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Horizontal Directional Drilling Quality Assurance / Quality Control

Horizontal Directional Drilling (HDD) involves the installation of underground utilities by drilling “horizontally” creating a hole of sufficient size to pull in the product – a pipe or communications cable. HDD avoids open cuts, which makes it particularly attractive for crossing highways or other transportation corridors, rivers and streams, and for traversing environmentally sensitive areas.

The process seems simple and straight forward. The elements of an HDD installation are:

1. A rig, which provides the physical means – thrust and torque, to open the hole and pull in the product.
2. A transmitter/receiver system for tracking the location of the bore.
3. The down-hole equipment - drill pipe, drill bits, and reamers, which converts the physical properties of the rig to open the hole and pull in the product.
4. The drilling fluid, which serves to stabilize the hole, cool the down-hole equipment, and remove the spoils from the hole.
5. The drilling fluid delivery and recovery system made up of tanks, mixing systems, pumps; and, when recycling fluids, a system of screens, filters, shakers, cones, etc. to remove spoils brought to the surface from the fluid.

HDD QA/QC measures are articulated in the installation contract, and by state and local regulations governing underground construction. In addition, industry guidelines such as the HDD Good Practices Guidelines are a source for HDD QA/QC procedures.

Preconstruction

Prior to construction, geological conditions need to be assessed to determine equipment and material needs. Walk the site to identify potential hazards, sources of interference, and special conditions. Plan bore with adequate setup area, separation from utilities and obstructions and cover.

Determine geological conditions

The type of soil in the path of the installation determines the type of equipment and materials that are best suited for the job and whether HDD is a suitable tool for installing the utility. Depending on the job size a geological survey may or may not be conducted by an experienced geotechnical engineer. If no geotechnical survey has been preformed, the contractor should look for existing records associated with

nearby construction sites, as well as other public records. Visual inspection of site geology and soil characteristics at the entry and exit pits also provide information on local geology.

Hazards, Obstructions and Utility Location

The installation of underground utilities using trenchless methods limits visual verification of conditions near and surrounding the installation. As with any underground construction, every means should be used to locate and verify existing conditions. These means include contacting the local one-call service and area utilities, reviewing records, having a locating service locate utilities, use locating equipment such as ground penetrating radar (GPR) and electrical field sensing equipment to locate underground utilities and objects.

Prior to installation, walk the bore path with the locating receiver to look for active electrical interference. When operating near existing utilities or potential hazardous conditions, potholing should be used to verify the exact location of the existing utility and bore path.

Drilling Fluids

Among other things, drilling fluids stabilize the hole, which mitigates hydro-fracturing and allows the product to be pulled-in more easily. The proper mix of drilling fluids is determined by the soil conditions and characteristics of the water mixed with the drilling fluid. Geotechnical information should be gathered in advance of the project and soils extracted from the hole should be tested from time-to-time during the installation to verify that the proper drilling fluid mix and additives are being used. Water should be checked and adjusted for pH and the presence of calcium.

Down-hole Equipment

The type of down-hole equipment to be used in an HDD installation depends on the soil conditions, depth of the installation, and size and type of the product being installed. Different bits and reamers work better in different soil conditions, down-hole transmitters come with different signal strengths, which should be matched for the depth of the installation. In addition, certain installations may require that break-away swivels be used to protect the product being installed.

Rig and Mud Circulation & Recycling Equipment

The rig size, and mud system / recycling equipment capacity should be matched to the job. A rig with inadequate torque and trust capability will cause the installation to be more difficult than it should be, putting the installation at risk. Similarly, an under capacity mud circulation system, i.e., inadequate tank or pump capacity, or recycling system, can have the same consequences.

Installation

A successful installation should follow the planned bore with a resultant as-built that approximates the planned path, maintain specified clearance from hazards and other utilities, stays within easement, minimize and deals with inadvertent drilling

fluid returns, and installs the product without damage at the surface or to the product being installed.

Recordkeeping

Tracking systems may provide electronic records of the product location but some older systems do not. In the event that the tracking system does not record installation information electronically, accurate records must be maintained to verify location and compare against plan. Newer systems provide planning software as well as recording of installation.

In addition, real-time record should be kept in a driller log of pitch and depth of each drill string, the drilling fluids used and any special conditions encountered in installation. This information provides a record for verification of pipe location and drilling operations.

Fluid Monitoring

Monitoring drilling fluid returns is also an important QA/QC procedure. Generally, drilling fluid, which carries soils from down-hole, should exit the hole at the entry or exit end of the installation. Drilling fluid flow provides visual verification that the hole is open and that the fluids are not inadvertently escaping. Lost circulation may be an indication that something is wrong.

Field tests that measure the drilling fluids viscosity and weight can help determine the need to adjust drilling fluid mix and the rate at which a product can be safely installed.

If the drilling fluid is being recycled, the recycling equipment should be inspected regularly to make sure that it is removing solids from the drilling fluid. Field tests can be run that provides the percent solids in the drilling fluid. If the percent solids in the fluid becomes excessive, adjustments in the system operation must be made to avoid damaging equipment.

Bits and Reamers Safety

Changing bits and reamers can be a potential safety hazard. Always use proper communications procedures and equipment such as breakout wrenches when changing bits and reamers.

Pipe Products

HDD can be used to install a number of products. The most common are plastic pipe and communications cables. But HDD can be, and is, used to install steel and cast-iron pipe. Each of these products has specific QA/QC procedures for joining their product. In addition, sometimes break away swivels are required during installation to protect the product from being over stressed when pulled-in.

Post-Installation

A successful installation using HDD is largely determined during the installation process. If plastic pipe is being installed, tension monitors or breakaway swivels

may be specified by owner. The pipe or product condition at the exit end of the installation should be examined to gouges, cuts or abrasions.

Water and gas pipelines should be tested against leaks with water or as specified by the owner. HDPE fusion welds should be tested using bent trap or other tests. Steel pipe welds should be tested as specified by manufacturer. The job site should be restored. All materials including drilling fluids should be disposed of as required by local ordinance or as specified by the owner.

For Further Information on HDD Equipment & Tooling Please Visit



Booth 300



Booth 331



Booth 623 & 722



Booth 520

Schauenburg
MAB GMBH

Booth 212



Booth 509



Booth 615



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