

FINAL

TRENCHLESS BEST PRACTICES FOR DAMAGE PREVENTION

GENERAL DOCUMENT



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NOTE: The GTI Trenchless Best Practices are presented as a general guide. All users of trenchless equipment are to consult and consider not only the GTI Trenchless Best Practices, but also employer practices, industry practices, federal and state statutes and regulations, equipment manufacturer requirements, and local laws, regulations and ordinances.

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TRENCHLESS BEST PRACTICES FOR DAMAGE PREVENTION:

Purpose:

To ensure that construction operators take actions to recognize the dangers associated with directional drilling and other trenchless operations, and to ensure that existing underground utility infrastructure are adequately located and protected from inadvertent *damage*.

Trenchless Construction (Installation / Replacement) Overview:

Trenchless operations are a type of subsurface construction work that requires few or non-continuous trenches. Trenchless operations includes such construction methods as horizontal directional drilling (HDD), pipe ramming, pipe jacking, pneumatic piercing, horizontal auger boring, tunneling, micro tunneling, bursting/splitting, and other methods for the installation of pipelines, conduits, and cables below the ground with minimal excavation.

While trenchless excavation may offer advantages of lower disruption and costs for utility installation projects, it is critical to utilize prudent trenchless practices. Trenchless construction projects where low quality practices have been used can result in *damage* posing a significant threat to public safety, property, and loss of life. For example:

- Waxahachie, Texas – September 21, 2015 - Home explosion
 - Telecom contractor installing a fiber optics line hit a gas and sewer line with a HDD machine.
 - Two people severely burned, nine homes damaged, one home destroyed.
 - Victim's attorney states that the contractors are to blame, citing unsafe practices.
- Ewing, New Jersey – March 4, 2014
 - Gas/Electric Utility Contractor installing electrical conduit via HDD hit a gas line.
 - One death, multiple injuries - A total of 55 homes were damaged or destroyed.
- Asheville, North Carolina – January 10, 2014
 - HDD machine *damaged* a 12" high pressure natural gas transmission line in 2003
 - The pipe failed over 10 years later sending flames hundreds of feet into the air.
- Royal Oak, Michigan – February 27, 2013
 - Gas company crews installing a new main via HDD hits a gas service.
 - One death - three homes destroyed and many others damaged.
- Kansas City, Missouri – February 19, 2013 (JJ's Restaurant)
 - Telecom contractor installing a telecom line crossed a gas line and hit it with the head of the HDD machine.
 - One death, multiple serious injuries - Business destroyed, many other buildings damaged in the downtown business district.

Each incident has a unique set of circumstances and sequence of events. Therefore, this document is intended to offer general practices and principles that can minimize the chances of a trenchless incident. Most importantly, trenchless operations require *competent personnel* who understand the technology and the risks associated with failing to account for the location of all underground utility infrastructure and failing to follow good practices.

Practice Guidelines:

Pre-Plan

- It should be determined what existing underground structures, utilities, and facilities are expected to be in the area, including privately owned sewer lines and French drains
- Other information, such as right-of-way and geological information should be obtained and reviewed
- The following should be determined and considered when creating the construction plan:
 - Requirements for both vertical and horizontal clearance, of underground structures, utilities and facilities
 - Size of pullback tools
 - Bend radius of pipe and product
 - Ability to track the *bore*
 - Ability to expose existing underground utility infrastructure and observe crossings
 - Surface structures for equipment placement and setback requirements
- An emergency response plan should be created and communicated to entire crew in the case of an underground strike
 - Plan should include:
 - contacts with phone numbers
 - procedures for each type of event
 - assignments of responsibilities
- Communication method between operator and tracker must be provided
- Traffic and pedestrian control must be planned
- Required construction permits must be obtained
- Planned installation should be mapped, either through a software program or hand written
- Drilling depth must be determined with the following considerations:
 - Ability to expose existing utilities to the depth of the planned path.
 - Ability to locate and expose the utility being installed in the future.
 - State, local and federal regulations for required depths of the utility being installed.

Locate Utilities

- Proposed excavation and path must be marked with white paint or flags
- One-call (811) must be contacted to coordinate utility locates with member companies
- All facility owners/operators that do not participate in one-call must be contacted and those facilities must be located
- Locates must be verified
 - Confirm locates with excavators own locating device

- Visually inspect for any underground utility infrastructure that may have been missed, such as:
 - sewer cleanouts
 - sunken areas indicating previous excavation
 - risers
 - outbuildings with utilities
 - light poles
 - meters
 - utility boxes
 - manhole covers
- Expose by hand digging or vacuum excavation all existing utility infrastructure down to the depth of the proposed path:
 - if the proposed path, exit/entrance pits, and/or anchoring position areas are within the tolerance zone (see Figure 1).
 - at the point of crossing, see Table 1 below
 - if the proposed path is parallel to existing underground facilities, see Table 2 below.
- All sewer lines/laterals in the path should be located.
- Photo of locates should be taken
- If locates are damaged, unclear, obscured, covered by snow, etc. they must be repeated.
- Facility owner/operator must be contacted if there are any questions about the marks or if the underground utility infrastructure can't be verified.
- Confirmation that locates have been completed should be obtained. No assumptions should be made regarding the location or depth of underground utility infrastructure.

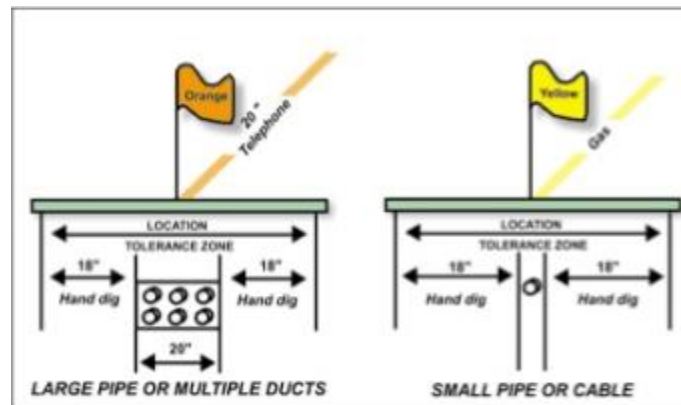


Figure 1. Examples of tolerance zones (These tolerance zones vary from state to state and should be verified based on the state requirements where the work is taking place)

Table 1. Crossing utility exposure guide

Positively identify (by potholing) all crossed utilities that are expected to be:

- Above and within 5' of the proposed vertical alignment,
- Below and within 3' of the proposed vertical alignment, and
- Additionally as requested by the owner of the right of way and/or the owner/operator of the utilities being crossed.

Table 2. Parallel utility exposure guide

If drilling parallel within...	Utility must be exposed	Drill head must be tracked
3' of existing utility	At least every 25'	At least every 5'
5' of existing utility	At least every 100'	At least every 10'

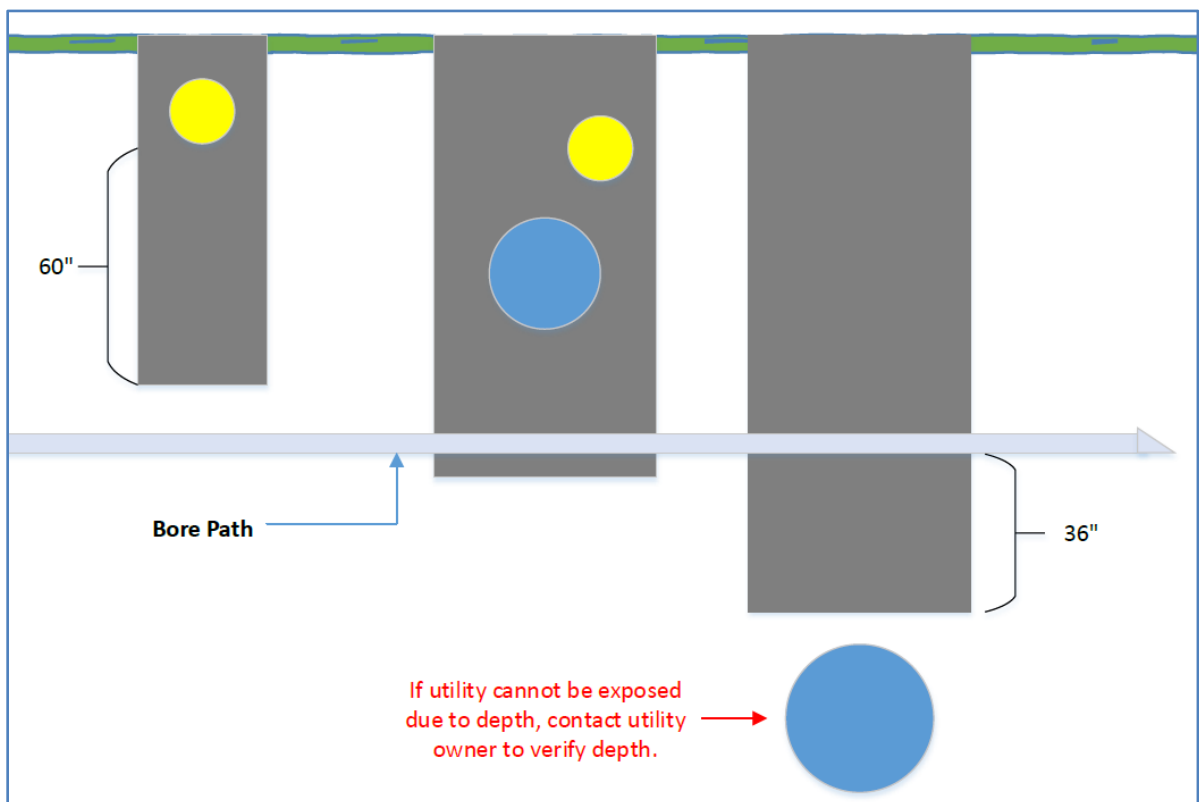


Figure 2. Minimum exposure of all crossed utilities

Prepare

- Ensure extra batteries are available for tracking equipment and communication devices
- Fresh/charged batteries must be installed in the beacon at the start of every shift
- Replace batteries in tracker when indicated on display
- Beacon and tracker must be calibrated at the start of every shift
- Frequency for tracking must be determined for the jobsite
- Replace batteries in communication devices for operator and tracker as needed
- Electric strike system, if equipped, must be set up and tested at the beginning of each shift
- Equipment setup location must be determined considering the following:
 - Ability to drive anchors
 - Proposed depth
 - Setback distance required
 - Nearby utilities
 - Ability to avoid utilities directly in front of the equipment

Crew Protection

- If there is any chance of drilling within 10 feet of a buried electric line
 - Everyone must be briefed on the electrical strike system and procedures
 - Consider setting up a protection zone around the equipment
 - No one should touch the drill while it is drilling
 - Drill operator should wear electrically insulated boots and have electrically insulated gloves within reach
 - Tracker should wear electrically insulated boots with pants tucked into tops of boots
- Manual pipe loading must be done only after drilling has stopped
- Anchors must be driven from the operator's platform
- Anchors must be driven to full depth for grounding or a ground rod should be used
- Tracker should step away from *bore* path while drill head is moving and track drill head only after it has stopped.

Trenchless Operations/Tracking

- The trenchless tooling must not be operated within the tolerance zone of other unexposed underground utility infrastructure.
 - Backreamer size must be considered when determining appropriate pilot *bore* location
- Drill head must ALWAYS be tracked during pilot *bore* every ½ to full length of installed drill rod
 - Drilling must be stopped anytime the ability to track is lost or hampered
 - Each tracking location should be marked and the depth recorded
 - Tracker should periodically review marks to ensure planned *bore* path is being followed
- When crossing a utility during all trenchless operations, including pilot *bore* and pullback, the crossing must be visually observed, even if under pavement, in which case pavement coring and potholing may be required. If visual observation is not possible, another path should be taken.

- When drilling parallel to existing utilities, see Table 2 above.
- An as-built map should be created.
- A camera inspection of sewer lines in the area must be conducted after the work is complete, if all sewer lines could not be verified and located.
- Operator/tracker must not vary installed path from planned path (direction or depth) without re-evaluating and exposing all underground utilities in the new path.

Emergency Response

- Reference equipment operator's manuals and internal company procedures.
- In case of an electric strike
 - Anyone on equipment must remain on equipment
 - Anyone off equipment must remain in place and must not touch equipment
 - Operator should pull back drill string to attempt to break contact
 - Strike system should be used after one full minute to re-check for a strike
 - Electric company should be contacted as soon as possible
- In case of natural gas strike
 - Machine must be shut down and all sources of ignition extinguished immediately
 - Gas company and 911 must be contacted as soon as possible
 - Everyone in the area should be notified of the strike
 - Evacuation is recommended
- In case of fiber optic cable strike
 - Everyone should be kept from looking at the *damaged* cable to prevent eye damage
 - Communications company should be contacted as soon as possible

Definitions:

Bore - A generally horizontal hole produced underground primarily for the purpose of installing underground utilities.

Competent person - One who is capable of identifying existing and predictable hazards in the surroundings or working conditions which are unsanitary, hazardous, or dangerous to employees, and who has authorization to take prompt corrective measures to eliminate them.

Damage - Any impact or contact with an underground facility, its appurtenances or its protective coating, or any weakening of the support for the facility or protective housing which requires repair.

Installed Path - The actual location of the *bore* or trenchless installation.

Locate - To indicate the existence of a buried line or facility by establishing a mark through the use of electromagnetic or other means and marking its location on the surface with stakes, paint or some other customary manner, that approximately determines the location of a line or facility.

Planned Path - The planned location for the *bore* or trenchless installation.

Test Holes / Pothole / Daylighting: Exposure of a facility by safe excavation practices used to visually ascertain the precise horizontal and vertical position of underground lines or facilities.

Tolerance zone - The area demarcating the space in which an underground line or facility is located, and in which special care is to be taken.

Tooling - Any device attached to the head of the drill string to cut or enlarge the *bore*. This may also include devices for attaching the installed product for pullback.

Tracker - The crewmember responsible for operating the tracking equipment, locating the head of the drill string or other trenchless equipment and communicating information to the operator.

Tracking equipment - A portable device used above ground that detects the signal from the tracking transmitter in the head of the drill string and measures parameters about the drill bit and the drilling process.

Trenchless Excavation - A type of subsurface construction work that requires few or non-continuous trenches. Trenchless Excavation includes such construction methods as horizontal directional drilling (HDD), pipe ramming, pipe jacking, pneumatic piercing, horizontal auger boring, tunneling, micro tunneling, bursting/splitting, and other methods for the installation of pipelines, conduits, and cables below the ground with minimal excavation.

Utility Infrastructure - Any sanitary sewer, underground line, system or structure used for transporting, gathering, storing, conveying, transmitting or distributing potable water, gas, electricity, communication, crude oil, refined or processed petroleum, petroleum products or hazardous liquids

Vacuum Excavation - Process using suction to remove solids, liquids, slurries, high-pressure air or water is employed to loosen soils and vacuum equipment is used to remove the loosened material.

References and Other Resources:

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- Kansas Underground Utility Damage Prevention Act: Excavator and Utility Operator Obligations
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- OSHA - Safety and Health Regulations for Construction (standard 1926.32)
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