AGA White Paper:
Natural Gas Pipelines and Unmarked Sewer Lines – A Damage Prevention Partnership

April 2010
AGA Distribution Construction & Maintenance Committee

Purpose

The purpose of this white paper is to provide a discussion of the issues related to trenchless pipeline installations in the vicinity of sewer lines. This paper includes reference to existing material related to damage prevention with an emphasis on sewer mains and lateral lines that are not marked. This paper does not imply acceptance of any responsibility or liability of any owner/operator to locate and mark sewer lines; it simply accepts whatever the current condition is in each location and offers guidelines to minimize existing exposure.

On December 30, 2004, AGA published an Engineering Technical Note: "*Directional Drilling Damage Prevention Guidelines for the Natural Gas Industry*." Attached in the appendix of this document, it shares specific guidelines and practices, which can be considered by natural gas utilities to improve safety. This particular paper seeks to build upon that information by providing insights into how natural gas utilities can collaborate with other stakeholders in getting sewer lines marked on a going-forward basis and in finding ways to effectively deal with existing sewer lines.

Background

Unlike gas, electric, water and telecommunications lines, cross-bored sewer laterals can go undetected for extended periods. These cross-bored sewer laterals are typically found when someone is attempting to unclog a sewer lateral and discovers the bored line inside the sewer lateral. Educating the public, regulatory bodies, sewer operators, developers, and plumbing associations of their roles in getting sewer lines marked will be essential in reducing the dangers associated with unmarked sewer lines. Information and support may also be provided by the local One-Call Agency. The need for this paper is based upon the elevated risk associated with unmarked sewer lines and the increased use of trenchless technology.

Resources / References

Available resources include: i) federal, state and local laws and regulations; ii) guidelines from Common Ground Alliance, American Gas Association, and other organizations; iii) various industry articles; and iv) manufacturer equipment instructions. Although the references listed below may be designed for directional drilling, many of the practices are applicable for other types of trenchless installation procedures.

This section provides specific reference material and sites. References range from general statements, guidelines and practices to specific recommendations. It is designed to provide the reader with a range of material depending on the needs and requirements.

American Gas Association (AGA)
Technical Note
December 30, 2004
"Directional Drilling Damage Prevention Guidelines for the Natural Gas Industry"
www.aga.org

Above document provides detailed recommendations and specific references to sewer lateral lines and recommended processes. **Note: It is included in the appendix of this document.**

Common Ground Alliance
Best Practices Version 6.0
March 2009
"Excavation Practice Statements and Description"
http://commongroundalliance.com
Above document is a reference guide with very general statements. No specific reference to sewer lateral lines.

Cross Bore Safety Association
www.crossboresafety.org
This site has a multitude of information.

Distribution Contractors Association
DCA Position Paper – Marking Sewer Laterals
November 16, 2006
http://dca-online.org

HDD Consortium
2001, 2004, 2008
"Horizontal Directional Drilling – Good Practice Guidelines"
Retail literature through North American Society for Trenchless Technology
http://www.nastt.org/store/good_practices.html
This manual is very detailed with specific recommendations and minimum guidelines. It is specifically related to directional drilling technology with references to preventative measures around sewer facilities.

National Underground Contractors Association
NUCA Position Paper – Locating and Marking Service Laterals
September 26, 2006
www.nuca.org

Office of Pipeline Safety
August 1999
"Study of One-Call Systems and Damage Prevention Best Practices"
Excavation Task Team Best Practices
http://commongroundalliance.com
Above document is a reference guide with very general statements. No specific reference to sewer lateral lines.

Definitions

Cross Bore: A utility cross bore is an intersection of an existing underground utility or underground structure by a second utility installed by trenchless technology that results in direct contact between the transactions of the utilities that compromises the integrity of either utility or underground structure.

Sewer Line: Includes any system to remove waste water from a structure including the sanitary sewer lateral, sewer main, or septic system line. This also includes combined sanitary sewer and storm water systems.

Trenchless Technology: includes use of the following:

1. Directional drills
2. Piercing tools (hogs, moles, missiles, etc.)
3. Water boring equipment
4. Augur boring equipment, including pipe jacking
5. Plowing
6. Insertion or pipe-splitting

Verify: To determine or test the accuracy of, as by comparison, investigation or reference.

The Regulatory Environment

All states have One-Call system(s) to distribute planned excavation information to utilities and most state One-Call laws have some type of penalty for non-compliance. However, since each state's enforcement mechanism varies as defined by its particular law, the effectiveness of enforcement varies widely, ranging from extremely active and effective to non-existent. An additional concern is that some states exempt all or portions of sewer systems from their regulations. Some state regulatory agencies are even precluded from assessing fines or penalties on a municipality that may be operating a sewer system.

Some state and local governments own and operate the sewer lines only from the property line to the waste water treatment facility. As a result, sewer lines on private property may either be owned by the property owner or owned and/or operated by the municipality.

From a municipality's perspective, there may be political implications associated with these regulatory and ownership issues. Elected officials are often faced with priorities associated with keeping sewer rates and taxes as low as possible, while simultaneously protecting the safety of their constituencies and the public.

Regardless of future changes in the regulatory environment, each sewer line operator must adhere to all current laws and regulations related to the location and marking of underground facilities in the particular state and locality where the project is located.

A Partnership Model

Natural gas owner/operators and sewer line owner/operators have shared interests:

- Safety of the general public and their customers
- Providing the service at the lowest cost
- Preventing damage to their infrastructure

Sewer line owners/operators face some challenges as portions of their systems can predate piped water or natural gas systems and most are not electronically locatable. Legacy sewer installation records are often inadequate, incomplete, or non-existent and the organizations that support those systems vary in size. Their resources may also vary according to the size of the systems.

Sewer and natural gas utilities should explore mutual damage prevention efforts and sewer system owner/operators may be able to learn from the natural gas utilities that have successfully addressed similar challenges in the past. Both should seek to understand each other's operating policies, practices, requirements and priorities. For example,

- What is the mark-out policy?
- Who owns the service line laterals?
- Who operates and maintains the service line laterals, on and off the public right of way?
- How are sewer lines located?
- What can be done to ensure that all sewer lines (whether new or replacement installations) are constructed in a manner that allows them to be electronically locatable?
- What is the level of involvement in the One Call process?
- Who is responsible for locates of buried facilities on private property?
- What communications, if any, are sent to customers to alert them, especially if they have a responsibility in marking customer-owned facilities under the local state statute?
- Will the sewer owner/operator install an outside cleanout on a homeowner's line if one is not available? (this is sometimes at a cost to the customer)
- How can the sewer owner/operator and the natural gas utility share information on sewer locations?
- What is the sewer owner/operator's typical response to a blocked sewer lateral?

The remainder of this paper focuses on other important steps that may be considered by the natural gas utility and the local sewer owner/operator.

Communication and Education with Other Stakeholders

In some circumstances, a communication and education strategy may be appropriate to help mitigate risk. The natural gas owner/operator can develop their own strategy based upon the unique requirements of each situation. It may be appropriate to encourage sewer system owner/operators (municipalities, city, etc.) to develop their own communication and education strategy to mitigate the risks that may exist for them in relation to their facilities regarding the use of trenchless technologies. **Specific communication examples are listed below, but the list is not intended to be all-inclusive, and not all of the suggestions listed below may be appropriate in all situations**.

- Communicate with and educate municipalities, public works departments, owner/operators of private sewer systems, plumbing industry, companies that rent rotary cutting tools, trade unions, contractors, state regulatory boards, homeowners, and the public.
- Include the trenchless technology topic related to sewer laterals and mains in mailings, letters, and/or bill inserts.
- Work cooperatively with the local One-Call Center to identify a list of locating firms that are available to stake privately owned underground facilities. This will provide property owners a reasonable method to fulfill any responsibility they may have to mark their buried facilities.
- Provide contact information for the facility owner and ask for notification prior to reaming sewer lines.
- As part of an operator's Public Education Program, network with plumbers, equipment rental businesses, owners of private sewer systems (e.g.- mobile home parks, commercial campuses, school complexes, hospitals), and state regulatory boards to develop best practices for investigating blocked sewer lateral lines.
- Work with state licensing boards to ensure that a thorough understanding of unmarked sewer line issues is required of individuals who are endeavoring to obtain or renew a business, plumbing, or contractor's license.

Practices to Consider in Using Trenchless Technologies

The 2004 technical note "*Directional Drilling Damage Prevention Guidelines for the Natural Gas Industry,"* identified practices that should be considered when using trenchless technology. The practices will not be applicable or effective for all utilities.
For example:

- Some states and municipalities require a plumber's license to access sewer systems; these licenses are generally not held by the natural gas distribution companies.
- Natural gas distribution companies may have difficulty accessing non-customer premises which are outside of the utility easement in which a trenchless technology was used.
- In many parts of the country, the sewer lateral is owned by the homeowner up to the sewer main and there is no information available for mark-out purposes.
- Many of the practices identified in the 2004 technical note apply to directional drilling, and not to other forms of trenchless technology.

When trenchless technology is used by a contractor working for a natural gas distribution company, additional safety language may be appropriate in the contract to clearly convey that the contractor needs to exercise prudent steps in assuring that all utility lines have been located. Additional insurance requirements may also be considered to ensure the appropriate levels of liability insurance are maintained to cover associated risk. Actual insurance requirements should be reviewed by appropriate personnel.

For simple work efforts where the natural gas distribution company or its contractor is the only entity involved in the construction, the practices outlined in the 2004 technical note "*Directional Drilling Damage Prevention Guidelines for the Natural Gas Industry"* may be sufficient when

using trenchless technology. For more complex work efforts or for when there are multiple companies, agencies, or municipalities involved, the 2004 technical note and the following additional practices may be considered by natural gas operators and sewer operators during the planning and installation effort:

1. Planning

The following are some additional practices for consideration during the planning stages for use of trenchless technology:

- Proper Engineering Design, determining a path of installation which will reduce the likelihood of utility interference
- Use of sub-surface utility engineering methods
- Participation in utility coordinating committees
- Participation in municipal coordinating committees
- Depending on the size and complexity of a project or activity, hold pre-bid / construction meetings with utilities and public works officials, prior to the start and during construction
- Use experienced contractors

2. Installation

Reminder: Follow applicable state one-call and dig-safe laws.

Below are some additional practices for consideration during a natural gas installation project that uses trenchless technology. (The local sewer operator may be able to assist.)

- Consider pre-location of sewer laterals where an exterior clean-out is available:
    - Measure the depth of the sewer line lateral. Caution should be taken because a sewer lateral may not have consistent grade or path from the building entrance to the sewer main.
    - Run a fish tape down through the exterior clean-out, use a line locator in the conductive mode, and verify location and depth by pothole; or
    - Insert a sonde in the exterior clean-out and use a drill head locator to verify location and depth; or
    - Pre-camera through the exterior clean-out to verify location and depth.
- Pot hole along the path, as appropriate for conditions
    - Establish criteria for which every sewer line must be pot holed (such as privately owned sewer systems including trailer parks, schools, college campuses, shopping malls, etc.)
    - Establish criteria for spaced verification of sewer laterals including:
        - Conditions that allow the practice (long, known depth sewer mains, etc.)
        - Verification at some set distance (for example, every 200’ when laterals are 4’ deep or every 400’ when laterals are 6’ deep)

3. Post-installation Records and Metrics

The following practice is for consideration during the documentation stages when using trenchless technology:

- Natural gas pipelines installed with trenchless technology can be identified on field work orders or company mapping systems as such.

NOTE: This technical note is a suggested guide only, and the use of these Guidelines or any variation thereof, shall be at the sole discretion and risk of the user parties. ***See Notice and Disclaimer on final page.***

Appendix

Directional Drilling Damage Prevention Guidelines for the Natural Gas Industry

December 30, 2004
AGA Distribution, Construction & Maintenance Committee

DCM – 2004 – 4-1

DIRECTIONAL DRILLING DAMAGE PREVENTION GUIDELINES FOR THE NATURAL GAS INDUSTRY

PURPOSE

The purpose of this paper is to provide general guidelines for natural gas operators to use in the enhancement of their company's damage prevention programs for directional drilling operations. This paper provides parameters for protecting existing natural gas facilities from damage during directional drilling activities, as well as includes general guidance on underground damage prevention procedures when installing new natural gas facilities by directional drilling.

Each natural gas operator is responsible for developing their own damage prevention program with guidelines, policies and procedures that are specific to the application of directional drilling within the region of their facilities. The information in this document is not intended to replace local, state, federal or private company rules or regulations. These guidelines are a suggested guide only, and the use of these guidelines or any variation thereof, shall be at the sole discretion and risk of the user parties.

BACKGROUND

The background of the need for the development of these safety guidelines is based on suggestions from two governmental agencies associated with the natural gas pipeline industry and a request from a natural gas industry association:

- National Transportations Safety Board (NTSB) Safety Recommendation P-99-1, dated April 28, 1999, which directed that the Research & Special Programs Administration (RSPA) ensure that the natural gas operators' damage prevention programs include actions to protect their facilities when directional drilling operations are conducted in proximity to those facilities.

- In follow-up to this advisory, RSPA issued a Pipeline Safety Advisory Bulletin ADB-99-04, dated August 23, 1999 to all owners and operators of hazardous liquid and natural gas pipeline facilities. This advisory urged these operators to review, and amend if

necessary, their written damage prevention program to minimize the risks associated with directional drilling and other trenchless technology operations near buried pipelines. Its purpose was to ensure that pipeline operators take actions to recognize the dangers associated with directional drilling and other trenchless technology operations, and to ensure that underground pipeline facilities are adequately located and protected from inadvertent damage.

- The American Gas Association (AGA) Operating Section Managing Committee requested that general safety guidelines for directional drilling operations in the proximity of natural gas facilities be developed.

RESOURCES

There are numerous articles, guidelines and instructions on the practice of directional drilling from various trade associations and manufacturers of equipment. Those documents are excellent resources for understanding the full extent of safe directional drilling practices. Though this paper will incorporate many of the already documented practices for safe directional drilling, its main purpose is to highlight the appropriate safety practices for natural gas operators to ensure that their underground facilities are adequately located and protected from damage.

The sources used for this paper include excerpts from materials prepared by the directional drilling trade associations, along with suggested practices that are in-development and in-place by member companies of the AGA.

DESCRIPTION OF PROCESS

Directional drilling is a trenchless method of installing underground facilities that can reduce the expense and difficulties that are experienced in open trench construction practices. The usage of directional drilling will be determined by the operator based on many factors. Some of these factors may include the site conditions, size of job, soil conditions, environmental considerations, subsurface interference, traffic disruption, and disruption to the public. It is typically used on river or stream crossings, railroad crossings, highway crossings, well-developed areas and environmentally sensitive areas.

The typical technique for installing pipe by directional drilling uses a surface mounted drill rig that launches drill rods creating a string of rods (called the drill string) below the ground guided by a drill head that is directionally controlled by the drill operator. The direction of the drill is along a pre-determined path (called the drill path) based upon the above ground and below ground, pre-construction investigations of the site. A locating device is used during the drill to track the location of the drill head so that the operator may make adjustments as necessary. A small diameter pilot hole is drilled from the entrance point (typically in a sending pit) to the desired exit point (receiving pit). It is necessary to use a drilling fluid during drilling to lubricate and protect the pipe, and to maintain the size of the hole being opened. Following the exit of the pilot drill bit, the hole is then enlarged by the use of a backreamer attached to the end of the drill string which is pulled back through the pilot hole. As the backreaming takes place, the pipe

being installed is also pulled into the hole. Directional drilling may require the use of a casing pipe to protect the carrier pipe where required and/or dictated by an outside agency.

DIRECTIONAL DRILLING GUIDELINES

General

The listed guidelines are general in nature and contain some suggested procedures. Precautions recommended by manufacturers of trenchless technology equipment should be reviewed prior to construction. Applicable state and local requirements for damage prevention should be followed.

Employee Safety

- Directional drilling, whether by the operator in installing new natural gas pipelines or by a third party installing facilities in the proximity of natural gas pipelines, should follow normal construction safety practices that are in accordance with local and federal safety guidelines.

- In addition, all recommended safety practices by directional drilling equipment manufacturers should be adhered to.

- The primary safety issue for field personnel is striking underground utilities. Proper planning and adequate protective measures will provide a safe work environment for the crews and minimize utility damage.

- Employees involved in any aspect of a directional drilling project should wear the appropriate protective equipment based on the conditions they are operating in and required by federal, state, local and company regulations. Appropriate personal protective equipment for directional drilling operations may include, but is not limited to, the following items: hard hat, gloves, safety glasses, hearing protection, flagger/traffic vests, dust masks, and electrical-protection gloves and boots.

- All drill machines should be equipped with an electrical strike detector in the event that the drill rods strike an energized underground utility. Field personnel should make sure that the strike detector is fully operational prior to the start of any directional drilling activities. The strike detector shall be entered into the ground prior to setting the anchor stakes into the ground.

- The drilling machine shall be properly grounded to assure operator protection in the event that the drill rod hits an electric line. Should the alarm go off, the operator should remain on the grounded machine until the drill rod is disconnected from the electrical line or the electric line is shut down.

- Only employees who have been trained and qualified should be permitted to operate the drilling equipment. Personnel should familiarize themselves with any safety concerns addressed in the operator's manual.

Planning

- If directional drilling must be used in streets with parallel runs of gas transmission mains, electric transmission lines, hazardous liquid pipelines, fiber optic lines and other similar facilities, it is advised that a minimum separation between the various underground facilities be established that ensures the safety of the facilities.

- The separation between the gas pipeline and other facilities must be sufficient to allow for maintenance activities on both utilities. Be sure to check local regulations for the minimum separation distances between the gas pipeline and the other facilities.

- Design and installation of metallic structures should be done in such a manner to minimize and mitigate damage from stray current and to prevent interference with existing cathodic protection current distribution on adjacent or crossed facilities.

- Drill paths that are parallel to within 3 feet of any utility, including gas lines, should be avoided. However, when deemed necessary to drill within 3 feet of a utility, the drill head should be physically located at regular intervals dependent on soil type and surrounding conditions.

- Drilling contractor should have a plan in place in the event of a utility strike. This plan should also include the notification of the utility owner.

Site Investigation

- Establish a proposed drill path and visually inspect the potential site for suitability for directional drilling by walking the area.

- Be alert to any obstructions and indications of the presence of other underground facilities or structures such as catch basins, sewers, water boxes, manhole covers, valve box covers, meter pits, telephone and cable television boxes, electrical transformers, conduit or drop lines from utility poles, pavement patches, previous locate marks, ditch line depressions, out buildings that may have unmarked utilities serving them, underground shutoffs, etc.

- Consider talking with local residents who may have knowledge of subsurface activities in the area.

- Review available underground facility maps.

- Depending on the scope of the project, most directionally drilled natural gas main installations should be straight, with a 3 feet minimum cover, and not vary by more than 2 feet horizontally. However, each utility will need to determine the appropriate minimum cover based on their company’s operating specifications as well as the actual physical operating conditions where the pipe is installed.

- Establish a site where there is sufficient room for entrance and exit tie-in pits, drill equipment, and safe operation.

- After determining the proposed drill path and delineating the work area with white paint, contact the appropriate utility One-Call provider to ensure that all underground facilities are located and marked accordingly by their owners. Request through the One-Call provider the location of other underground utilities. If possible, identify the presence of utilities not located through One-Call and attempt to determine their location by contacting the owner(s) of those facilities or employing other means to identify the path in which they are running. Note: not all One-Call Centers will send mark-out requests for design purposes.

- In locating facilities, it should be noted that One-Call providers will only help to notify owners of active utility services. Since there may be abandoned and private services that are not located, it is worthwhile to check with utility companies or local residents to determine if their knowledge will reveal any helpful information for critical situations.

- In finalizing the drill path, determine the depth and location of all underground facilities along that path to the extent practicable. Test holing should be considered.

- Establish locations of all entrance and exit pits to ensure that there are not any aboveground or subsurface structures that would interfere with the drilling equipment's operation. Ensure that there is adequate clearance of overhead electric, telephone or cable lines for these locations.

- Establish by test holes or from experience the suitability of soil conditions for directional drilling along the proposed drill path. Directional drilling may not be suitable if the subsoil is composed of large grain material (e.g., gravel and cobble fragments, rock, buried debris, abandoned foundations).

Pre-construction

- Call the local One-Call provider with sufficient advance notice to ensure that all underground facilities are marked, or verified that they are not in the location of the proposed work.

- Notification to all underground utilities through the local One-Call provider must be typically made 48 to 72 hours prior to the start of any directional drilling, depending on the requirements in the state where work is taking place.

- Notify residential and business neighbors, along with privately owned services (e.g., gas, water, and electric) in the area of impending work.

- Proper jobsite setup and layout are essential to ensure safe directional drilling operations. The following should be considered when preparing the jobsite: work area protection,

flagger requirements, barricades or other methods to safeguard the public and employees, applicable safety and excavation requirements, marking and locating hazards, verifying One-Call markings, checking location and depth of underground facilities, checking for signs of venting associated with underground tanks, etc.

- There should be a briefing for all employees on the jobsite prior to beginning operations and periodically during the project. The briefing should include:
  - Overview of project plans and identification of field supervision
  - Location and access to local emergency facilities
  - Location and type of buried services and overhead obstructions
  - Jobsite safety: warnings, barriers, emergency procedures, personal protective equipment

- Review the selected locations for the boring machine and the entrance/exit pits to ensure that there are no subsurface or aboveground interferences.

- A visual inspection should be made for the proposed drill path just prior to the drilling operation to ensure that all utilities are marked and that there are no subsurface interferences.

- Expose all underground utilities that are perpendicular or parallel to the bore path, and verify the depth of the facilities. Efforts to locate the existing facility may utilize such techniques as electronic location devices, hand digging, pot holing when practical, vacuum excavation methods, use of pressurized air or water, pneumatic hand tools or other noninvasive methods. Note: some HDD methods use slurry, and digging void in the drill path causes the drill slurry to rise to the surface.

- Existing underground facilities should be exposed with sufficient space around the facility so that the drilling operation can be visually checked to ensure that it will not impact the facility.

- If in the course of excavation the location of the existing facility is found to be incorrect, the facility owner should be contacted so they can correct their records.

- The crew leader should visually inspect the planned drill path, just prior to proceeding with the drilling operation, to ensure that all utility services and underground structures have been identified and test holes made as required.

- Avoid sinking anchor stakes for the boring machine within 24 inches of any utility. If this requirement is impossible to meet, then test holes should be made at a depth equal to 12 inches deeper than the length of the anchor stakes to ensure no strike will occur when anchoring the machine.

Construction

- Parallel installations: Test holes should be excavated at intervals along the existing underground facility closest to the drill path to positively locate and inspect this facility throughout drilling operations to assure no direct or incidental contact. Test holes should be a minimum of 12" deeper than the desired depth of the facility that is to be installed. The minimum intervals for these test holes are dependent on the proximity of the existing facility to the drill path, as well as the type of facility being paralleled. The drilling path should be continuously monitored and it is suggested that the location of the drill head is marked at least every 10 feet.

- Paralleling gas installations: For existing gas facilities, a typical suggestion is to excavate a test hole every 50 feet if the drill path is within 5 feet of a distribution gas pipeline. If an existing gas pipeline that is being paralleled crosses under pavement, the pipeline should be exposed at each curb for monitoring. The intervals for the test holes will be dependent on the proximity of the existing pipeline to the drill path, as well as the type of gas pipeline in operation.

- Crossing installations: Consider excavating test holes at all crossing locations to the extent practicable. The existing facility should be completely exposed with sufficient visual area so that it can be assured that the drilling operations do not impact the facility. A typical practice is to excavate at least 12 inches below the existing facility and 24 inches on either side of the located position of the facility to be crossed. The 24 inches on either side is in addition to the facility width marked by the line locator.

- The test holes can be used to observe the drill head as it passes exposed substructures. Test holes are also used to ensure adequate clearance for the back-reamer (pull-back head). Note that the backreaming process will be a larger hole size and should be taken into consideration when specifying minimum separation distances from existing facilities.

- Establish, check and maintain proper radio communication between the operator and locator at all times before and during directional drilling operations. Communication between the drill operator, locator and operating personnel is critical. Adequate communications should be established between the operator of the drill rig and the crew member that is tracking the location of the drill string during these operations. Appropriate hand signals should be agreed upon in case the electronic communication fails.

- Appropriate locate and guidance equipment for steering and maintaining accurate location of the drilling head should be used during all drilling operations. Using electronic locating equipment, the location of the drill head during the drilling operation should be continuously monitored to ensure that the drill path follows the design profile. Locations should be marked or staked as required. The drill head should be inspected at test holes previously made at substructure locations to ensure adequate clearance.

- If possible, maintain a minimum separation of 12" when crossing gas facilities; however, if facilities are fully exposed, then a separation of less than 12” may be considered where regulations allow.

- The aboveground drill path should be sufficiently accessible to allow the locator to be able to monitor the progress of the drill head. Overhead structures or wire lines may present potential problems in the accuracy of the electronic locator along the drill path. Steel-reinforced concrete (e.g., sidewalks, driveways, roads, etc.), invisible dog fences, underground power cables and fiber optic cable can also present problems and may interfere in use of the locator. Walking the drill path with the locator prior to the drill string being started can reveal interference problems.

- The horizontal and vertical position of the drill head should be closely monitored as the drilling progresses. The location of the reaming tool should also be closely monitored during the backreaming process to ensure that the reaming tool follows the path of the pilot hole.

- Directional drilling crews should perform periodic sweeps of the area during the project to further ensure that all possible attempts to avoid damage to marked and unmarked facilities have been made.

- Cease drilling operations if an unidentifiable, abnormal or unanticipated resistance or sudden movement of the drill string is encountered. Also, cease operations if other conditions develop (lightning, etc.) that could affect the safe operation of the equipment and personnel. Proceed only after the source of the disturbance has been identified and/or eliminated. Particular care should be taken to ensure that existing substructures are not penetrated. If any underground facility is known to be damaged during the project, notify the appropriate operator and/or emergency response personnel immediately, as appropriate.

- If determined to be needed following the completion of a directional drill near an existing gas pipeline, perform a leak survey of the pipeline to ensure that it was not impacted by the new installation.

Directional Drilling in Proximity of Sewer Facilities

- Sewer systems are especially vulnerable to damage from directional drilling operations for the following reasons:
    - Lines are often non-metallic, making them difficult to locate.
    - Clean-outs or other indications of laterals may be hidden or non-existent.
    - Damage may not be readily apparent when a sewer, particularly a gravity flow system, is pierced by a drilling machine.

- Additional efforts should be considered in determining whether sewer lines and laterals are within the proposed construction area of a directional drilling project. Some of these efforts may include the following:

- Contact the city, building owners, local plumbers, and other persons that can provide assistance with identifying the existence and location of sewer lines.
- Obtain maps and drawings of the sewer system from the city or other entity. Maps can provide the depth of the sewer lines and other valuable information that can assist in determining the location of the sewer lines within the proposed drill path.
- Visually check the job site for sewer cleanouts, manhole covers, and any markings on curbs or gutters that may exist for sewer facilities.
- Use internal camera systems, if available, that travel down the main sewer line and allow the laterals to be located visually.
- Use electronic technology, if available, to track a locating transmitter inserted into a sewer and/or lateral to determine its path and depth.
- Use ground penetrating radar, if available, to assist in locating sewer lines and laterals.

- In determining the depth of the sewer and laterals, the following guidelines should be considered:
  - If a sewer line is located, check the direction of the flow of the water and the direction of the pipe. The flow direction will tell the grade of the sewer. It will help judge whether the sewer will be shallower or deeper where the drill is being made.
  - Access manhole covers and measure the depth of the main sewer line.
  - Access outside clean-outs and measure the depth of the sewer line lateral. Caution should be taken because a sewer lateral may not have a consistent grade from the building entrance to the sewer line.
  - Obtain access to buildings that do not have an outside clean-out and visually identify where the sewer exits the structure. Visually determine the depth of the sewer lateral by identifying where the lateral exits the building versus the depth of the sewer main at the street.

- If known sewer facilities cannot be positively located, then consider the following alternatives:
  - Do not use directional drilling or other trenchless equipment for installing the gas main or service.
  - Use the directional drilling equipment and perform a post-construction camera inspection of possibly affected sewer lines.
  - Use directional drilling equipment only in those areas where the location and depth of sewer lines have been determined to be safely outside the drill path and use open trench equipment for areas where the sewer line conflicts have not been ruled out.
  - Use a sewer listening device where sewer lines are not physically exposed. It is important that a person monitoring the sewer for penetration be alert to any unusual noise and immediately communicates the information to the equipment operator. It is possible that the drill penetration will coincide with a resistance felt by the operator.

NOTE: These "Directional Drilling Damage Prevention Guidelines for the Natural Gas Industry" are a suggested guide only, and the use of these Guidelines or any variation thereof, shall be at the sole discretion and risk of the user parties. ***See Notice and Disclaimer on final page.***

SOURCES

- National Transportations Safety Board (NTSB) Safety Recommendation P-99-1, dated April 28, 1999
- RSPA Pipeline Safety Advisory Bulletin ADB-99-04, dated August 23, 1999
- GPTC Guide for Gas Transmission and Distribution Piping Systems: 2003 Edition - Guide Material Appendix G-192-6 - "Subsurface Damage Prevention Guidelines for Directional Drilling and Other Trenchless Technologies"
- "Common Ground: Study of One-Call Systems and Damage Prevention Best Practices", August 1999
- HDD Consortium, "Horizontal Directional Drilling - Good Practice Guidelines", May 2001
- Directional Crossing Contractors Association, "Horizontal Drilling Safe Operations Guidelines", 2000
- Various member companies of the American Gas Association - specifications, operations guidelines, procedures manuals, etc.

Notices and Disclaimer

This document was prepared by the American Gas Association's (AGA) Distribution Construction & Maintenance Committee based on suggestions from the National Transportations Safety Board and the Research & Special Programs Administration and the request of the AGA Operating Section Managing Committee.

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