

1 Materials

1.1 Pipe - Pipe used in this method includes an existing *Host* pipe and a *Replacement* pipe.

1.2 Allowable forces

The pulling force shall not exceed the pipe manufactures recommendation.

1.3 Replacement Pipe Characteristics

- (a) HDPE pipe shall have a standard dimension ratio (SDR) of 11 or less.
- (b) Pipe shall be round. Steel pipe shall have a roundness tolerance, so that the difference between the major and minor outside diameters shall not exceed 1% of the specified nominal outside diameter, or 0.25 inch, whichever is less. Likewise, HDPE, ductile iron, and PVC pipe shall have similar roundness tolerances.
- (c) Pipe shall have square and machine beveled ends. The pipe end maximum out-of-square tolerance shall be 0.04 inch, (measured across the diameter).
- (d) The maximum allowable straightness deviation over any 10 foot length of steel pipe is 1/8 inch. Likewise, ductile iron, and PVC pipe shall have similar straightness tolerances. HDPE pipe does not to be straight.
- (e) 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.

3 Construction

3.1 Minimum Allowable Depths

Minimum allowable depth of cover shall be as specified in the approved plans.

3.3 Method

- (a) The ends of each section of 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) Portions of the manhole shall be removed to ease the pipe installation. Upon completion, the manhole shall be restored appropriately.

3.4 Access Pits

- (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.

However, for this method, the location and number of insertion or launching pits will typically be located near existing or proposed manholes. Therefore, access pits shall be placed and located to minimize the total number of pulls and maximize the length of pipe replaced per pull, and within the constraints of the maintaining service. Access pits shall be located at points near specific repair locations whenever possible.

- (b) Sheeting and Bracing - Sheeting and bracing shall be required whenever any part of the access pit excavation is located within the roadbed influence area. Steel sheet piling shall be furnished and installed as indicated in the current MDOT Standard Specifications for Construction, section 704. An additional earth retention structure shall be required above and below the bore hole on the drilling face of all access pits to prevent loss of material during construction.
- (c) Protection - Fencing barriers shall be installed adjacent to access pits, open excavations, 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.
- (d) Miscellaneous Items
 - The pit or manhole wall must have a thrust block with proper structural capabilities to resist the pull/push forces.
 - Manholes and pipes shall be protected by installing all pulleys, rollers, bumpers, alignment control devices and other equipment required to protect existing manholes, and to protect the pipe from damage during installation. Under no circumstances shall the new pipe be stressed beyond its elastic limit.
 - At no time shall this method be used when another unprotected underground utility or facility is located within 2.5 feet from the bursting head.

- 3.5 Oversize Allowance** - Oversize is the annular space between the enlarged host pipe and the outside diameter of the replacement pipe. When using this method, the allowable oversize diameter is two inches greater than the replacement pipe diameter.

3.6 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.

3.9 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.
- (b) Potential heave or settlement shall be monitored at each edge of right of way, 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) 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.

3.10 Ground Water Control

Pipe bursting below the groundwater table increases the difficulty of bursting operations. During the operation, insertion and receiving pits shall be kept dry.

- (a) Dewatering shall be conducted whenever there is a high ground water table level to prevent flooding and facilitate the operation. The water table elevation shall be maintained at least 2 feet below the operation at all times.
- (b) Minor water seepage or pockets of saturated soil may be effectively controlled through bailing or pumping. This control shall be accomplished without removing any adjacent soil that could weaken or undermine any access pit, its supports, or other nearby structure.
- (c) Larger volumes of ground water shall be controlled with one or more well points or with staged deep wells. Well points and staged deep well pumping systems shall be installed and operated without damage to property or structures, and without interference with the rights of the public, owners of private property, pedestrians, vehicular traffic, or the work of other contractors. Any pumping methods used for de-watering and control of ground water and seepage shall have properly designated filters to ensure that the adjacent soil is not pumped along with the water. Well diameter, well spacing and the pump's pumping rate, shall provide adequate draw down of the water level. Wells shall be located to intercept ground water that otherwise would enter the access pit excavation and interfere with the work. Upon removal of a well, the hole shall be filled and grouted according to the specifications identified in MDOT's flowable fill special provision, and MDOT's Plugging Drill Holes special provision.
- (d) Existing storm sewers shall only be used to discharge water from the dewatering operation in accordance with a permit obtained from the appropriate storm sewer owner. Filters or sediment control devices shall be required to ensure that the existing system is not adversely affected by construction debris or sediment.

- (e) If grouting is used to prevent ground water from entering the area of the access pit, the grouting shall be installed without damage to property or structures and without interference with the rights of the public, owners of private property, pedestrians, vehicular traffic, or the work of other contractors. The material properties of the grout shall conform to the specifications identified in MDOT's flowable fill special provision.

3.11 Failure

- (a) Should anything prevent completion of this operation, the remainder of the pipe shall be constructed 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.

3.13 Bulkhead - Pipe ends shall be temporarily sealed until the drive and receiving shafts are made permanent, or other manholes are installed, to prevent water of 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. The shafts shall be backfilled and sealed upon completion of the microtunneling. The shaft and supports shall be removed to 10 feet below the original ground surface. The disturbed work site area shall be restored to existing grades and original material condition.
- (b) The disturbed grass-surface area shall be topsoiled, seeded, fertilized, mulched, and anchored according the current MDOT Standard Specifications for construction, sections 816 and 917. Slopes steeper than 1-on-3, shall be sodded according to the current MDOT Standard Specification for Construction, sections 816.03 and 917.11.
- (c) Upon completion of the work, the contractor shall remove and properly dispose of all excess materials and equipment from the work site.