Meta – Analysis: Cross Bore Practices

By: PHMSA/NAPSR Plastic Pipe Ad Hoc Committee

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Methods

The information contained within this report is based on the collective experiences of team members of the Plastic Pipe Ad Hoc Committee (PPAHC) and white papers and other experiences that have been shared with the team. The PPAHC is composed of representatives of the U.S. Department of Transportation Pipeline and Hazardous Materials Safety Administration (PHMSA) and the National Association of Pipeline Safety Representatives (NAPSR).

The topics were identified based on common questions that have been posed within the industry. These are topics encountered and addressed in individual States by State regulators or operators through best practices that are not often incorporated in the Federal code. To identify practices in your State, you can contact your NAPSR representative (http://www.napsr.org/). To obtain more general information on the topic, you can contact Max Kieba with PHMSA's Office of Pipeline Safety, Engineering and Research Division, by phone at 202-493-0595 or email at max.kieba@dot.gov.

Background

A cross bore is defined as an intersection of an existing underground utility or underground structure by a second-party utility resulting in direct contact that compromises the integrity of either utility or underground structure. For example, a cross bore occurs when a new natural gas line is installed using a trenchless method and intersects an existing underground utility, such as a sewer line. This example may pose no problem initially and can go undetected for months or years. However, if the sewer line becomes blocked and mechanical equipment, such as a rotating auger, is used to clear it, the intersecting gas line can be damaged, resulting in a gas leak. The leaking gas can migrate into buildings via the sewer line, resulting in a potentially dangerous situation.

Issues with cross boring were identified as early as 1972, thus this is not a new problem. The occurrence of cross bores has become more prevalent as the installation of gas distribution facilities using trenchless technology becomes more popular. However, there is limited data on the number of cross bores found per mile of sanitary sewer inspected. Typically sanitary sewer laterals belong to the property owner and are not marked by local municipalities in response to locate requests. Sewer laterals are often not identified on maps due to a lack of requirements and/or technology available at the time of their installation, and they are not locatable using conventional methods since they are commonly non-metallic pipe.

The PPAHC surveyed States in February 2013 on cross boring practices and developed this report to share the results from that survey and to describe experiences with cross boring practices.

Results

Survey Results

There were 26 responses to the survey representing 24 states. Not all respondents answered every question.

Types of excavation methods recognized as being cross bore threats by the State entities were Directional drilling (100%), Pneumatic piercing (hole hogs) (70%), Straight line hydraulic and/or pneumatic horizontal boring (60%), Large cable plows (35%), and Vibratory plows (30%).

Fourteen of 23 responding States (61%) noted incidents or near misses as the result of cross bores in sewer systems. Fortunately, none of these incidents or near misses resulted in deaths; however, 6 of the States reported injuries associated with the incidents/near misses. As expected 9 of the States reported property loss associated with the incidents/near misses.

Only 5 of 13 responding States (38%) had formal directives/regulations regarding the installation of new natural gas pipeline facilities to avoid the potential for a cross bore incident. Nine of 13 responding States (69%) had damage prevention programs that included directives/regulations for all excavators regarding boring. Of those States, the damage prevention programs required

100% of the sanitary sewer mains to be located and marked, 42% of the sanitary sewer laterals, and 50% of the storm sewers.

Table 1: States' responses to directives or regulations compared to best practices across methods during construction

	Directives/Regulations	**Best Practices**
Camera use in sewer mains before gas line placement	22%	21%
Camera use in sewer mains after gas line placement	11%	29%
Camera use in sewer laterals before gas line placement	22%	21%
Camera use in sewer lateral after gas line placement	22%	14%
Maps of sewer mains to be on site as part of excavation process	22%	36%
Daylighting of each sewer lateral at point of intersection with bore path	56%	57%
Listening device placed in nearest sewer manhole operated by excavator during the crossing of lateral and/or mains	11%	29%
Excavator establishes location and depth of lateral using a steel tape inserted through sewer cleanout	11%	36%
Excavator daylights or potholes each crossing of a marked utility at least 12" past the depth of the proposed bore path	33%	64%
Tracer wire required on new/replaced sewer laterals to make them locatable	33%	29%

Table 2. Techniques to identify areas of potential conflict between sanitary sewer and gas pipe installed by trenchless excavation during planning/site selection

	Explicitly Required	Best Practices
Areas of high water table	0%	20%
Areas surrounding identified lakes	0%	0%
Areas with shallow sewer mains	0%	40%
Localized elevation changes (terraced properties)	0%	40%
Homes with shallow or no basements	0%	40%
Sewer lateral that exit other than the basement floor	0%	40%
Systematic camera studies of sewer mains and laterals	100% (1)*	60%

*One State explicitly requires Systematic camera studies of sewer mains and laterals. Other States recognized systematic camera studies as a best practice.

The majority, 61%, of the States, have natural gas operators provide supplementary messages to plumbers regarding cross bores. In 56% of the States, gas operators encourage plumbers to contact them or the one-call center before clearing sewer line blockages beyond the outside wall of a building.

General experiences

One company indicated that 23% of their cross bores were identified by plumbers that had been previously educated by the operator on this issue. A large percentage of States have influenced operators to provide supplemental messages through their public awareness programs. Efforts are also underway to educate “do it yourselfers” regarding the potential dangers of cross bores; brochures and information are often provided in both English and Spanish at local rental equipment retailers.

As an example, one operator implemented a sewer lateral inspection program, and created a priority customer classes list, such as schools, hospitals, nursing homes, mobile home parks, and apartment complexes. The operator established a sewer lateral database with a goal of looking for a minimum separation of 18 inches.

In other areas, operators have been able to collaborate with local municipalities to perform camera surveys/inspections.

The State of Minnesota shared information relating to assessing the risk with cross bores. The key findings from their study revealed that in each of the conflicts:

- Plastic pipe was involved;
- Areas with municipal sewer systems were involved;
- Trenchless gas installation methods were used;
- Short-side service situations accounted for 80% of the conflicts; and
- Previous projects were involved (repeats of where conflicts were found).

Other common findings regarding cross bores include:

- Without the benefit of marking sewer laterals, some gas pipelines installed by boring have penetrated those sewer laterals.
- Subsequent sewer lateral blockage followed by mechanical cleaning has damaged gas pipelines and created hazardous conditions in the area near the damage.
- Sewer lateral conflicts are threats to the integrity of distribution pipelines.
- Use of a camera for inspection needs to be performed immediately after a gas line is installed and prior to the introduction of gas. Sewer lateral investigation programs have been effective in mitigating risks.
- Public education programs have been effective in mitigating risks.
- More preventative measures are needed in terms of marking sewer laterals to eliminate conflicts right from the start.

Discussion / Conclusion

As pointed out in the comments of the survey, 'Any excavation method can be a cross bore threat without adequate procedures and quality control.'

The data collected under this study continue to indicate that cross bores are a threat to pipeline safety and should be considered in operators' distribution integrity management plans. Regulators and operators need to consider cross bores as a known threat to determine if additional measures are needed.

Some regulatory agencies have adopted rules/requirements for implementation of cross bore techniques while others have relied on best practices. Should there be consideration for a wider adoption of regulations to incorporate more of these best practices?

The PPAHC team deems that valid messages were identified and needed to be shared. However, PPAHC acknowledges everyone's experiences are not the same, and we encourage a continued dialogue on this issue.

If a State encounters issues with cross bores not previously shared in the survey, please submit the information to your NAPSR PPAHC representative.

Reference

1. Cross Bore Safety Association. (http://crossboresafety.org/)
2. Cross Bore Awareness & Prevention. Jeff Murray, Minnesota Office of Pipeline Safety. CGA Excavation Safety Conference & Expo. 2013.
3. Mitigating the Risk of Cross-Bores. Paul Armstrong, Gas Technology Institute. Northeast Gas Association's Fall Operating Conference, Oct 2012.

Informational Sites

1. Cross Bore Safety Association (http://crossboresafety.org/)
2. North American Society for Trenchless Technology (http://www.nastt.org/)