

SECTION 02 44 60
HORIZONTAL DIRECTIONAL DRILLING

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. The work specified in this section consists of horizontal directional drilling (HDD) method of installation, also commonly referred to as directional boring or guided horizontal boring. This work shall include all services, equipment, materials, and labor for the complete and proper installation, testing, restoration of underground utilities and environmental protection and restoration.
- B. This specification is primarily written for the installation of piping and conduit of various sizes. For the installation of other materials such as fusible C-905 PVC or welded steel, the methods and specifications herein apply, but may be modified by the NYCHA Representative as appropriate.
- C. The size and configuration of the various components of the systems shall as indicated herein, and in the Plans.
- D. All materials and installation of the system shall be in accordance with the standards and specifications of NYCHA.

1.02 RELATED SECTIONS

- A. Section 01 00 00 – General Requirements

1.03 QUALIFICATIONS

- A. Directional drilling and pipe/conduit installation shall be done by an experienced Contractor specializing in directional drilling and whose key personnel have at least five (5) years experience in this work. Furthermore, the Contractor must have installed directionally drilled pipe/conduit at least as large as 20 inches in diameter, having performed installations of at least 1000 feet in length, and successfully installed at least 50,000 feet in total length.

1.04 QUALITY ASSURANCE

- A. This specification calls for a wide range of procedural precautions necessary to insure that the very basic, essential aspects of a proper directional bore installation are adequately controlled. Strict adherence shall be required under specifically covered conditions outlined in this specification. Adherence to the specifications contained herein, or the NYCHA Representative's approval of any aspect of any directional bore operation covered by this specification, shall in no way relieve the Contractor of their ultimate responsibility for the satisfactory completion of the work authorized by NYCHA.

1.05 SUBMITTALS

- A. **WORK PLAN:** Prior to beginning work, the Contractor must submit to the NYCHA Representative a general work plan outlining the procedure and schedule to be used to execute the project. The plan should document the thoughtful planning required to successfully complete the project.
- B. **EQUIPMENT:** The Contractor must submit specifications on directional drilling equipment to be used to ensure that the equipment will be adequate to complete the project.
- C. **LABOR:** The Contractor must submit a detailed list of supervisory, technical and general personnel to be utilized during the project. Certifications and experience of all key personnel must be included.
- D. **MATERIALS:** Specifications on all materials to be used shall be submitted to the NYCHA Representative for approval. Materials shall include the pipe, fittings and any other item which is to be an installed component of the project.
- E. **OTHER:** All other permits and/or plans required of the Contractor by the District, County or affected agency including, but not limited to, temporary erosion & sediment control plan, dewatering plan, traffic control plan and trench shoring plan.

PART 2 MATERIALS

2.01 ALL OTHER PIPE AND FITTING MATERIALS SHALL BE AS REQUIRED BY THE CONTRACT DOCUMENTS OR SHOWN ON THE DRAWINGS.

2.02 EQUIPEMENT

- A. General: The directional drilling equipment shall consist of a directional drilling rig of sufficient capacity to perform the bore and pullback of the pipe/conduit, a drilling fluid mixing & delivery system of sufficient capacity to successfully complete the installation, a guidance system to accurately guide boring operations, and trained and competent personnel to operate the system. All equipment shall be in good, safe operating condition with sufficient supplies, materials and spare parts on hand to maintain the system in good working order for the duration of this project.
- B. Drilling Rig: The directional drilling machine shall consist of a hydraulically powered system to rotate, push and pull hollow drill pipe into the ground at a variable angle while delivering a pressurized fluid mixture to a guidable drill (bore) head. The machine shall be anchored to the ground to withstand the pulling, pushing and rotating pressure required to complete the crossing. The hydraulic power system shall be self-contained with sufficient pressure and volume to power drilling operations. The hydraulic system shall be free of leaks. The rig shall have a system to monitor and record maximum pull-back pressure during pull-back operations.
- C. Drill Head: The drill head shall be steerable by changing its rotation and shall provide the necessary cutting surfaces and drilling fluid jets.
- D. Mud Motors (if required): Mud motors shall be of adequate power to turn the required drilling tools.
- E. Drill Pipe: Shall be constructed of high quality 4130 seamless tubing, grade D or better, with threaded box and pins. Tool joints should be hardened to 32-36 RC.

2.03 GUIDANCE SYSTEM

- A. The guidance system shall be of a proven type and shall be setup and operated by personnel trained and experienced with this system. The Operator shall be aware of any magnetic anomalies and shall consider such influences in the operation of the guidance system if using a magnetic system.

2.04 DRILLING FLUID (MUD) SYSTEM

- A. Mixing System: A self-contained, closed, drilling fluid mixing system shall be of sufficient size to mix and deliver drilling fluid composed of bentonite clay, potable water and appropriate additives. Mixing system shall be able to molecularly shear individual bentonite particles from the dry powder to avoid clumping and ensure thorough mixing. The drilling fluid reservoir tank shall be sized for adequate storage of the mud. Mixing system shall continually agitate the drilling fluid during drilling operations.
- B. Drilling Fluids: Drilling fluid shall be composed of clean water and an appropriate additive. Water shall be from a clean source with a pH of 8.5 – 10 and/or as per mixing requirements of the manufacturer. Water of a lower pH or with excessive calcium shall be treated with the appropriate amount of sodium carbonate or equal. The water and additives shall be mixed thoroughly and be absent of any clumps or clods. No hazardous additives may be used. Drilling fluid shall be maintained at a viscosity sufficient to suspend cuttings and maintain the integrity of the bore wall.
- C. Delivery System: The mud pumping system shall have a minimum capacity to supply mud in accordance with the drilling equipment pull-back rating at a constant required pressure. The delivery system shall have filters in-line to prevent solids from being pumped into the drill pipe. Connections between the pump and drill pipe shall be relatively leak-free. Used drilling fluid and drilling fluid spilled during drilling operations shall be contained and properly disposed of. A berm, minimum of 12 inches high, shall be maintained around drill rigs, drilling fluid mixing system, entry and exit pits and drilling fluid recycling system (if used) to prevent spills into the

surrounding environment. Pumps and/or vacuum truck(s) of sufficient size shall be in place to convey excess drilling fluid from containment areas to storage facilities.

2.05 OTHER EQUIPMENT

- A. Pipe Rollers: Pipe rollers, if required, shall be of sufficient size to fully support the weight of the pipe while being hydro-tested and during pull-back operations. Sufficient number of rollers shall be used to prevent excess sagging of pipe.
- B. Pipe Rammers: Hydraulic or pneumatic pipe rammers may only be used if necessary and with the authorization of the NYCHA Representative.
- C. Restrictions: Other devices or pipeline placement systems for providing horizontal thrust other than those previously defined in the preceding subsections shall not be used unless approved by the NYCHA Representative prior to the commencement of the work. Consideration for approval will be made on an individual basis for each specified location. The proposed device or system will be evaluated prior to approval or rejection on its potential ability to complete the pipeline placement satisfactorily without undue stoppage and to maintain line and grade within the tolerances prescribe by the particular conditions of the project. Approval by the NYCHA Representative does not relieve the Contractor of its responsibilities (see section 1.04)

PART 3 EXECUTION

3.01 GENERAL

- 1. The NYCHA Representative and the Development Staff must be notified 48 hours in advance of starting work. The directional bore shall not begin until the NYCHA Representative or their authorized representative is present at the job site and agrees that proper preparations and precautions for the operation have been made. The NYCHA Representative's approval for beginning the installation shall in no way relieve the Contractor of the ultimate responsibility for the satisfactory completion to the work as authorized under the Contract. It shall be the responsibility of NYCHA to provide inspection personnel at such times as appropriate without causing undue hardship by reason of delay to the Contractor.

3.02 PERSONNEL REQUIREMENTS

- A. All personnel shall be fully trained in their respective duties as part of the directional crew and in safety.

3.03 DRILLING PROCEDURE

- A. Site Preparation:
 - 1. Prior to any alterations to the work-site, the Contractor shall photograph or video record the entire work area, including entry and exit points. One copy of which shall be given to the NYCHA Representative and one copy shall remain with the Contractor for a period of one year following the completion of the project.
 - 2. The work site as indicated on the Drawings, within the right-of-way, shall be graded or filled to provide a level working area. No alterations beyond what is required for operations are to be made. The Contractor must confine all activities to the designated work areas.
- B. Drill Path Survey: The entire drill path shall be accurately surveyed with entry and exit stakes placed in the appropriate locations within the areas indicated on
 - 1. the Drawings. If the Contractor is using a magnetic guidance system, the drill path will be surveyed for any surface geomagnetic variations or anomalies.
- C. Environmental Protection: The Contractor shall place silt fence between all drilling operations and any drainage, wetland, waterway or other area designated for such protection by the State, Federal and Local regulations. Additional environmental protection necessary to contain any hydraulic or drilling fluid spills shall be put in place, including berms, liners, turbidity curtains and other measures. The Contractor shall adhere to all applicable environmental regulations. Fuel or oil may not be stored in bulk containers within two hundred feet (200') of any water-body or wetland.

- D. Safety: The Contractor shall adhere to all applicable State, Federal and Local safety regulations and all operations shall be conducted in a safe manner. Safety meetings shall be conducted at least weekly with a written record of attendance and topic submitted to the NYCHA Representative.
- E. Pipe: The pipe shall be welded/fused together in one length, if space permits. Steel pipe welds will be X-rayed prior to being placed in bore hole. Pipe will be placed on pipe rollers before pulling into bore hole with rollers spaced close enough to prevent excessive sagging of pipe.
- F. Pilot Hole:
 - 1. Pilot hole shall be drilled on bore path with no deviations greater than 5% of depth over the length of 100 feet. In the event that the pilot does deviate from the bore path more than 5% of depth in 100 feet, the Contractor must notify the NYCHA Representative and the Contractor may be required to pull-back and re-drill from the location along the bore path before the deviation.
 - 2. In the event that a drilling fluid fracture, inadvertent returns or returns loss occurs during pilot hole drilling operations, the Contractor shall cease drilling, wait at least 30 minutes, inject a quantity of drilling fluid with a viscosity exceeding 120 seconds as measured by a Marsh funnel and then wait another 30 minutes. If mud fracture or returns loss continues, the Contractor must cease operations and notify the NYCHA Representative. The NYCHA Representative and Contractor will discuss additional options and work then will proceed accordingly.
- G. Reaming: Upon successful completion of the pilot hole, the Contractor will ream bore the hole to a minimum of 25% greater than outside diameter of the pipe using the appropriate tools. The Contractor shall not attempt to ream, at one time, more than the drilling equipment and mud system are designed to safely handle.
- H. Pull-Back:
 - 1. After successfully reaming the bore hole to the required diameter, the Contractor will pull the pipe back through the bore hole. In front of the pipe will be a swivel to prevent torsional stresses occurring in the pipe. Once pull-back operations have commenced, operations must continue without interruption until the pipe is completely pulled into the bore hole. During pull-back operations the Contractor shall not apply more than the maximum safe pipe pull pressure at any time.
 - a. pipe will be a swivel to prevent torsional stresses occurring in the pipe. Once pull-back operations have commenced, operations must continue without interruption until the pipe is completely pulled into the bore hole. During pull-back operations the Contractor shall not apply more than the maximum safe pipe pull pressure at any time.
 - 2. In the event that the pipe becomes stuck, the Contractor will cease pulling operations to allow any potential hydro-lock to subside and will then continue pulling operations. If the pipe remains stuck, the Contractor must immediately notify the NYCHA Representative. The NYCHA Representative and Contractor will discuss options and work then will proceed accordingly.

3.04 PIPE TESTING

- A. The pipe shall be hydrostatically tested after joining into continuous lengths prior to installation and again after installation.
- B. The testing procedure and pressures shall be in accordance to Section 02517.3.04 with the Standard Specifications.
- C. At the completion of each successful test, erosion prevention and control measures will be used during removal and discharge of the water.

3.05 SITE RESTORATION

- A. Following drilling operations and pipeline installation, the Contractor must de-mobilize equipment and restore the work-site to its original condition or as specified in the Contract Documents. All excavations must be backfilled and mechanically compacted to 95% of original

density. Landscaping must be restored or replaced to its original condition. All drilling mud shall be properly disposed of by the Contractor.

3.06 RECORD KEEPING

- A. The Contractor shall maintain a daily project log of drilling operations and a guidance system log with a copy given to the NYCHA Representative at the completion of the project. As-Built drawings will be verified as to accuracy by the NYCHA Representative.

END OF SECTION 02 44 60