

SECTION 071  
SPECIFICATIONS - HORIZONTAL DIRECTIONAL DRILLING

Throughout these Specifications, the term horizontal directional drilling (HDD) refers to a method of constructing sewer at a specified depth, length and grade by boring a small, pilot drill path with a continuous string of steel drill rod, pulling back a cutter called a back reamer through the pilot drill path to enlarge the hole in advance of the simultaneous pulling of a specified pipe into place. Construction of sewers using HDD methods shall conform to these Specifications.

The Contractor shall be responsible for determining underground conditions at and near the site(s) of the work to be performed and determining the impact of the work on existing conditions at and in proximity to the planned locations of work. Underground conditions at the site(s) of the work have not been investigated beyond any representation of existing conditions made part of the project Plans and these Specifications. The Contractor shall be responsible for determining the probability of damage to assets such as structures, utilities, etc., at and near the location(s) of work. The Contractor shall be responsible for any damage caused by HDD operations.

To determine underground conditions, the Contractor may propose to the Engineer a plan to acquire a subsurface profile using acceptable investigative means such as soil borings. If acceptable to the Engineer, such information may be gathered at the expense of the Contractor.

Pits, including launching and bursting pits, located along the alignment of the pipe to be constructed shall be minimized in quantity and located to maximize the footage of pipe constructed in a single pull. The number of pit locations shall also be minimized to decrease the locations where containment of the boring head, reamer and pipe is lost. Where possible, the Contractor shall use as pit locations the locations of necessary excavations such as sewer service reinstatements and manhole constructions. The duration that pits are open shall be kept to a minimum. The Contractor shall prepare, for the Engineer, a pit location schematic illustrating the planned pit locations and schedule for pit excavation, dewatering, backfilling and restoration. If the Engineer does not approve of the plan offered by the Contractor, the Contractor shall redesign the plan accordingly and resubmit a revision to the Engineer for review.

Pit locations shall consider locations of existing underground utilities to minimize service interruptions to customers. If necessary, the Contractor shall provide temporary provision for the maintenance of all utility services to customers. Unless approved by the Engineer, the Contractor shall not be allowed to disrupt any utility services to customers. The Contractor shall coordinate all utility disconnections, temporary measures for providing utility services and reconnections with the appropriate utility provider.

If necessary, the Contractor shall be responsible for procuring a clean water supply for the purpose of completing the work.

#### 1.0 Experience Requirements

Prior to consideration for participation towards the completion of the Project, the Contractor must demonstrate to the Engineer that the Contractor has direct and relevant experience in the construction of pressurized water collection and distribution systems using HDD methods.

Also prior to consideration for participation towards the completion of the Project, the Contractor must demonstrate to the Engineer, in the form of correspondence from the manufacturers of both the HDD system proposed as well as the proposed pipe joining system, that the Contractor, or an assisting

subcontractor with responsibility for the construction of the proposed pipe using HDD methods, as well as operators who will participate in the completion of the work, are properly trained and certified as licensed users of the equipment to the satisfaction of the manufacturers. The Contractor shall demonstrate such compliance in the form of correspondence from authorized representatives of the manufacturers to the Engineer in which the manufacturers certify that the Contractor, or subcontractor, and named operators are trained to the satisfaction of the manufacturers. Only those operators who the manufacturers of the pipe bursting and pipe joining equipment certify as sufficiently trained shall be allowed to operate the HDD and pipe joining equipment.

Contractors shall submit documentation and information showing conformance with these experience and training requirements including a list of field supervisory personnel and their experience towards the completion of qualifying projects using HDD methods. Information must include information about project owners including names, addresses, telephone numbers and contact persons, the date, duration and location of work performed, information specific to the work including the length, depth, material and dimension of pipes constructed using HDD methods as well as information about the equipment and participating Contractor personnel.

## 2.0 Submittals

Submittals to be provided by the Contractor to the Engineer prior to and during the performance of the work towards the completion of the Project shall include those submittals detailed throughout these Specifications as well as those below.

Prior to construction, the Contractor shall submit detail drawings and written descriptions of the proposed construction. The Contractor shall provide to the Engineer information about the proposed work including, but not limited to, excavation locations, dimensions, methods to protect public and private property, methods of dewatering, utilities that may be affected and traffic control measures. The design of all aspects of the work not specified in these Specifications or in the Plans shall be the responsibility of the Contractor.

Additionally, prior to the commencement of construction, the Contractor shall provide to the Engineer recommendations of the manufacturers of the HDD equipment, the pipe and, if applicable, the equipment used to join segments of the specified pipe. Information from the manufacturers shall include specifications and guidelines for the use of their equipment towards the completion of the work as specified on the project Plans and in accordance with these Specifications.

For all materials being used in the performance of the work, each of the Contractor's crews shall have with them at all times material safety data sheets (MSDS) for all materials in which such information is required. MSDS sheets shall be available for inspection at all times and copies shall be provided by the Contractor to the Engineer and to each fire department with jurisdiction at the locations of the work.

## 3.0 Horizontal Directional Drilling

The drilling equipment must be capable of placing the specified pipe at the specified location, depth and grade without deviations from the project Plans or these Specifications. Limitations on pulling forces allowed during pipe bursting operations depend on the specified replacement pipe and may be specified in the project Plans. If not specified on the project Plans, the maximum allowable pulling force to be experienced by six (6) inch HDPE, DIPS, DR11, pipe shall be 12,000 lbs. If not specified on the project Plans or within these Specifications, the maximum allowable pulling force as recommended by the

manufacturer of the pipe. Prior to the commencement of construction, the Contractor shall submit to the Engineer recommended maximum pulling forces as provided by the pipe manufacturer. Manufacturer recommendations shall be provided on manufacturer letterhead, executed by an appropriate authority of the manufacturer and reference the maximum allowable pulling force for each pipe to be constructed.

The construction of sewers using HDD methods must be performed in accordance with the recommendations of the manufacturers of the HDD equipment, the pipe and, if applicable, the equipment used to join segments of the specified pipe.

Throughout the insertion process, the Contractor shall constantly measure and record axial tension force readings on the pipe material, the insertion velocity, the mud flow circulation and exit rates and the length of pipe installed. All information collected shall be the exclusive property of the Engineer.

The HDD equipment must have a guidance system that has the capability of measuring inclination and azimuth. The guidance system must have an independent means of ensuring the accuracy of the installation; the Contractor shall measure the repeatability of the inclination/azimuth before drilling commences. The Contractor shall demonstrate a viable method to eliminate accumulated error. The guidance system must have an inclination accuracy of 0.1% of grade, a range accuracy of 0.1 of a foot and an azimuth accuracy of 0.1% of grade.

The guidance system shall be capable of generating a profile showing the location and depth of the constructed pipe along its entire length. Measurements of the depth of the outside edge of the pipe at its crown as well as the horizontal location of the same shall be taken and recorded at intervals of no less than five (5) feet along the entire alignment of the pipe including the linear ends. Measurements of depth and horizontal location shall be accurate to 0.1 of a foot in all directions. All information collected shall be the exclusive property of the Engineer.

In the event of difficulties encountered during boring operations that require the withdrawal of the HDD equipment from the pilot drill path, the Contractor shall be allowed to withdraw and abandon the boring and begin a second attempt. With the approval of the Engineer, the Contractor may excavate at the point of the difficulty to correct problems. The Engineer must be notified immediately if any obstruction is encountered that stops the forward progress of drilling operations.

The Contractor shall consider the potential overstressing of the pipe in bending and shall avoid bending the pipe near its limitations as specified by the pipe manufacturer. The entry angle of the pilot drill path and the boring process will maintain a curvature that does not exceed the allowable bending radii of the product pipe per the pipe manufacturer.

The reaming head shall create a bore hole dimensioned sufficiently for the construction of the pipe; however, the dimensions of the bore hole shall be minimized to maximize support for the replacement pipe. The maximum allowable size of the bore hole shall be 1.2 to 1.5 times the diameter of the carrier pipe. If a bored hole collapses such that bursting operations might become impossible or damaging to the replacement pipe, the Contractor shall take measures to reestablish the bored hole including, if necessary, excavation at the location of the failure.

To reduce frictional drag and tensile forces on the proposed pipe and help keep the bore hole open, bentonite or polymer lubrication muds shall be injected into the annular space behind the reaming head. Disposal of exposed drilling fluid and spoils shall be the responsibility of the Contractor and performed immediately. Information regarding other proposed drilling fluids shall be submitted to the Engineer for

approval at least two (2) weeks before the opening of proposals.

The HDD system must supply sufficient cable in one continuous length so that the pipe can be constructed as specified. Pipe construction shall be continuous and without interruption from one manhole to another, as specified.

Monitoring of the force applied directly to the replacement pipe shall be performed by the Contractor using load cells or strain gauges mounted closely behind the bursting head. Axial tension force readings, constant insertion velocities, mud flow circulation/exit rates and the footage length of pipe installed shall all be monitored and recorded during HDD operations.

If polyethylene (PE) pipe is used to construct the pipe, connections cannot be made to the pipe sooner than forty-eight (48) hours after release of all tension on the pipe. If the pipe manufacturer recommends a longer relaxation time, the Contractor shall comply. Connection of sewer services to the pipe shall be accomplished by sewer tapping in accordance with Subsection 3.0 of Section 031 of these Specifications.

Joints between constructed HDPE pipe and manholes shall not be completed until the expiration of the minimum relaxation period. Sufficient excess length of replacement pipe, but less than four (4) inches measured from the inside of the manhole wall, shall be allowed to protrude into adjoining manholes in consideration of the relaxation of the pipe. Following the relaxation period of the HDPE pipe, the pipe shall be trimmed to the interior face of the manhole. Additional requirements for the construction of joints between HDPE pipe constructed using pulling methods and manholes can be found in Section 027 of these Specifications and the project Plans.

#### 4.0 Quality Control and Assurance

At the Contractor's expense, gravity sewers constructed using HDD methods shall be subjected to both air testing and deflection testing and meet the requirements of Section 039 of these Specifications. Air testing shall be performed prior to the connection of any sewer services.

Additionally, at the Contractor's expense, the entirety of replacement gravity sewers shall be inspected using CCTV methods in accordance with Section 093 of these Specifications. Sewer inspections shall generate images of entire replacement sewers and these images shall be captured in video format and provided to the Engineer immediately after completion of inspections. At his expense and to the satisfaction of the Engineer, the Contractor shall be responsible for correcting any defect(s) discovered during testing and inspections.

END OF SECTION