HDD Locating – Knowing the Basics

By Siggi Finnsson

Locating is an integral part of any horizontal directional drilling operation, but is often viewed as the "black magic" part of the operation, since many people do not fully understand how the locating system functions.

The act of locating a transmitter underground is an interaction between the transmitter, the receiver, the person (locator) holding the receiver and the environment.

A transmitter, beacon, sonde or probe as they are sometimes called, sends out a magnetic signal, which allows the aboveground receiver to identify the location, direction and depth of the transmitter and the drill head it sits in. The position of the receiver relative to the transmitter is what determines the readings on the receiver. A secondary signal, the data signal, is also emitted from the transmitter. This signal, which typically includes clock (roll), pitch, transmitter temperature and battery status, sends information about transmitter properties independent of the position of the receiver.

There are various methods of locating a drill head depending on the type of receiver used. Some locating systems have multiple ways of locating the head, but let's assume that the head has been correctly located. A depth reading can then be taken and this reading depends on the calibration of the receiver. A calibration essentially involves an operation, prior to launch, that allows the receiver to assign a depth value to a particular signal strength reading.

As an example, the signal strength from a transmitter at the calibration distance (specified by the manufacturer) is measured and stored. This calibration distance is often 10 ft. Since this is the basis for the receiver "knowing" what 10 ft is, it is very important that this calibration be done properly and accurately.

It is also a good idea to perform some operational tests on the locating equipment prior to launching the pilot bore. Some equipment types have a self-test or self-diagnostic feature, which will indicate if there is a problem. Signal strength tests verify the proper signal from the transmitter and range tests check that roll/pitch data are received at a given distance. Both of these can be completed quite easily and quickly and can point out potential problems.

After the equipment has been tested, the next step would be to test for interference. There are two types of interference. Active interference is anything that emits its own signal. Examples include power lines, tracer wires or invisible dog fences to name a few. If these transmit on a frequency close to that of your receiver, these may affect your readings. To test for active interference, walk your bore path with your receiver turned on in locating mode and look for a signal. The higher the signal, the more potential there is for interference.

This is also an opportune time to review all the utility locates.

Passive interference is anything that might distort, block or weaken your signal. Examples include rebar, chain link fences or other below ground metallic (conductive) structures. These may affect the apparent location and/or depth of the transmitter. Passive interference will not show up as a reading on your receiver due to its very nature. This brings the primary benefit of highlighting anomalies, or instances where the equipment behaves unexpectedly. Since the drill rods are generally of a fixed length we should have a pretty good idea of where the head is and how deep it is after a rod has been drilled. If the receiver disagrees, we need to stop and figure out why.

There are four possible solutions to the locate a discrepancy: transmitter malfunction, receiver problem, operator error or interference. By systematically eliminating three of the four, you have your answer. It is strongly recommended that a spare transmitter be kept on the jobsite. Not only will this limit your downtime in case of a failure, but a second transmitter can be an invaluable troubleshooting tool since it gives you extra equipment to compare your readings to.

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If the problem is caused by interference, some of the solutions might include a more powerful transmitter, a wireline system, a locating system on a different frequency or alternate locating methods.

Treat your locating system with the care it deserves, as it is sensitive electronic equipment. Know how it functions so that you can quickly see when it doesn't behave correctly. Plan your day's activities and follow this plan. This will not only make you more productive but your bores will be straighter resulting in less pullback loads, easier installations and less wear and tear on your equipment.

Siggi Finnsson oversees Digital Control Inc.'s European activities and develops training curriculum. All Electronic Drillmaster Reports are reviewed by the Electronic Drillmaster Advisory Board: Finnsson, Ed Savage, Vermeer Mfg.; Corey Potter, Subsite Electronics; and John Archambeault, McLaughlin Mfg.