

| | | | | |
|-------------------|--------------|------------------|----------------|-----------|
| F.A.P. RTE. | SECTION | COUNTY | TOTAL SHEETS | SHEET NO. |
| 338/IL 59 | -2011-035-1- | DUPAGE | | |
| | | | CONTRACT 60P42 | |
| FED.ROAD.DIST.NO. | ILLINOIS | FED. AID PROJECT | | |

Guided Horizontal Drilling System (HDD) (Continued)

Down hole and Surface Grid Tracking System:
Contractor shall monitor and record x, y, and z coordinate relative to an established surface survey bench mark. The data shall be continuously monitored and recorded at least once per drill pipe-length or at twenty five (25) feet, whichever is more frequent.

Deviations between the recorded and design bore path shall be calculated and reported on the daily log. If the deviations exceed plus or minus 5 feet (horizontal or vertical deviation) from the design path, such occurrences shall be reported immediately to DPU-E. The Contractor shall undertake all necessary measures to correct deviations and return to design line and grade.

Drilling Fluid Pressures and Flow Rates:
Drilling fluid pressures and flow rates shall be continuously monitored and recorded by the Contractor. The pressures shall be monitored at the pump. These measurements shall be made during pilot bore drilling, reaming and pullback operations.

Drill Path:
Prior to drilling Contractor shall utilize all verified locate information to determine drill pathway. Marked up drawings (see site preparation paragraph) shall be on site at all times, and referred to during the drill operation.

Guidance System:
Contractor shall provide and maintain instrumentation necessary to accurately locate the pilot hole (both horizontal and vertical displacements), measure pilot string tensional and axial and measure drilling fluid discharge rate and pressure. The DPU-E Representative shall have access to instrumentation and reading at all times during operation.

Pilot Hole:
The pilot hole shall be drilled along the path shown on the plans and profile drawings or as directed by the DPU-E Representative in the field. Unless approved otherwise by DPU-E, the pilot hole tolerances shall be as follows:

Elevation:
As shown on the plans.

Alignment:
±5 feet and within 3 feet of right-of-way or easement boundary.

Curve Radius:
The pilot hole radius shall be no less than 80% of the maximum bending radius as recommended by the pipe manufacturer of the pipe being installed. In no case shall the bending radius be less than 30 pipe diameter, unless approved otherwise by DPU-E.

Entry Point Location:
The exact pilot hole entry point shall be within ±5 feet of the location shown on the drawing or as directed by the DPU-E Representative in the field.

Exit Point Location:
The exit point location shall be within ±5 feet of the location shown on the drawing or as directed by the DPU-E Representative in the field.

Limitations on Depth:
If not noted on the plans, 5" and 6" HDPE pipe and smaller shall be installed with a depth of 6 feet and 3" HDPE pipe shall be installed with a depth of 3 feet to 6 feet unless it is required to install the pipe deeper due to utility conflicts. Where utilities cross under roads, the depth of cover shall be a minimum of 7' to top of conduit.

Water Main and Non-Water Main Separation Requirements:
The minimum separation requirement between HDPE conduit and a water main shall be 18" minimum.

| | | |
|--|--|--|
| NAPERVILLE PUBLIC UTILITIES DEPARTMENT ELECTRIC STANDARDS | SPECIFICATION FOR THE INSTALLATION OF HDPE CONDUIT BY THE HORIZONTAL DRILLING SYSTEM (HDD) | DATE: 02-19-08 PAGE: 13 OF 25 C30-1950 |
|--|--|--|

Guided Horizontal Drilling System (HDD) (Continued)

Pull Back:
After successfully reaming bore hole to the required diameter, Contractor will pull the pipe through the bore hole. In front of the pipe will be a swivel and reamer to compact bore hole walls. Once pull-back operations have commenced, operations must continue without interruption until pipe is completely pulled into bore hole. During pull-back operations Contractor will not apply more than the maximum safe pipe pull pressure at any time. Maximum allowable tensile force imposed on the pull section shall be equal to 80% of the pipe manufacturer's safety pull (or tensile) strength.

Torsional stress shall be minimized by using a swivel to connect a pull section to the reaming assembly. The pull-back section of the pipeline shall be supported during pull-back operations so that it moves freely and the pipe is not damaged. External pressure shall be minimized during installation of the pull-back section in the reamed hole. Damaged pipe resulting from external pressure shall be replaced at no cost to the DPU-E. Buoyancy modification shall be at the discretion of the Contractor and shall be approved by the DPU-E Representative. The Contractor shall be responsible for any damage to the pull section resulting from such modifications. In the event that pipe becomes stuck, Contractor will cease pulling operations to allow any potential hydro-lock to subside and will commence pulling operations. If pipe remains stuck, Contractor will notify DPU-E Representative. DPU-E Representative and Contractor will discuss options and then work will proceed accordingly. For HDPE pipe with a pulling length greater the 500 LF, the Contractor shall utilize a break-away link. Contractor shall provide a break-away link between the swivel and the pipe or a combination swivel and break link. Break-away link shall be rated at 80% of pipe manufacturer's safe pull (tensile) strength. Break pins shall be color coded for easy identification. Contractor shall provide rated break-away link for each material and pipe size(s) for the project.

Drilling Operation:
The alignment for drilling the pilot hole and installing the conduit are as specified on the drawing. (Size of conduit, length, location and number of duct in pull) the allowable lateral and vertical deviations are as specified by the contractor above. A boring/drilling head shall be used that is compatible with the expected soil conditions and as specified above.

Entrance and exit angles for drilling operation can be whatever the contractor desires such that the elevation profile for the conduit is maintained. See limit of conduit bend radius

The pilot shall be backed reamed to a diameter suitable for the installation of the various conduit sections required

The contractor to furnish the following information;

Reamed diameter for one 3, 5, or 6 inch HDPE conduit _____

Reamed diameter for two 3, 5 or 6 inch HDPE conduit _____

Reamed diameter for three 3, 5, or inch HDPE conduit _____

Reamed diameter for four 3, 5 or 6 inch HDPE conduit _____

Reamed diameter for six 3, 5 or 6 inch HDPE conduit _____

Drilling Fluids:
The composition of the drilling fluids shall be submitted to the owner for approval prior to utilization. No fluid will be approved or utilized that does not comply with permit requirements and environmental regulations.

Composition of Drilling Fluids with MSD sheets _____

| | | |
|--|--|--|
| NAPERVILLE PUBLIC UTILITIES DEPARTMENT ELECTRIC STANDARDS | SPECIFICATION FOR THE INSTALLATION OF HDPE CONDUIT BY THE HORIZONTAL DRILLING SYSTEM (HDD) | DATE: 02-19-08 PAGE: 14 OF 25 C30-1950 |
|--|--|--|

Guided Horizontal Drilling System (HDD) (Continued)

Mixing system:
a self-contained, closed, drilling fluid mixing system shall be of sufficient size to mix and deliver drilling fluid. Mixing system shall continually agitate the drilling fluid during operations.

Drilling Fluids:
Drilling fluid shall be composed of clean water, appropriate additives and clay. Water shall be from an authorized source with a minimum pH of 6.0. 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 potentially hazardous material maybe used in drilling fluid.

Delivery System:
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 conveyed to the drilling fluid recycling system. A berm, minimum of 12" high, shall be maintained around drill rigs, drilling fluid mixing system entry and exit pits and drilling fluid cycling system 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 and recycling facilities.

Drilling Fluid Recycling System:
The drilling fluid recycling system shall separate sand, dirt and other solids from the drilling fluid to render the drilling fluid re-usable. Spoils separated from the drilling fluid will be stockpiled for later use or disposal.

Control of Drilling fluids:
The Contractor shall follow all requirements of the Frac-Out and Surface Spill Contingency Plan as submitted and approved and shall control operational pressures, drilling mud weights, drilling speeds, and any other operational factors required to avoid hydro fracture fluid losses to formations, and control drilling fluid spillage. This includes any spillages or returns at entry and exit locations or at any intermediate point. All inadvertent returns or spills shall be promptly contained and cleaned up. The Contractor shall maintain on-site mobile spoil removal equipment during all drilling, pre-reaming, reaming and pull-back operations and shall be capable of quickly removing spoils. The Contractor shall immediately notify DPU-E of any inadvertent returns or spills and immediately contain and clean up the return or spill.

Disposal
Disposal of drilling fluids shall be the responsibility of the contractor and shall be conducted in compliance with all relative environmental regulations, right of way, work space agreements and permit requirements.

Drilling fluid returns shall be collected within the entrance pit, exit pit or spoils recovery pit. The contractor shall immediately clean up any inadvertent drilling fluid spills or overflows from these pits or equipment.

| | | |
|--|--|--|
| NAPERVILLE PUBLIC UTILITIES DEPARTMENT ELECTRIC STANDARDS | SPECIFICATION FOR THE INSTALLATION OF HDPE CONDUIT BY THE HORIZONTAL DRILLING SYSTEM (HDD) | DATE: 02-19-08 PAGE: 15 OF 25 C30-1950 |
|--|--|--|

| | | | | | | | | | |
|---------------------|---------------|--------------------|---|-----------|----------------------------|----------------|--|-------|--|
| PROJECT TITLE | | | | | ROUTE 59 ROAD IMPROVEMENTS | | | | |
| PROJECT DESCRIPTION | | | | | DETAILS AND STANDARDS | | | | |
| ENGINEER | DRAFTING DATE | MAP # | SCALE | | | | | | |
| BCC | 5-11-12 | 4211,4212,4223 | N.T.S. | | | | | | |
| DESIGN BY | DRAFTED BY | REVISIONS DATE | AT&T JOINT AGREEMENT # | PROJECT # | | | | | |
| DL | PSM | | N/A | EU-12 | | | | | |
| CHECKED BY | APPROVED BY | CAD FILE | SHEET # | | | | | | |
| | | 0060648001D147.DWG | 47 OF 63 | | | | | | |
| Naperville | | | Department of Public Utilities Electric Division | | | WORK REQUEST # | | 60468 | |