

**SPECIAL CONDITIONS FOR HORIZONTAL
DIRECTIONAL DRILLING (HDD)
November, 2007**

1 Materials

1.1 Pipe

Approved materials for HDD include: medium-density polyethylene (MDPE), high-density polyethylene (HDPE), steel, fusible PVC, restrained joint PVC, and ductile iron pipe. Alternate materials will require prior approval.

MDPE and HDPE pipes shall conform to the current ASTM D1248, ASTM D2513, ASTM D3350, and ASTM F714. Steel pipe shall conform to the current ASTM A 53-97 and ASTM 139-96. Ductile iron pipe shall conform to the current ASTM 716-95 and ASTM 746-95. PVC pipe shall conform to the current ASTM F1962-99 and ASTM D2321-00.

1.2 Allowable forces

The pulling force shall not exceed the pipe manufactures recommendation. When using MDPE, HDPE, or fusible PVC pipe an extra six foot section of the pipe shall be pulled out of the borehole to check for any sign of stress or damage.

1.3 Pipe Characteristics

- (a) MDPE and HDPE pipe shall have an SDR value of 11 or less.
- (b) Pipe shall be without any significant dimensional or surface deformities. All pipes shall be free of visible cracks, holes, foreign material, foreign inclusions, blisters, or other deleterious or injurious faults or defects. Any section of the pipe with a gash, blister, abrasion, nick, scar, or other deleterious fault greater in depth than ten percent (10%) of the wall thickness, shall not be used.

1.4 Protective Coatings (Steel Pipe)

A coating to provide a corrosion barrier as well as an abrasion barrier is required. The coating shall be bonded well to the pipe and have a hard smooth surface to resist soil stresses and reduce friction. A mill-applied fusion bonded epoxy coating is required for steel pipes.

2 Construction

2.1 Minimum Allowable Depths

The minimum allowable installation depth of cover of a HDD installed pipe under the road and shoulder surface is correlated to the pipe diameter. Table 2 summarizes the minimum allowable depths:

Table 2 -- Minimum Allowable Depth

Pipe Diameters (inches)	Depth of Cover (feet)
6 or less	6
7 - 12	8
13- 24	10
24 and greater	12

In locations where the road surface is superelevated, the minimum depth of the bore shall be measured from the lowest side of the pavement surface. In addition, a minimum 3 foot depth shall be maintained in all other features including ditch bottoms.

2.3 Method

- (a) The ends of each section of MDPE and HDPE pipe shall be inspected and cleaned as necessary to be free of debris immediately prior to joining the pipes by means of thermal butt-fusion. The Polyethylene pipe shall be of the same type, grade, and class of the polyethylene compound used in the process.
- (b) The handling of the joined pipeline shall be in such a manner that the pipe is not damaged by dragging it over sharp or jagged objects. Sections of the pipes with cuts and gouges exceeding 10 percent of the pipe wall thickness or kinked sections shall be removed and the ends rejoined.
- (c) Pipe rollers, skates or other protective devices shall be used to prevent damage to the pipe, eliminate ground drag, reduce pulling force, and reduce the stress on the pipe and joints.
- (d) Sufficient space shall be allocated to fabricate and layout the product pipeline into one continuous pipe length, thus enabling the pull back to be conducted during a single operation. If space considerations are discovered that make this impossible, the permit applicant shall obtain specific alternative instructions from the MDOT Engineer/Inspector.
- (e) The required piping shall be assembled in a manner that does not obstruct adjacent roadways or public activities.
- (f) The drill path alignment shall be as straight as possible to minimize the frictional resistance during pullback and maximize the length of the pipe that can be installed during a single pull.
- (g) The minimum radius of curvature of HDD path should be 1,200 times the nominal diameter of the pipe to be installed.
- (h) For large diameters (greater than 20 in), an intermediate pre-reaming is required before pulling the utility into place.
- (i) The drilling fluid in the annular region outside of the pipe shall not be removed after installation, and remain in place to provide support for the pipe and neighboring soil.

2.4 Drilling Site

- (a) Location - A minimum distance, from the edge of the paved shoulder or curb, to the face of any access pit, equipment, and supplies, shall be 35 feet along freeways and limited access roadways and 25 feet along free access roadways. Any deviation from these distances shall require prior approval from the MDOT Engineer/Inspector.
- (b) Protection-Fencing barriers shall be installed adjacent to equipment and supplies with suitable fencing and plastic drums to prohibit pedestrian access to the work site. Equipment shall not be used as fencing to protect access pits.

2.5 Overcut Allowance

The overcut diameter shall not exceed the outside diameter (OD) of the pipe by more than 1.5 times to ensure excessive voids are not created resulting in post installation settlement.

2.6 Watertight Joints

Water tight pipe joints are required to ensure the integrity of the roadbed. Pipe shall be constructed to prevent water leakage or earth infiltration throughout its entire length.

2.7 Drilling Fluids

- (a) Drilling fluid shall be used during drilling and back reaming operations.
- (b) Excess drilling fluids shall be contained within a lined pit or containment pond, or trailer-mounted portable tank, until removed from the site.
- (c) All drilling fluids shall not enter the streets, manholes, sanitary and storm sewers, and other drainage systems, including streams and rivers.

2.8 Pipe Locating and Tracking-

The following requirements may be waived depending on size, bores and/or conditions:

- (a) During construction, continuous monitoring and plotting of pilot drill progress shall be undertaken to ensure compliance with the proposed installation alignment. The contractor shall plot the actual horizontal and vertical alignment of the pilot bore at each edge of pavement and at intervals not exceeding 20 feet. This “as built” plan and profile shall be updated as the pilot bore is advanced.
- (b) The contractor shall at all times provide and maintain instrumentation that will accurately locate the pilot hole and measure drilling fluid quantity. The contractor shall grant the Engineer/ Inspector access to all data and readout pertaining to the position of the bore head, the fluid pressures, and flows.
- (c) Trace wire is required for all non metallic pipe installation for post construction location purposes.

2.9 Settlement/Heaving Monitoring

- (a) This method shall be performed in a manner that will minimize the movement of the ground in front of, above, and surrounding the boring operation; and will minimize subsidence of the surface above and in the vicinity of the boring. The ground shall be supported in a manner to prevent loss of ground and keep the perimeter and face of the boring stable at all times, including during shutdown periods.
- (b) Potential heave or settlement shall be monitored at each shoulder point, each edge of pavement, the edge of each lane (or centerline for two lane roads), and otherwise at 50 foot intervals along the pipe centerline.
- (c) For pipe sizes larger than 3 inches a survey shall be performed one day prior to initiating this operation at each required monitoring location. A similar survey shall then be performed at each location, on a daily basis, until the permitted activity has been completed. All survey readings shall be recorded to the nearest one-hundredth (0.01) of a foot. Digital photographs of the pavement conditions shall also be taken prior and after the pipe installation.
- (d) All operations shall stop immediately whenever monitored points indicate a vertical change in elevation of 1/2 inch or more, or any surface disruption is observed. The Contractor shall then immediately report the amount of settlement to the MDOT Engineer/ Inspector.

2.11 Failure

- (a) Should anything prevent completion of this operation, the remainder of the pipe shall be constructed and/or abandoned by methods approved by the MDOT Engineer/Inspector.
- (b) Abandonment of any component of the installation shall only be allowed as approved by the MDOT Engineer/Inspector.

3.12 Contamination

When an area of contaminated ground is encountered, all operations shall stop immediately, and shall not proceed until approved by the MDOT Engineer/Inspector. Any slurry shall be tested for contamination and disposed of in a manner, which meets Local, State and/or Federal requirements.

3.13 Bulkhead

Pipe ends shall be temporarily sealed with a cap until the connection is made permanent, to prevent water or earth infiltration.

3.14 Work Site Restoration

- (a) Access pits and excavations shall be backfilled with suitable material, and in a method approved by the MDOT Engineer/Inspector.
- (b) The disturbed grass-surface area shall be top soiled, seeded, fertilized, mulched, and anchored according the current MDOT Standard Specifications for construction, sections 816 and 917.
- (c) Upon completion of the work, the contractor shall remove and properly dispose of all excess materials and equipment from the work site.