Typical AST Cathodic Protection Ground Bed and/or Reference Cell Installation by Horizontal Directional Drilling Method

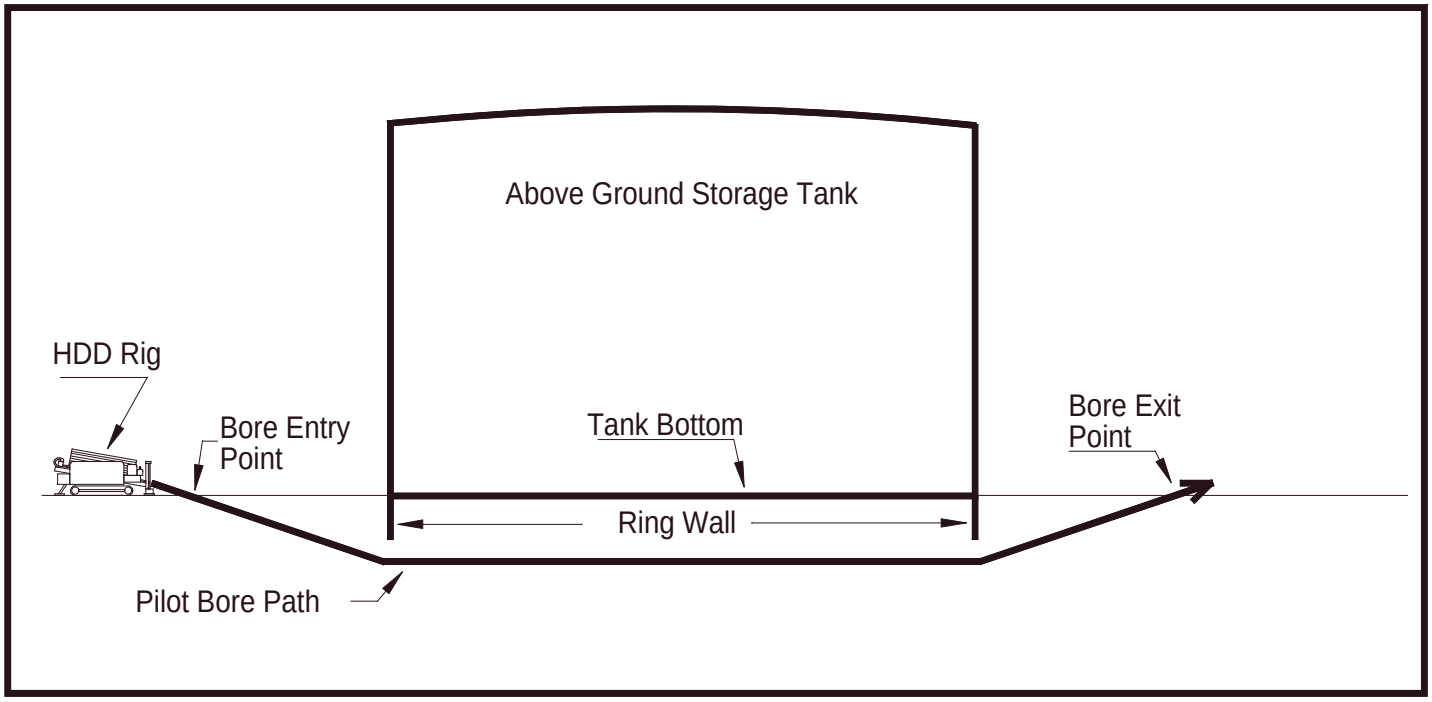
A drill path is determined based on site-specific conditions. These conditions include work area limitations, surface obstructions, underground obstructions, ground conditions, drill string and product bend limitations, the type of product to be installed, etc.

The bore entry and exit points are typically 20 to 40 feet from the tank. This distance varies based on ground conditions and the product to be installed.

Linear anode ground beds are typically placed 8 to 12 feet deep under the tank bottom. This depth is determined by the ground conditions, ring wall depth, tank diameter, ground bed design, etc.

Reference Cell conduits are typically placed 2 to 4 feet deep under the tank bottom. This depth is determined by the ground conditions, ring wall depth, tank diameter, ground bed design, etc.

A pilot hole is drilled along a pre-determined path using a steerable drill bit. A beacon, located in the drill head, transmits a signal to the driller's console with drill head position information to assure proper adherence to the pre-determined drill path.



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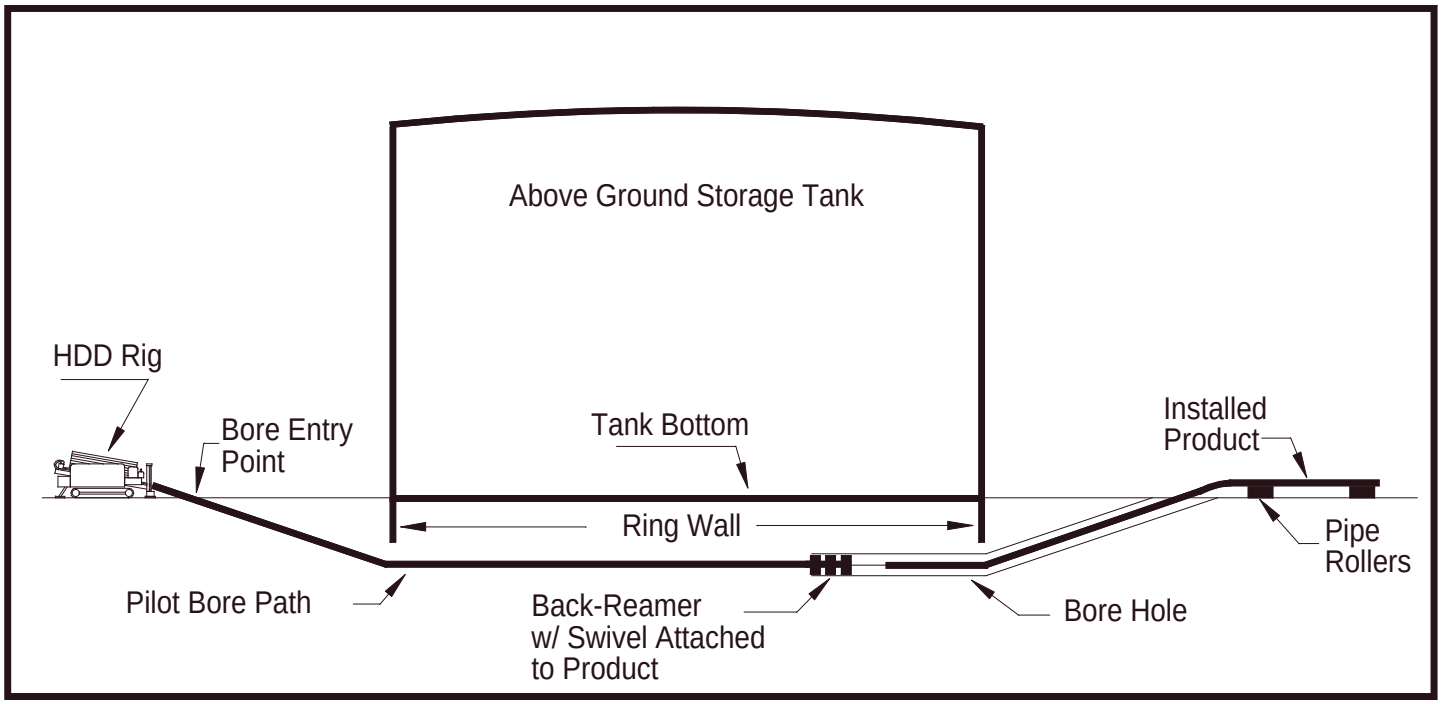
Once the pilot hole is drilled, a back-reamer and swivel assembly is attached to the end of the drill string, at the bore exit point. The product to be installed (linear anodes or reference cell conduit) is connected to the swivel assembly and placed into to bore hole as the drill string is pulled back to the HDD rig. The swivel assembly prevents the product from rotating and/or twisting during placement.

Reference Cell conduits are typically 2", 2 ½" or 3" slotted PVC well casing pipe that is supplied in 20ft joints. Prior to drilling, the slotted PVC pipe is laid out and glued together to the pre-determined bore length. It is placed on pipe rollers and fitted with a drain sleeve or "sock" prior to being placed in the bore hole.

Linear anodes are typically supplied on wooded spools. The spool is placed at the bore exit point on a spool stand or elevated by an excavator boom. The spool rotates and feeds the anodes into the bore as the drill string is pulled back to the HDD rig.



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