accurate and calibrated to the manufacturer’s specifications of the vertical depth. The system shall be accurate to within 2% vertically and two feet horizontally.
- 3.1.8.5 Every effort shall be made to maintain pipe installations at the proper alignment and at a depth of 42 inches (minimum) for potable water and reclaimed water lines, and a depth of 54 inches (minimum) for force mains (centerline of pipe). Where deeper installations are shown on the plans, or required by the Owner, the HDD Contractor shall make such adjustments without additional cost to the Owner. Deviations from the plans may be made ONLY with the approval of PUD.
- 3.1.8.6 The drilling mud shall be bentonite slurry or approved equal and shall be contained and disposed of in accordance with state/federal regulations and permit conditions. The General Contractor shall install erosion and sedimentation control measures including, but not limited to, straw bales to prevent drilling mud from inadvertently spilling out of the entrance/exit pit and pressure relief vents.
- 3.1.8.7 The pipe shall be installed in a manner that does not cause upheaval, settlement, cracking, movement or distortion of surface features.
- 3.1.8.8 If unexpected subsurface conditions are encountered during the bore, the procedure shall be stopped. The installation shall not continue until approval has been given by the Owner.
- 3.1.8.9 Equipment shall be fitted with a permanent alarm system capable of detecting an electrical current. The system shall have an audible alarm to warn the operator if the drill head contacts electrified cables.
- 3.1.8.10 Drill the pilot bore on the bore path with no deviations greater than 4% of the depth over the length of the bore. In the event that the pilot does deviate from the bore path by more than 4% of depth over the length of the bore, the pilot must be pulled back and re-drilled



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- from a location along the bore path before the deviation.
- 3.1.8.11 Upon completion of the pilot hole, submit a set of as-drilled records showing the pilot bore path plan and profile, as well as all directional survey reports as recorded during the drilling operation. Upon written approval (including time and date) by the Engineer of Record of the pilot bore location, back reaming (enlarging) of the bore opening can begin.
  - 3.1.8.12 The carrier pipe shall be pulled back through using the wet insertion construction technique. At the HDD Contractor's option, the pipe may be installed ballasted with water during installation.
  - 3.1.8.13 When back reaming, the bore hole shall not exceed 1.5 times the outside diameter of the pipe or pipe joint/coupling for pipe up to 12 inches in diameter. For greater than 12 inch diameters the bore hole shall not exceed the maximum outside diameter of the pipe, plus six inches.
  - 3.1.8.14 All nonmetallic pipe shall be installed with two insulated 10 gauge hard drawn copper clad steel core locating wires (minimum breaking strength of 1000 pounds) with color coded HDPE coating attached to the carrier pipe using (minimum) two-inch wide duct tape. Tape shall be at every joint and four to five feet spacing. Locating wires shall terminate four or more inches above the concrete valve pad and fold back inside a three-inch PVC access pipe (for example see Specification 331002, Exhibit W-13A). A continuity test shall be performed by the HDD Contractor in the presence of the County's inspector. Wires shall be installed on terminal water lines leading to fire hydrant. Access to tracer wires at the hydrant valve, shall be provided when the hydrant is more than 10 feet from the water main.
  - 3.1.8.15 The annular space between the pipe and the bore hole shall be filled with an approved material (Bentonite or equal) to support and stabilize the pipe. If pressure grouting is used, caution should be exercised to insure that excess grout pressure does not distort or collapse the pipe.
  - 3.1.8.16 Pipe shall be installed in a manner that will insure that external loads will not subsequently cause a decrease of more than five percent in the vertical cross-section dimension. When changes in direction are necessary, these shall be accomplished gradually such that the ratio of bend radius to nominal pipe size is not less than 300.
  - 3.1.8.17 In the case of a pull-back where the bore will be abandoned, the HDD Contractor shall inject an approved grout into the annular space. This action will be in conjunction with the removal of the bore tool to insure against collapse of the cover material.