# DIVISION 33 – UTILITIES

# SPECIFICATION 330523: HORIZONTAL DIRECTIONAL DRILLING

## PART 1.0 GENERAL

### 1.1 DESCRIPTION

1.1.1 The horizontal directional drilling (HDD) 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) six-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.

1.1.3 The Contractor is responsible for all the work, whether self-performed or performed by a sub-contractor. References herein to a HDD Contractor apply to the contractor actually performing the HDD work.

### 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 Technical Manual
- Hillsborough County Utility Accommodation Guide (UAG)

### 1.4 WARRANTY

1.4.1 A one-year warranty for the pipe must be included from the Contractor and must 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 Contractor must 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 must begin at Substantial Completion for County projects, and at Project Acceptance by the Water Resources Department (WRD) Records Group for County dedicated projects.

## 1.5 SUBMITTALS

1.5.1 HDD Contractor's Experience Record: Furnish documentation supporting the HDD Contractor's qualifications and experience. This must include a list of all equipment to be used and a list of personnel and their qualifications and experience. The equipment listing must 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 must 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 must be prepared by the HDD Contractor and submitted as required by Specifications 331001, 333002, and 339001. The plan must 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 and proposed conflicting pipes, conduits, or obstructions. Clearances must not be less than the guidance system's accuracy tolerance.

1.5.5 Record Drawings: The HDD locations and elevations must be shown on the Record Drawing. The Contractor's Surveyor must locate the beginning, ending and the surface locations of the driller's log readings, and the locations must be indicated on the record drawings. The HDD Contractor must 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 must 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 Utility Design Section Manger. Any deviation from the specifications requires a design exception.

1.5.7 At completion of the work submit the required Asset information specified in the Hillsborough County Technical Manual, Section 2, to the Engineer of Record or the County Project Manager (as applicable).

# PART 2.0 PRODUCTS

## 2.1 GENERAL

2.1.1 Products intended for contact with potable water must be evaluated, tested, and certified for conformance with NSF Standard 61.

2.1.2 Products used in directional drilling applications must 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 must comply with Appendix B.

2.1.4 The minimum allowed pipe size for directional drill is six (6) inches.

## 2.2 POLYVINYL CHLORIDE PIPE AND COUPLINGS (PVC)

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

2.2.2 Blue pipe must be supplied for the potable water system (refer to Specification 331001), purple pipe must be supplied for the reclaimed water system (refer to Specification 339001), and green pipe must be supplied for wastewater system (refer to Specification 333002).

2.2.3 Nominal outside diameters and wall thickness of pipe must conform to the requirements of ANSI/AWWA C900.

2.2.3.1 Pipe must be DR-18 (minimum).

2.2.3.2 Pipe must be furnished in standard laying lengths of 20 feet or must be 40 feet (typically) for fusible PVC.

2.2.4 Pipe must 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 must be assembled in the field with butt-fused joints as required by the applicable WRD specifications.

2.2.6 Restrained Joint Couplings

2.2.6.1 All restrained couplings must be furnished in DR-14.

2.2.6.2 Pipe must be joined using nonmetallic restrained type couplings. Pipe and couplings must be designed as an integral system and must be provided by a single manufacturer for maximum reliability and interchangeability.

2.2.6.3 Pipe and couplings must 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 must be permitted.

2.2.6.4 Couplings must be designed as a minimum for use at the rated pressures of the pipe with which they are utilized and must incorporate twin elastomeric sealing gaskets meeting the requirements of ASTM F477. Assembled joints must meet the leakage test requirements of ASTM D3139.

2.2.6.5 Allowable axial loads must be supplied by the manufacturer. The Engineer and Contractor must utilize appropriate instrumentation to ensure that these loads are never exceeded.

2.2.6.6 Only experienced personnel must be used to install pipe. Coupling edges must be beveled to reduce drag force when pipe is installed by HDD. Assembly of joints must be accordance with the manufacturer's instructions.

2.2.6.7 Restrained Joint Couplings for C900/RJ pipe must 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: Must 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 must be manufactured only for water distribution pipe and couplings conforming to ANSI/AWWA C151/A21.51. Restrained joint pipe must also meet all performance requirements ANSI/AWWA C151/A21.51.

2.3.2 Nominal outside diameters and wall thickness of thrust-restrained pipe must conform to the requirements of ANSI/AWWA C151/A21.51. Restrained pipe must be CL50 minimum. Pipe must be furnished in standard laying lengths of 20 feet one inch.

2.3.3 Ductile Iron Fittings: Fittings for bends, tees, etc., must 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 HDD installations within the jurisdiction of another governing authority and where Hillsborough County requires a separate casing, the HDD Contractor must comply with regulations of that governing authority. State highway casing installations must 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 Contractor must 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 must be supplied by the pipe manufacturer. The HDD Contractor must utilize appropriate instrumentation to ensure that these loads are never exceeded. Coupling edges must be beveled to reduce drag force on the pipe when fusible PVC is not used.

3.1.5 Only experienced personnel must be used to install HDD pipe. A qualified HDD Contractor must have at least three years of experience involving work installing pressurized pipe greater than four inches in diameter. Experienced personnel include the foreman, drill technician, and locator. A competent and experienced supervisor for the HDD Contractor must be present 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 Contractor must have all applicable permits in hand prior to construction and all directional drilling work. All drilling must be performed in the presence of the County Inspector, or the EOR (or a representative in their responsible charge).

3.1.7 It must be the HDD Contractor's responsibility to perform the directional drilling work in strict conformance with the requirements of the governing authority in whose right-of-way or easement

the work is being performed. Any special requirements of the governing authority, such as insurance, and flagmen, must be strictly followed during the performance of work. The special requirements must be provided and performed by the Contractor at no additional cost to the County.

## 3.2 INSTALLATION

3.2.1 Pipe must be handled, stored and joined in accordance with manufacturer's specifications and County Specifications.

3.2.2 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) must be inserted by the HDD Contractor at the beginning and end of each horizontal directional drill. The HDD Contractor must provide both a report and a bore log, certified by an authorized company representative, to the Engineer of Record for Construction indicating the horizontal and vertical location every 10 linear feet or less along the pipe.

3.2.3 Excavation

3.2.3.1 Required directional drilling pits must be excavated and maintained to minimum dimension. Said excavations must be adequately barricaded, sheeted, braced and dewatered, as required, in accordance with the applicable portions of these Specifications.

3.2.3.2 Excavation adjacent to the road pavement must be performed in a manner to adequately support these facilities.

3.2.3.3 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 must be used for pipe assembly during final product pull back.

3.2.4 Guidance System

3.2.4.1 The Guidance system must 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.

3.2.4.2 The guidance system must be capable of tracking in any soil condition, including hard rock. It must 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.

3.2.4.3 The guidance system must be accurate and calibrated to the manufacturer's specifications of the vertical depth. The system must be accurate to within 2% vertically and one foot horizontally.

3.2.5 Every effort must be made to maintain pipe installations at the proper alignment and at a depth, at the center line of the pipe/ pilot bore, of 42 inches (minimum) for potable water and reclaimed water lines, and a depth of 54 inches (minimum) for force mains. Where deeper installations are shown on the plans or required by the County, the HDD Contractor must make such adjustments without additional cost to the County. Deviations from the plans may be made ONLY with the approval of WRD.

3.2.6 The drilling mud must be bentonite slurry or approved equal and must be contained and disposed of in accordance with state/federal regulations and permit conditions. The Contractor must install erosion and sedimentation control measures including, but not limited to, filter socks to prevent drilling mud from inadvertently spilling out of the entrance/exit pit and pressure relief vents.

3.2.7 The pipe must be installed in a manner that does not cause upheaval, settlement, cracking, movement or distortion of surface features.

3.2.8 If unexpected subsurface conditions are encountered during the bore, the procedure must be stopped. The installation must not continue until approval has been given by the County.

3.2.9 Equipment must be fitted with a permanent alarm system capable of detecting an electrical current. The system must have an audible alarm to warn the operator if the drill head contacts electrified cables.

3.2.10 Drill the pilot bore on the bore path with no deviations greater than 2% of the depth and one foot horizontally over the length of the bore. If the pilot does deviate from the bore path by more than 2% of depth or one foot horizontally over the length of the bore, the pilot must be pulled back and re-drilled from a location along the bore path before the deviation. The bore must not create high points not shown on the drawings.

3.2.11 Upon completion of the pilot hole, submit to the Engineer of Record for Construction 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 for Construction of the pilot bore location, back reaming (enlarging) of the bore opening can begin.

3.2.12 The carrier pipe must 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.

3.2.13 When back reaming, the bore hole must 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 must not exceed the maximum outside diameter of the pipe, plus six inches.

3.2.14 All nonmetallic pipe must be installed with insulated hard drawn copper clad steel core locating wire (minimum breaking strength of 1000 pounds) with color coded HDPE coating attached to the carrier pipe using (minimum) two-inch wide duct tape. Tape must be at every joint and four to five feet spacing. For additional locate/tracer wire requirements refer to the applicable specification 331001, 333002, or 339001 (Part 4.0 Construction).

3.2.15 The annular space between the pipe and the bore hole must 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 ensure that excess grout pressure does not distort or collapse the pipe.

3.2.16 Pipe must be installed in a manner that will ensure 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 must be accomplished gradually such that the ratio of bend radius to nominal pipe size is not less than 300.

3.2.17 In the case of a pull-back where the bore will be abandoned, the HDD Contractor must 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.

3.2.18 Where directionally-drilled segments are to join to another directionally drilled segment, an open-cut segment, or an existing pipe, the directionally-drilled segment(s) must be excavated back and laid to a matching grade so as not to create a non-designed (that is, not shown on the approved plans) high point.