PART 1 GENERAL

1.01 SUMMARY

A. These specifications apply to horizontal directional drilling (HDD) of high density polyethylene pipe (HDPE) for force mains, low pressure sewers, and water mains from 1.25" through 24" diameter.

B. These specifications are intended to technically describe the nature of the materials, equipment and workmanship required for installing force mains, low pressure sewers, and water mains by HDD methods.

C. This specification is intended to cover all work necessary for the installation of the pipe as shown on the drawings and as specified herein by HDD methods.

1.02 PRICE AND PAYMENT PROCEDURES

A. Unless indicated otherwise, HDD shall be paid incidental to and shall be included with the unit prices for the pipe installed.

B. When a specific pay item for HDD is indicated in the Contractor's bid, HDD will be measured, in place, by length, in linear feet.

C. The unit price for HDD pipe shall include the following.

1. Excavation, use, and backfilling of all access and exit pits.
2. Pilot tunnel boring.
3. Removal and disposal of spoils and drilling fluid including all costs associated with use of vacuum excavation equipment.
4. Traffic control including efforts to maintain access to roads and driveways during all HDD operations.
5. All costs and activities associated with "potholing" to expose existing utility lines.
6. Any and all labor, equipment, and materials required to complete the work not previously called out above.

1.03 REFERENCES

A. ASTM F1962 - 11 Standard Guide for Use of Maxi-Horizontal Directional Drilling for Placement of Polyethylene Pipe or Conduit Under Obstacles, Including River Crossings.

B. Plastics Pipe Institute – Guidelines for Use of Mini-Horizontal Directional Drilling for Placement of High Density Polyethylene Pipe TR-46 2009.

1.04 RELATED REQUIREMENTS

A. LOW PRESSURE SEWERS – SECTION 33 33 00.

B. PACKAGED SEWAGE GRINDER PUMPING UNITS – SECTION 33 32 16.13

1.05 QUALIFICATIONS

A. HDD Contractors shall have actively engaged in the installation of pipe using HDD methods for a minimum of three years, during which time the Contractor has completed at least 80,000 feet of HDD installations from 1.25" to 24" inches in diameter.

1.06 SUBMITTALS

A. The Contractor shall submit documentation showing a minimum three years of HDD experience with at least 80,000 feet of guided boring installation of 1.25" to 24" diameter projects similar in the scope and value to the project specified in the contract documents. Information must include, but not be limited to the following.

1. Date and duration of work.
2. Location.
3. Pipe information (i.e. length, diameter, depth of installation, pipe material, etc.).
4. Project Owner information (i.e. name, address, telephone number, contact person, etc.).
5. Contents handled by the pipeline (i.e. water, wastewater, conduit, gas, etc.).

B. The Contractor shall submit a list of field supervisory personnel and their experience with HDD operations. At least one of the field supervisors listed must be at the site and be responsible for all work at all times when HDD operations are in progress. HDD operations will be postponed until the resume(s) of the Contractor's field supervisory personal have been received.

C. Working drawings, written procedures, and information that demonstrates in detail the proposed method of operation. This submittal shall include, but not be limited to the following:

1. Size, capacity and setup requirements of all equipment (including drill rig thrust/pullback and rotary torque capacity as well as the mud pump motor size).
2. HDD guidance system type and information including the accuracy, range, and repeatability values for inclination, roll, and azimuth of the system.
3. Type of cutting tool head.
4. Method of monitoring and controlling line and grade.
5. Arrangement of equipment.
6. Location and sizes of drilling and receiving pits.
7. Location of product pipe joining areas and staging areas.
8. Method of dewatering.
9. Method of removing spoils.
10. Carrier pipe type and size.
11. Method of joining carrier pipe.
12. Method of installing tracer/detection wire.
13. Method of abandonment of pilot holes.
14. Carrier pipe end seals.

15. Bentonite drilling fluid product information including the following:
    a. Product information.
    b. Material specifications.
    c. Handling procedures.
    d. Special precautions required.
    e. Method of mixing and installation.
    f. Identification of polymer enhancement material or special additives (if applicable).
    g. Method of measuring and maintaining water and bentonite quality during bore progress.
    h. MSDS sheet.

D. Information regarding the clean water source for mixing of drilling fluid.

E. As-Built Survey

1. At the completion of pilot hole drilling described herein, Contractor shall provide a tabulation of coordinates referenced to the drilled entry point, which accurately described the location of the pilot hole.

2. Logs of pullback pressures for each setup upon completion of the installation of each length of pipe.

F. All drawings, catalog cuts and other descriptive data covering related items in the same system shall be submitted at the same time in order that their complete integrated applicability in the entire system may be adequately reviewed.

G. If, during construction, the Contractor determines that modifications to the method and equipment as stated in the original submittal are necessary, the Contractor shall submit a plan describing such modifications, including the reasons for the modifications, to the Owner for review prior to making the modification.

1.07 FIELD CONDITIONS

A. HDD operations shall not interfere with, interrupt, or endanger the ground surface or the activities or items upon the surface.

B. HDD operations shall be confined to the area of work as shown on the project drawings.

C. The HDD Contractor shall comply with all local ordinances, codes, statutes, rules, and regulations including the Owner's Engineering standards and Occupational Safety and Health Administration requirements.

D. When rock stratum, boulders, underground obstructions, or other soil conditions that impede the progress of drilling operations are encountered, the Contractor will review the situation with the Owner. The Contractor shall determine the feasibility of continuing drilling operations and review this with the Owner should adjustments or switching to an alternative construction method determined to be necessary.

PART 2 PRODUCTS

2.01 PIPING MATERIALS

A. See **RELATED REQUIREMENTS.**

2.02 DRILLING FLUID

A. No drilling fluid shall be used that does not comply with environmental regulations.

B. Drilling fluids shall be a mixture of clean water and bentonite clay. The fluid shall be inert. The fluid should remain in the tunnel to insure the stability of the tunnel, reduce drag on the pulled pipe, and provide backfill within the annulus of the pipe and tunnel.

C. Disposal of excess drilling fluid and spoils shall be the responsibility of the Contractor and shall be conducted in compliance with all relevant regulations, right-of-way, workspace requirements, and permit agreements. Excess drilling fluid and spoils shall be disposed of at an approved location and shall be performed at no additional cost to the Owner. The Contractor is responsible for transporting all excess drilling fluid and spoils to the disposal site and for paying any disposal costs. Excess drilling fluid and spoils shall be transported in a manner that prevents accidental spillage onto roadways. Excess drilling fluid and spoils shall not be discharged into sanitary or storm drain systems, or waterways.

D. Drilling fluid returns caused by fracturing, formations, or any other means at locations other than the entry and exit points shall be minimized. The Contractor shall immediately clean up and dispose of any drilling fluid and spoils from return areas.

E. The Contractor shall provide mobile spoils removal equipment capable of quickly removing spoils from entry and exit pits and from return areas. This equipment must be present during all HDD operations to fulfill the disposal requirements previously described.

2.03 DRILLING WATER

A. The Contractor shall provide clean water for the mixing of drill fluid.

B. The Contractor is responsible for locating a clean water source, and for transportation and storage of water.

C. The Contractor shall secure appropriate permissions from the entity having jurisdiction over the clean water source.

PART 3 EXECUTION

3.01 PREPARATION

A. Excavate access and exit pits as necessary to horizontally directional drill the proposed pipe alignment as shown on the project drawings.

B. The drilling procedures and equipment shall provide protection of workers particularly against electrical shock. As a minimum, grounding mats, grounded equipment, hot boots, hot gloves, safety glasses and hard hats shall be used by crewmembers.

C. The drilling equipment shall be equipped with an operational alarm system capable of detecting electrical current.

D. The Contractor is responsible for protecting all existing utilities. The Contractor shall call Miss Dig (811) a minimum of 3 working days before any work is to begin. Existing utilities within the path of the proposed horizontal directional bore shall be "pot holed" to determine depth.

3.02 HORIZONTAL DIRECTIONAL DRILLING OPERATONS

A. Equipment

1. The drilling equipment must be capable of placing the pipe within the planned line and grade without inverse slopes.

2. The drilling equipment must meet the minimum thrust/pullback rating, minimum rotary torque rating, and the minimum mud flow pumping capacity to facilitate installation of the product pipe per the contract drawings.

3. The guidance system must have the capability of measuring inclination, roll, and azimuth. The guidance system must have an independent means to ensure the accuracy of the installation. The Contractor will demonstrate a viable method to eliminate accumulated error due to inclinometer (pitch or accelerometer). The guidance system shall be capable of generating a plot of the borehole survey for the purpose of an as-built drawing.

4. The proposed equipment set up requirements, including but not limited to proposed access and exit pit locations, are at the sole determination of the Contractor. Such information shall be submitted along with all other required information per the specifications.

3.03 PILOT HOLE BORING

A. The entry angle and the pilot hole and the boring process shall maintain a curvature that does not exceed the allowable bending radius of the product pipe.

B. The pilot hole shall be drilled along the path shown on the plan and profile drawings to the following tolerances:

1. Elevations: Plus or minus six inches.

2. Alignment: Plus or minus six inches.

3. Curve Radius: No curves will be accepted with a radius less than that shown on the plan and Profile drawings.

C. Alignment Adjustments and Restarts

1. The Contractor shall follow the pipeline alignment as shown on the drawings within the specifications stated. If adjustments are required, the Contractor shall notify the Engineer and Owner for approval prior to making the adjustments.

2. In the event of difficulties at any time during boring operations requiring the complete withdrawal from the tunnel, the Contractor may be allowed to withdraw and abandon the tunnel and begin a second attempt at a location approved by the Owner. The Contractor may excavate at the point of the difficulty and install the product pipe by trench method, at no additional cost to the Owner, per the general provisions and specification for construction.

3. The number of access pits shall be kept to a minimum. The equipment must be capable of boring and installing the proposed diameter product pipe in a continuous run of a minimum distance of 600 feet without intermediate pits.

3.04 INSTALLING PRODUCT PIPE

A. After the pilot hole is completed, the Contractor shall install a swivel to the reamer and commence pullback operations. Should pre-reaming of the tunnel be necessary, it shall be performed at the option of the Contractor and at no additional cost to the Owner.

B. The reaming diameter shall not exceed 1.4 times the diameter of the product pipe being installed.

C. The product pipe being pulled into the tunnel shall be protected and supported so that it moves freely and is not damaged by stones and debris on the ground during installation.

D. Pullback forces shall not exceed the allowable pulling forces for the product pipe.

E. The Contractor shall allow sufficient length of product pipe to extend past the termination point to allow connections to adjacent pipe sections or gate valves.

F. Pulled pipes will be allowed 24 hours of stabilization prior to making tie-ins.

3.05 INSPECTION

A. The Contractor will at all times provide and maintain instrumentation which will accurately perform the following functions.

1. Locate the pilot hole.
2. Record coordinates referenced to the drilled entry point.
3. Measure drilling fluid flow discharge rate and pressure.

4. Measure pullback pressure.

B. The Engineer and Owner will have access to these instruments and readings at all times.

3.06 OBSTRUCTIONS

A. The Owner and Engineer must be notified immediately if any obstruction is encountered that stops the forward progress of the HDD operation. The Contractor must review the situation with the Engineer and Owner and determine the feasibility of continuing drilling operations or switching to an alternative construction method.

B. Dewatering of pits and excavations must meet the general provisions and specifications as set
forth by the Owner's standards. The type of dewatering method used by the Contractor must be approved by the Owner, prior to commencing with the dewatering activity.

END OF SECTION