

SECTION 330523.13 – HORIZONTAL DIRECTIONAL DRILLING

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.02 SUMMARY

- A. The Work under this section includes supplying all equipment, materials and qualified personnel, and performing all tasks necessary for the installation of pipe materials as specified utilizing the technique of Horizontal Directional Drilling (HDD) at the locations and elevations shown on the project plans in a manner acceptable to the Engineer.
- B. This Section includes casings and related components for crossing State of Alaska Department of Transportation & Public Facilities (DOT&PF) property.
- C. References:
 - 1. American Society for Testing and Materials (ASTM):
 - a. ASTM D638 – Standard Test Method for Tensile Properties of Properties.
 - b. ASTM D3350 – Standard Specification for Polyethylene Plastics Pipe and Fittings Materials.
 - 2. Project Specifications:
 - a. Section 013300 “Submittal Procedures.”
 - b. Section 335000 “Casings.”

1.03 CONTRACTOR QUALIFICATIONS

- A. Construction of pipe by the horizontally drilled, directionally controlled method shall be performed only by a qualified contractor or subcontractor and personnel. The Contractor or subcontractor performing the work as an entity, and the resident supervisor(s) to be in responsible charge of the HDD work shall each have a minimum of five (5) years of experience in horizontal directional drilling. In addition, the resident supervisor(s) shall have successfully completed a minimum of three (3) directionally drilled pipe installations of 12-inch or greater diameter pipes, each with a length in excess of 300 feet.

1.04 BUY AMERICAN REQUIREMENTS

- A. Provide certificates to show that all products meet the following requirements.
 - 1. American Iron and Steel (AIS)
 - 2. Build America, Buy America Act
- B. See Supplementary Conditions for details.

1.05 CONTRACTOR SUBMITTALS

- A. Furnish Submittals in accordance with Section 013300 "Submittal Procedures" and the following supplemental requirements.
- B. In accordance with instructions to proposers, submit contractor, subcontractor, and supervisor qualifications to complete directional drilling with bid proposal for project. Qualification submittal shall include:
 - 1. Names, addresses, phone numbers and work history for all supervisory personnel to be directly involved with the project and present on the project throughout the HDD construction substantiating the individual's qualifications to perform the required work. Include a list of experience projects for the individual with the following information:
 - 2. Name of the project.
 - 3. Project location.
 - 4. Date of Completion.
 - 5. Owner.
 - 6. Owners Representative and phone number.
 - 7. Description of HDD work, include size and length of pipe, soil conditions, and equipment used.
 - 8. Specific responsibility of individual named in the resumes.
- C. At least one week prior to scheduled work submit complete methodology, specific to each crossing, including:
 - 1. Drawing of work site, including location and footprints of equipment, pipe layout area, the locations of the entry, exit pits, pipe assembly area, fencing
 - 2. Equipment specifications and capabilities.
 - 3. Size of pilot hole.
 - 4. Number and size of pre-reams.
 - 5. Use of rollers, baskets and side booms to suspend and direct pipe during pull back.
 - 6. Type and capabilities of the drill head tracking system.
 - 7. The number of sections in which the product is to be installed
 - 8. Minimum pipe elevation.
 - 9. Entry and exit angle of pipeline.
 - 10. Bending radii of the pipeline.
 - 11. Weak link type and capabilities.
 - 12. Anticipated subsoil conditions and contingency plan for dealing with varied soil condition.
- D. Schedule of work including mobilization, drilling the pilot hole, reaming passes, pipe assembly, pipe pullback, clean up and demobilization.
- E. Drawing of work site, including location and footprints of equipment, pipe layout area, the locations of the entry, exit and slurry containment pits, pipe assembly area, fencing.
- F. Drilling fluid management plan, including drilling fluid containment, recycling/transport and approved disposal site.
- G. Emergency procedures for inadvertently boring into a live power line, natural gas line, water line, sewer line, or fiber-optic cables. Procedures must comply with regulations.

- H. Environmental Monitoring Plan including method of dealing with inadvertent returns, surface seepage of drilling fluids and spoils, and “frac-outs”.
- I. At least two (2) weeks prior to commencing work submit data from the manufacturer regarding the tensile strength and recommended minimum bending radius of the pipe.
- J. The Engineer will review submittals and must approve prior to beginning work.
- K. Within four (4) days of completing the directional drilling installation for each run of pipe, provide the log of the drilling operation and guidance system records documenting the line and grade of that installed pipe on increments no more than 10 feet.

1.06 EQUIPMENT

- A. The Contractor shall be responsible for the directional drilling method and equipment. The drilling machine shall be suitable in all regards for the purpose of installing the size, length, and pipe materials specified to the locations and elevations shown on the plans through all types of soil materials that may be encountered, including but not limited to sand, gravel, silt, rock, and debris all of which may be saturated with water or frozen.
- B. Contractor shall use a rotary drilling machine with steerable drilling head purpose designed for HDD installation of pipe. The drilling machine shall have a minimum of 70,000 lb manufacturer rated pullback capability, and a maximum drill string bend radius of no greater than 500 feet.
- C. Operating range and degree of accuracy of the proposed tracking system shall be adequate to meet project conditions. Tracking/steering equipment shall allow for continuous monitoring of the drilling head along the entire proposed alignment. The monitoring equipment and drilling machine control systems shall be capable of locating and placing the pipe within a tolerance of plus or minus 1-foot in both the horizontal and vertical planes. If a poor contact with the sonde is expected to occur at any section, this shall be communicated to the Engineer prior to commencement of construction.
- D. The drilling unit must be equipped with an electrical strike safety package. The package shall include warning sound alarm, grounding mats and protective gear.
- E. Provide load cell for monitoring of pipe tension during pullback operations.

1.07 PRE-COMMENCEMENT

- A. Notify owners of subsurface utilities along and on either side of the proposed drill path of the impending work through the one-call program. All utilities along and on either side of the proposed drill path are to be located. Not all utilities participate in one-call and it is the Contractor’s responsibility to coordinate with all utilities present.
- B. All utility crossings shall be exposed using hydro-excavation, hand excavation or another approved method to confirm depth.
- C. The proposed drill path shall be determined and documented, including its horizontal and vertical alignments and the location of buried utilities and substructures along the path.
- D. Excavation for entrance and exit pits are to be of sufficient size to avoid a sudden radius change of the pipe, and consequently, excessive damage.

1.08 REGULATORY REQUIREMENTS

- A. The Contractor shall perform all work in accordance with the laws and regulations of the State of Alaska.
- B. The Contractor shall abide by all regulatory agency restrictions/requirements, including those of the Alaska Department of Fish and Game, US Army Corps of Engineers, and DOT&PF.

1.09 CONSTRUCTION AREA

- A. Contractor shall complete all construction activities including staging of materials and equipment and stringing together pipe, within the designated public right-of-way or within the acquired temporary construction easements provided for the purpose.

1.10 GEOTECHNICAL INFORMATION

- A. Geotechnical borings are available for reference as indicated in Supplementary Conditions. These borings represent general conditions across the project area and should not be assumed to represent exact subsurface conditions at horizontal directional drilling sites. Contractor is responsible for obtaining additional geotechnical information that they deem necessary to identify localized frozen soils, muck, and groundwater information.

PART 2 - PRODUCTS

2.01 DRILLING FLUID

- A. The Contractor is to ensure that the drilling fluids and chemicals that have the potential to come into contact with the ground are biodegradable, safe to water bodies and fire resistant.

2.02 HIGH DENSITY POLYETHYLENE PLASTIC PIPING (HDPE) AND FITTINGS

- A. Pipe and fittings shall conform to AWWA C901 and AWWA C906.
- B. HDPE Pipe shall meet the following: Manufactured from PE4710 polyethylene compounds that meet or exceed ASTM D3350, cell classification of PE445574; Standard Dimension Ratio (SDR) of 17, and a minimum working pressure of 200 psi; all pipe shall have the same trade (brand) name and shall be certified by the manufacturer as compatible for fusion joining.
- C. Pipe Joints: Join HDPE pipe and fittings using butt-fusion and/or electrofusion couplings. Butt-fusion shall be in accordance with ASTM D3261. Electrofusion couplings shall comply with ASTM F1055.

2.03 BALL MARKERS

- A. Electronic Ball Marker shall contain a passive-tuned antenna, molded inside a plastic disk. Shell of marker must be impervious to minerals, chemicals and temperature extremes. 3M Scotchmark 1403-XR Electronic Ball Marker for water utilities and 1404 XR Electronic Ball Marker for wastewater utilities, or equal, compatible with 3M marker locator.
 - 1. Ball Marker Colors: Blue: Water systems.

PART 3 - EXECUTION

3.01 INSTALLATION OF PIPE

- A. A cone shall be fabricated and attached to the pulling head that will protect the leading edge of the arctic pipe insulation. This is a jacketed, large diameter pipe. Ream bore hole, and provide pulling equipment to degree needed to install pipe without jacket damage.
- B. A shield shall be fit around the pulling head that prevents cobbles from wedging between the drill string and pipe.
- C. Drill path shall not deviate more than 2 feet horizontally and/or 1 foot vertically at any point from the designed alignment without preapproval by the Engineer. If the drill path deviates outside these stated tolerances, the Engineer, at the Engineer's discretion, can request that a new bore hole be drilled at no additional cost to the Owner.
- D. Desired end points for the HDD boring are as shown on the Drawings. The pilot hole entry point shall be as close as practical to the specified location. The exit point shall be within 2 feet horizontally and 1 foot vertically from the specified exit point. If the pilot hole bore fails to arrive within the stated parameters, the Engineer, at the Engineer's discretion, can request that a new pilot bore hole be drilled at no additional cost to the Owner. The Contractor shall stake this point in the field using experienced surveying personnel.
- E. Tracking readings of the drilling head shall be marked at least every 10 feet for review by the Engineer.
- F. Drill only in areas shown on Drawings or where preapproved by Engineer.
- G. The Contractor shall inspect each pipe and fitting prior to installation to ensure that there are no damaged portions of the pipe. Pipe damaged prior to Substantial Completion shall be repaired or replaced by the Contractor.
- H. Contractor is responsible for providing proper equipment to be used for lifting and placing pipe.
- I. Pipe to be installed to the required alignment shown in the Drawings
- J. Monitor tension loads during pipe pullback, do not exceed manufactures recommended load limits on pipe. Assist pipe into entry hole (push and pull operations) as needed to limit tensile loads.
- K. Every precaution shall be taken to prevent foreign material from entering the pipe.
- L. When pipe laying is not in progress, the open end of the pipe must be closed to the satisfaction of the Engineer.
- M. Securely attach at least two tracing wires to the pulling head prior to pullback.

3.02 GENERAL

- A. Only trained operators shall be permitted to operate the drilling equipment and manufacturer's operating instructions and safety practices shall always be followed.

- B. Drilling mud pressure in the borehole shall not exceed that which can be supported by the overburden to prevent heaving or hydraulic fracturing of the soil ("Frac-out").
- C. Entrance and exit angles of the drill string shall be as per the submitted methodology. Any deviation from these values shall first be approved by the Engineer.
- D. If a drilled hole must be abandoned, the hole shall be filled with grout or bentonite to prevent future subsidence.
- E. Pipe installation shall be performed in a manner that prevents over-stressing and straining of the pipe.
 - 1. A section of pipe at least one nominal diameter size smaller than the carrier pipe shall be connected between the pulling head and the carrier pipe to prevent over-stressing to carrier pipe. The maximum tensile strength of weak-link shall not exceed the recommend pull-back force of the carrier pipe.
 - 2. Torsional Stress: A swivel connection shall be employed between the product pipe and the reamer (and back reamer, if applicable) to eliminate torsional stress on the product pipe.
 - 3. Buckling Stress: The Contractor shall fill the underground portion of the pipe with potable water, during pullback to prevent buckling and reduce buoyancy.
- F. If the pipe becomes stuck in the drill hole during pullback such that it cannot be successfully pulled into place without exceeding the manufacturers allowable tensile stress and strain, and cannot be recovered in whole or in part, Contractor shall seal the pipe and existing drill hole and repeat efforts to achieve a successful drill beginning with a new pilot hole. Contractor shall bear all costs connected with supplying replacement pipe string as required and installing it in accordance with the plans and specifications.

3.03 DRILLING

- A. Drilling mud shall be used during drilling and back-reaming operations.
- B. A sufficient number of proof pre-reams shall be utilized to avoid heaving while enlarging the hole to the desired diameter.
- C. During pull-back, the conduit must be sealed at either end with a cap or plug to prevent water, drilling fluids and other foreign materials from entering the pipe as it is being pulled back.
- D. Pipe rollers, skates or other protective devices shall be used.
- E. It is desirable for the product pipeline to be welded into one string prior to commencement of the pullback operation, so as to enable an uninterrupted installation.
- F. The pilot hole shall be back-reamed to accommodate and permit free sliding of the product inside the borehole. Back-ream diameter shall be 1.5 times the OD of the carrier pipe.

3.04 DRILLING FLUIDS – COLLECTION AND DISPOSAL PRACTICES

- A. Excess drilling mud slurry shall be contained in a tank at exit and entry points until recycled or removed from the site. Entrance and exit tanks shall be of sufficient size to contain the return of drilling mud and spoils.

- B. When working in an area of contaminated ground, the slurry shall be tested for contamination and disposed of in a manner that meets government requirements.
- C. Precautions shall be taken to keep drilling fluids out of the streets, manholes, sanitary and storm sewers and other drainage systems, including streams, rivers, and lakes.
- D. Recycling drilling fluids is an acceptable alternative to disposal.
- E. The Contractor shall make all diligent efforts to minimize the amount of drilling fluids and cuttings spilled during the drilling operation, and shall provide complete clean-up of all drilling mud overflow or spills.
- F. The Contractor shall dispose of all recovered drilling fluid and cuttings at a disposal site provided by the Contractor. Drilling fluid and cuttings shall not be disposed of or otherwise buried on site.

3.05 CLEANUP, MATERIAL DISPOSAL AND WORK

- A. Disposal of any material into sloughs and drainages is strictly prohibited.
- B. Disposal of drilling fluids into the City and Borough of Yakutat sewer system is strictly prohibited.
- C. The Contractor shall have available at the site containment equipment, such as silt fencing, pumps, geotextiles, etc., necessary to contain any inadvertent release of drilling fluid to the environment. The containment equipment shall be onsite at all times when work is ongoing.
- D. The Contractor shall be aware that the Owner may implement a monitoring program to monitor water quality in adjacent water bodies.
- E. Burying of rubbish and waste onsite shall not be permitted.
- F. Disposal of waste or volatile materials into waterways or storm or sanitary sewers shall not be permitted.
- G. Pumping or draining water containing silt in suspension into waterways, sewers or drainage systems is prohibited.
- H. Abide by requirements of statute, bylaws, and regulations respecting disposal of wastes.
- I. All waste materials shall be removed and disposed by the Contractor at a disposal site located by the Contractor and approved by the Engineer. Obtain required permits for waste disposal. Provide copies to the Owner. The work area shall be organized and cleaned at the end of each working day.
- J. The Contractor shall maintain the site and surrounding properties in as clean a condition as possible during execution of the Work.

PART 4 - MEASUREMENT AND PAYMENT

4.01 MEASUREMENT

- A. Horizontal Directional Drilling: Horizontal Directional Drilling pipe shall be measured by the installed length in the field and shall include all joints and other such items necessary for joining.
1. All drilling, excavation and disposal, bedding, markers, backfill materials and placement, and traffic control shall be subsidiary to installed cost of pipe.
 2. All pavement patching and any other restoration shall be subsidiary to the installed cost of the pipe.

4.02 BASIS OF PAYMENT

- A. Payment for approved quantities of utilities casing as measured above shall be at the contract unit price per installed item.

<u>Pay Item No.</u>	<u>Pay Item</u>	<u>Pay Unit</u>
330523-1	Horizontal Directional Drilling 8"	Linear Foot
330523-2	Horizontal Directional Drilling 12"	Linear Foot
330523-3	Horizontal Directional Drilling 18"	Linear Foot

END OF SECTION