the Energy to Lead

Mitigating the Risk of Cross-Bores

Northeast Gas Association's
Fall Operating Conference
October 4, 2012

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Gas Technology Institute

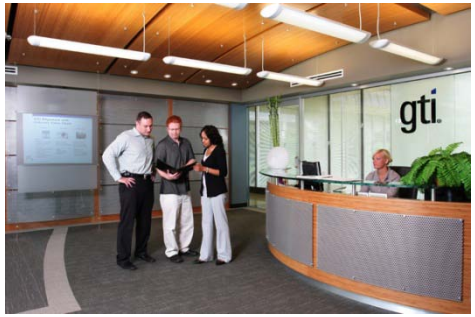
gti

Mitigating the Risk of Cross-Bores

- Cross-Bore Best Practices Guide provides a single source of information that can be used by natural gas operators to investigate and remediate existing cross-bores as well as prevent future cross-bores
- Outreach and Education Program provides information to effect positive changes in attitude, practices and operations
- Cross-Bore Database is providing a national database of damages and incidents to assist in identifying trends
- Technology development underway for prevention and detection methods
  - Acoustic Pipe Locator
  - Mechanical Spring
  - HDD “Look Ahead” sensors, Acoustic and GPR

GTI Overview

- Not-for-profit research, with 70 year history
- Facilities
  - 18 acre campus near Chicago
  - 200,000 ft^2, 28 specialized labs
  - Offices in AL, CA, MA, PA TX, Wash DC
- Staff of 250
- Market opportunities are creating substantial growth
- 1,200 patents; 500 products



Pilot-Scale Gasification Campus

Offices & Labs

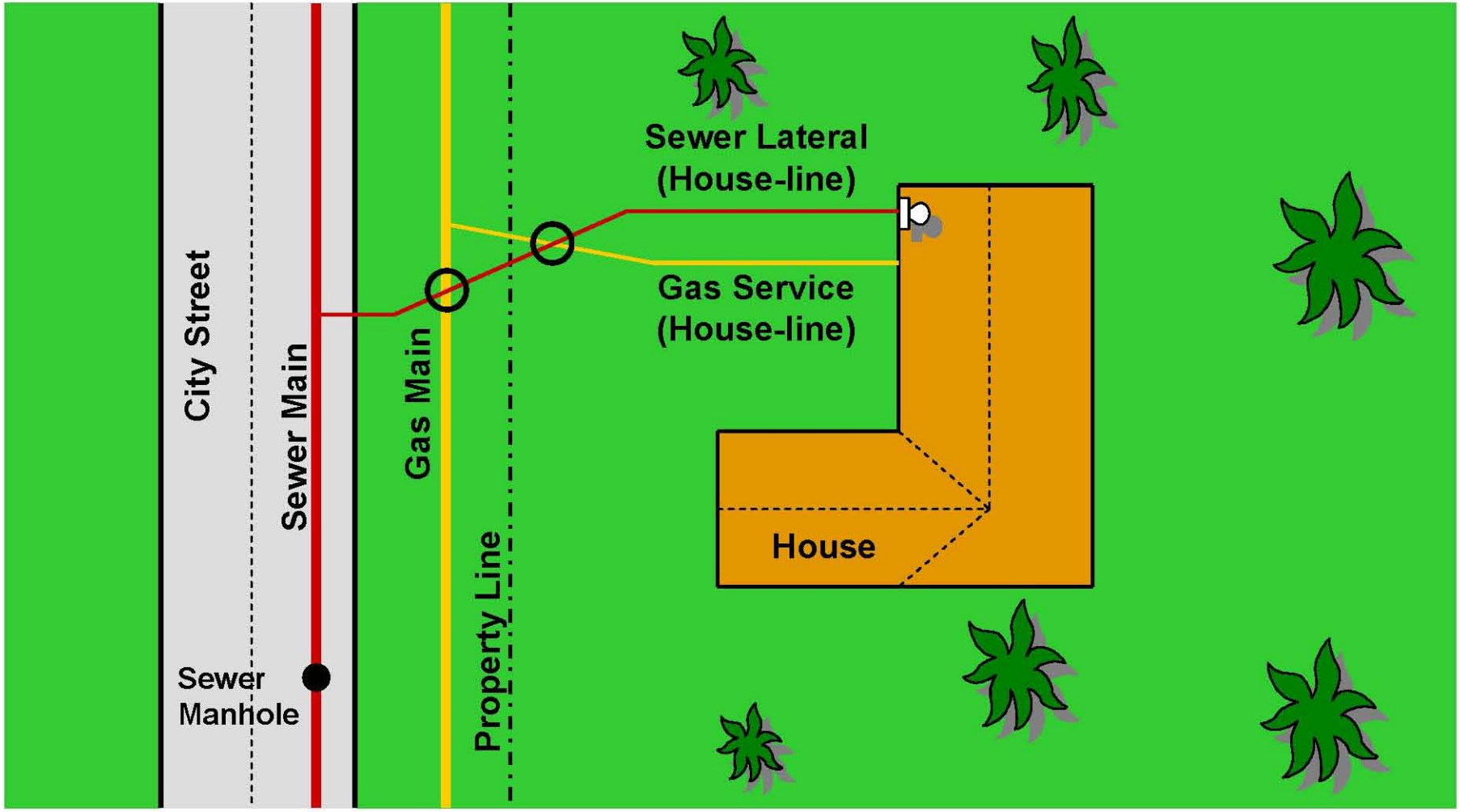
Energy & Environmental Technology Center

Cross-Bores

> **What is a sewer cross-bore?**
A sewer cross-bore is the inadvertent placement of a gas main or service through a sewer line. Sewer cross-bores typically occur during trenchless construction.

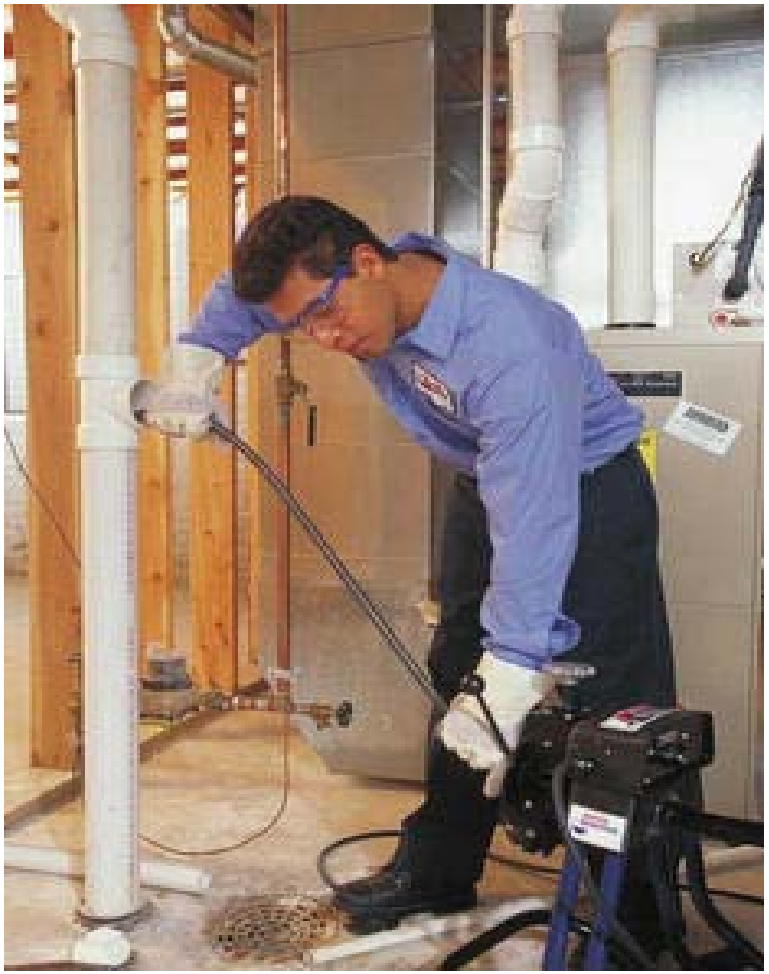
What can happen as a result of a sewer cross-bore?
The sewer line may become blocked and need to be cleared by a plumber or the building owner with mechanical clearing tools. This may cause the gas line to be cut which could cause an explosion or fire.

Potential Intersections



○ = Potential Intersection

Cross-Bore Incidents



Known Cross-Bore Incidents

- last 10 years

- Austell, GA
- Bellwood, IL
- Burlington, VT
- Cincinnati, OH
- Clayton County, GA
- Fairfax, OK
- Gilbert, AZ
- McKinney, TX
- Madill, OK
- Massena, NY
- Merriam, KS
- Middletown, OH
- Mobile, AL
- Phoenix, AZ
- Rochester, MN
- St. Paul, MN
- Tucson, AZ
- White Bear Lake, MN

Cross-Bore Investigative Results

- Minnesota Public Utilities Commission
  - 27 cross-bores reported in a 6 month period
- Palo Alto, CA
  - 4 blocks inspected. 24 cross-bores found
- City A
  - 2 cross-bores per mile in 200 miles of sewer main
  - One cross-bore at a school
- City B
  - 3 cross-bores per mile of sewer main
  - One cross-bore at a hospital
- City C
  - 2% cross-bores out of 11,000 sewer laterals inspected

OTD Project
Cross-Bore Best Practices

- Developed a Cross-Bore Best Practices Guide which provides a single source of information that can be used by natural gas operators to investigate and remediate existing cross-bores as well as prevent future cross bores
- The guide provides methodologies, technology recommendations, and procedures for preventing and detecting cross bores
- It can assist natural gas operators to reduce their risk and exposure to the threat of cross-bores
- Next step is to develop an outreach program to facilitate implementation

First Recorded Cross-Bore Incident Kenosha, WI August 29, 1976

NTSB Recommendations

- Complete inspection of those locations along the construction route where gas mains and sewer laterals may be in proximity to one another and correct any deficiencies.
- Examine records to determine other locations where gas lines were installed near existing sewer facilities (including a review of sewer blockage complaints), then inspect these locations and take corrective action where necessary.
- Revise construction standards to require the underground facilities be located accurately before construction and to provide protection for these facilities near boring operations.
- Inform inspectors and supervisory personnel of the circumstances of this accident, train them to be alert for similar conditions, and advise them of preventive actions.

The NTSB's recommendations from 1976 capture the core of the best practices included in this Guide.

Summary of Best Practices

- Comply with all regulations
- Evaluate the potential for cross-bore events to exist and dedicate resources
- Do not assume a lack of a natural gas service precludes a location from having a cross-bore
- Provide support from the highest level of the organization
- Create a separate department or cross-department team with a common goal and focus
- Use a record keeping system that is fully auditable
- Use a GIS
- Use a risk-based approach
- Include cross-bores within the DIMP Plan
- Develop operating procedures and training programs specific to cross-bores
- Coordinate information exchange with One-Call Systems

Types of Cross Bores

- Legacy Cross-Bores
  - Cross-bore events that currently exist due to previous installations
  - Most cost effective approach to the investigative efforts uses a risk-based approach that progresses from a review of records to a focused field investigation
- Future Cross-Bores
  - Cross-bores that do not currently exist but may as new gas mains and services are installed

PRACTICE	INVESTIGATIVE APPROACH
Customer Type	Similar to public building inspections in a typical leak survey program. The type of customer can impact the magnitude of the potential outcome if an issue occurs.
Previous Claim Experience and/or Incident Reports	When a cross bore is reported it is probable that others may have occurred in the same area due to similar utility installation practices or field conditions.
Data Range	A determination of the date when trenchless technology was first used and/or the period when changes or improvements were made in the technique influenced the time period when a change in risk occurred.
Survey Completed Projects	Surveying completed trenchless technology projects on a random basis to identify patterns.
Service Path	Establishing the horizontal location of the sewer line and the crossing gas line through mapping and/or field locates to exclude the potential for the two facilities to intersect.
Risk-based with Attributes	Develop a list of attributes, which may be weighted, where each attribute would increase the probability of a cross bore occurrence. Risk attributes can be used in a matrix or added to prioritize investigations. The attributes would relate to the installation "environment" and would include but not be limited to: • Natural gas service depth • Sewer system depth • Service material type • Service installation type • Basement floor depth below surrounding grade • Building on slabs or with crawl spaces • Trailer parks • Sloped building lot

Preventing Future Cross Bores

- Establish a tolerance/safety zone with a minimum clearance of 2 foot horizontal and 1 foot vertical based on sewer mark-outs.
- Do not “blind bore” or assume the depth or location of any facility. Pothole to expose all parallel or crossing utilities and observe the bore as it passes each intersecting utility as well as when the reamer is pulled back.
- Use a camera for pre and post installation inspection to establish the condition of the sewer prior to installation and to verify no cross-bores occurred during the installation.

Cross-Bore Public Awareness

- Increase awareness of the hazards associated with gas/sewer conflicts
  - Plumbing and sewer cleaning contractors
  - Equipment rental companies
  - Customers
- Safety DVD
- Bill inserts, advertisements, news media, online

Public Awareness Example

IF YOU'RE EXPERIENCING A BLOCKAGE IN AN EXTERIOR SEWER LINE, BE AWARE THAT IT MAY BE CAUSED BY A NATURAL GAS PIPELINE. THERE IS A RARE CHANCE THAT A NATURAL GAS PIPELINE MAY HAVE PENETRATED THE SEWER LINE WHEN IT WAS INSTALLED USING TRENCHLESS CONSTRUCTION METHODS. IF THIS OCCURRED, AN AUGER "SNAKE" COULD CAUSE DAMAGE TO THE GAS LINE WHEN CLEARING THE SEWER LINE, WHICH MAY RESULT IN A GAS LEAK.

If you need to clear an exterior sewer line located outside of a structure using mechanical equipment and suspect blockage may be caused by a natural gas pipeline, call Southern California Gas Company (SoCalGas®) at 1-800-427-2200 before you attempt to clear the line. We will respond by phone or visit the site to determine if a natural gas pipeline is clogging the sewer line at no charge to you.

Important Safety Steps

When clearing a blockage in any exterior sewer line, remember to follow these important safety steps:

- Always use a cleanout outside of the structure to auger the sewer line, if one is available. Using an exterior cleanout will lessen the chance of natural gas entering into the structure in the unlikely event that a gas line is damaged while clearing the blockage.
- Exercise caution when using a power-driven tool to clear the blockage. Any spark producing device may cause ignition if natural gas is present.

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SIGNS OF A NATURAL GAS LEAK

It is important to keep in mind that natural gas is flammable and that a simple spark can serve as an ignition source. For your safety and for the safety of those around you, be aware that any of the following signs may indicate the presence of a gas leak:

SIGHT	SOUND	SMELL
• Bubbles rising through standing water or in toilet bowls. • Dead or dying vegetation (in an otherwise moist area) over or near pipeline areas.	• A hissing, whistling, or roaring sound at the sewer cleanout, sewer vents, or inside the structure served by the sewer line.	• The distinctive odor* of natural gas at the sewer cleanout, sewer vents, or inside the structure served by the sewer line.

WHAT TO DO IF YOU SUSPECT A NATURAL GAS LEAK

If any signs of a gas leak are present, immediately stop what you are doing and:

- Have everyone immediately evacuate the structure and move away from any area where gas is venting.
- DON'T light a match, candle or cigarette.
- DON'T turn electrical appliances or lights on or off or use any device that could cause a spark.
- Retreat to a safe distance away from the structure (at least 50 yards) as the gas leak may lead to a fire or explosion.
- From a safe location, call SoCalGas at 1-800-427-2200, 24 hours a day, seven days a week; or call 911.
- Do not go back into the building for any reason until a SoCalGas technician or a licensed, qualified person has verified it is safe to return.

YOUR SAFETY IS IMPORTANT TO US.

SoCalGas has been dedicated to providing safe and reliable energy for more than 140 years. We have a strong safety record and work hard to maintain it throughout our natural gas transmission pipelines and distribution system. We have an ongoing program to conduct safety inspections of our entire pipeline system and comply with all federal and state regulations.

You have received this brochure because SoCalGas operates underground natural gas pipelines in areas where you or others may provide exterior plumbing services. Help keep customers, employees, the public and job locations safe by understanding the information in this brochure.

* Some persons may not be able to smell the odor because they have a diminished sense of smell, olfactory fatigue (normal, temporary inability to distinguish an odor after prolonged exposure to it) or because the odor is being masked or hidden by other odors that are present, such as cooking, damp, musty or chemical smells. In addition, certain conditions in pipe and soil can cause odor fade – the loss of odorant so that it is not detectable by smell.

Other Important Contact Information

Excavation, demolition and other forms of digging are major causes of pipeline damage.

Call 1-800-427-2000 to report a pipeline emergency (SoCalGas).

Call Underground Service Alert (USA) at 811 at least two business days prior to any excavation. Having pipelines and other utility owned lines marked before you dig can help prevent injury, costly property damage and loss of utility service. The call is FREE!

Visit **socalgas.com/safety** for more safety information.

About SoCalGas

SoCalGas is the nation's largest natural gas distribution utility, serving more than 20.9 million customers throughout our service area, spanning Central and Southern California. We monitor the natural gas for quality and add a distinctive odor* to aid in the detection of leaks. We deliver it through pipelines to our residential customers for cooking and heating and to commercial and industrial customers for manufacturing of products and generation of electricity.

(Spanish on reverse)

Public Awareness – Door Hanger Examples

nationalgrid
THE POWER OF ACTION

Urgent Safety Notice
Possible Sewer & Gas Conflict

Address _____ *Date* _____

To: Property Owner / Maintainer / Resident

National Grid, or its contractor, has installed gas piping on this property or across its frontage.

We used boring or drilling methods that reduced digging and trenching in the road and on your property. This required that we take several steps to avoid contacting buried sewer, water, telephone and electric lines.

We were not able to verify the location of your sewer line. Please contact the gas crew if they are still working in the vicinity, or call National Grid at the number below, so that we can arrange an inspection of the sewer line from inside your building - at our expense and at your convenience.

We believe we avoided your sewer line, but want to be sure. Damage may not become apparent for some time and can lead to a blockage. In the event we damaged the line, we will see to its proper repair.

We regret the inconvenience, but want to ensure your safety. We urge you to allow us to inspect the sewer line. **If you decline to have the inspection, please hang this tag next to your main sewer cleanout as an alert.** If the line needs to be cleared in the future, determine the cause of the blockage by remote camera inspection before attempting to clear the line. Call National Grid if a gas line is found to be the cause of the blockage. Do not attempt to clear the line.

You may call the National Grid representative below to confirm this request.

Name _____

Phone Number _____

Please Refer to this Project Number _____

This is an important notice. Please have it translated.

Este é um aviso importante. Queira mandá-lo traduzir.
Este es un aviso importante. Sírvase mandarlo traducir.
Avis important. Veuillez traduire immédiatement.

ĐÂY LÀ MỘT BẢN THÔNG CÁO QUAN TRỌNG
XIN VUI LÒNG CHO DỊCH LẠI THÔNG CÁO ẤY

Questa è un' informazione importante,
si prega di tradurla.

Это очень важное сообщение.
Пожалуйста, попросите чтобы
вам его перевели.

CM4878 (10/10)

nationalgrid
THE POWER OF ACTION

Urgent Safety Notice
Possible Sewer & Gas Conflict

LEAVE THIS TAG
AT THE BUILDING'S
MAIN SEWER CLEANOUT

Plumbers / Sewer Maintenance Personnel:

Please read the front of this card

If the sewer line here develops a blockage between the last inside cleanout and the main line, tank, or leach field, determine the cause by camera inspection before use of mechanical clearing methods.

Gas piping was installed on this property or across the frontage using trenchless methods. The clog could be caused by an unintended breakage of the sewer during the gas installation.

If the camera shows that a gas line is involved in the sewer blockage, call National Grid for immediate assistance.

Do not attempt to clear the line.

This tag should stay in place at the main cleanout. Once determined to be clear by camera inspection, check below:

❒ Camera Inspection Found Clear

Date _____

CM4878 (10/10)

nationalgrid
THE POWER OF ACTION

WE'LL BE WORKING HERE SHORTLY

National Grid, or its contractor, will be installing gas piping on this property or across its frontage. You may have noticed stakes or markings on the ground above where buried utilities are located. Excavators use these marks to avoid damaging buried pipes, wires and cables.

Generally, private underground facilities, such as sewer pipes are not subject to staking or marking.

What can you do to help? National Grid or contract employees, may ask to enter your premises to inspect the location of the underground utilities entering and leaving your property. After they properly identify themselves, brief access would be greatly appreciated. This will assist us in verification.

You may call the National Grid representative below to confirm this request. We regret any inconvenience, but want to work as safely as possible.

Name _____

Phone Number _____

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CM4877 (10/10)

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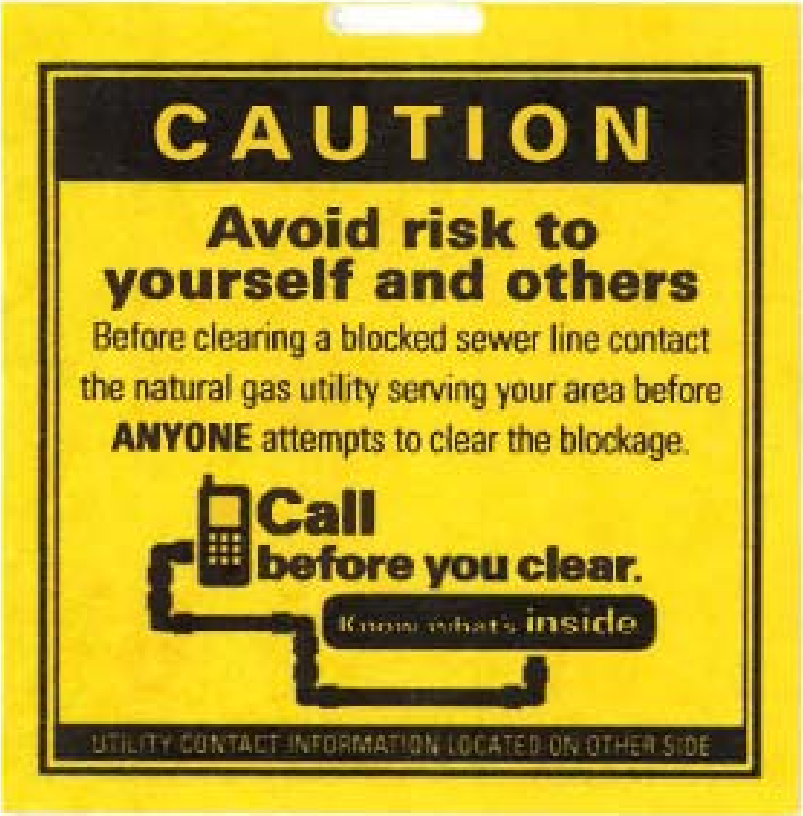
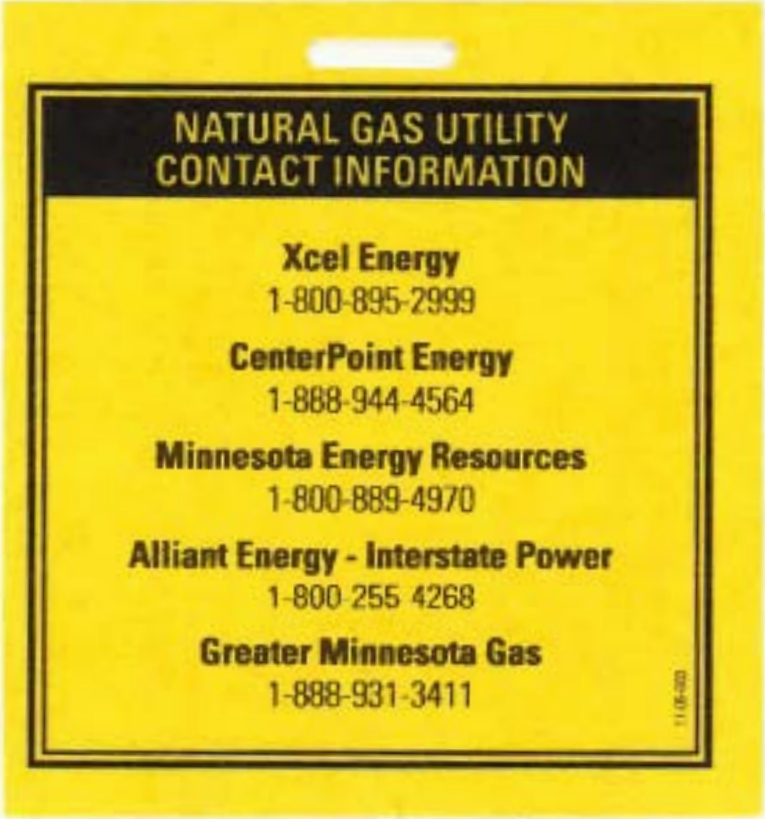
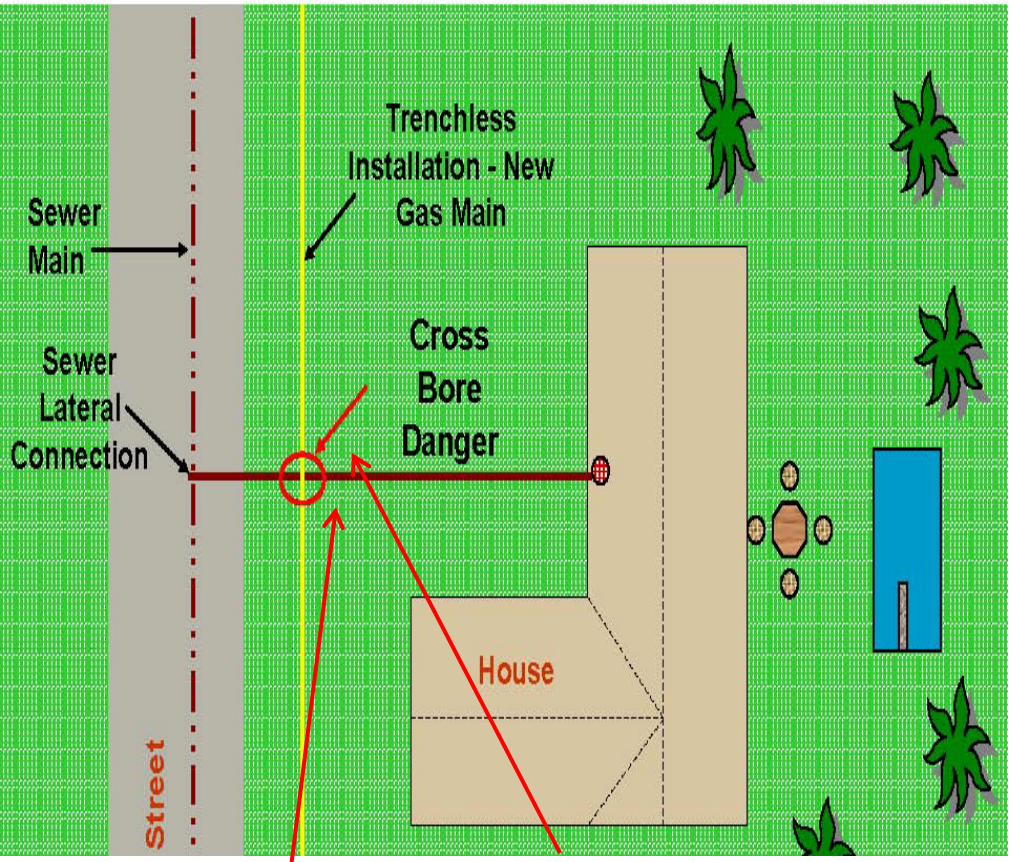
Public Awareness – Sewer Tag Example





Sewer Cross-Bore Awareness for Gas Operations



What is a sewer cross-bore?

A sewer cross-bore is the inadvertent placement of a gas main or service through a sewer line. Sewer cross-bores typically occur during trenchless construction.

What can happen as a result of a sewer cross-bore?

The sewer line may become blocked and need to be cleared by a plumber or the building owner with mechanical clearing tools. This may cause the gas line to be cut which could cause an explosion or fire.

How can I avoid causing a sewer cross-bore?

You can avoid causing a sewer cross-bore by excavating and locating sewer lines in advance of trenchless construction.

What do I do if I discover a sewer cross-bore?

If you discover a gas main or service that has been cross-bored through a sewer line, relocate the gas line and properly repair the sewer line. If you discover any other utility's cross-bore, notify the building owner and the other utility.

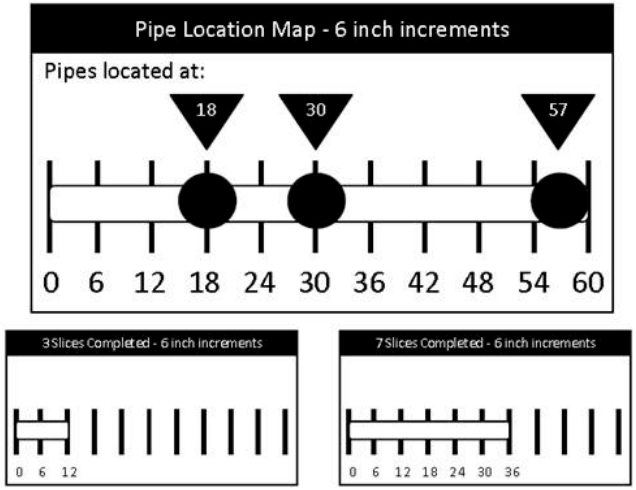
What do I do if I damage a sewer line?

In the event that you damage a sewer or drain line, you must ensure that it is repaired properly.

OTD Project

Acoustic Pipe Locator

Ultra-Trac APL



Display

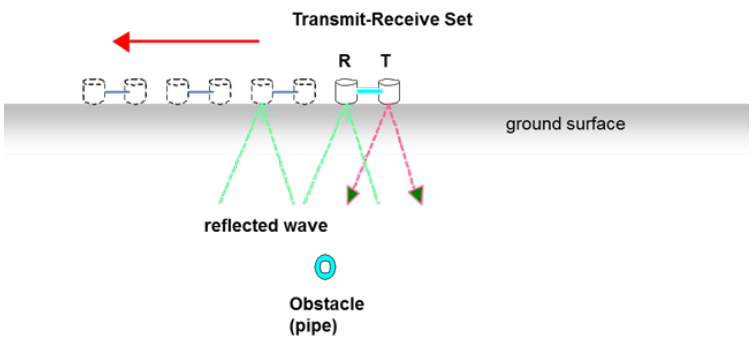
- Technology licensed to Sensit Technologies
- Currently transferring technology
- Components are being assembled
- Expected to be commercially available in 4Q2012

Acoustic Pipe Locator

Need/Benefits:

> Locate gas distribution pipes with emphasize on detecting plastic pipes
  - 300,000 miles of plastic pipes without tracer wires in US alone
  - 500,000 to one million miles of plastic pipes without tracer wires in the world
  - Tracer wires prone to damage/corrosion
    > Increases miles of plastic pipes to be detected
  - 60%+ damage by third party
  - Direct implications on operating cost and safety

> Water and sewer lines



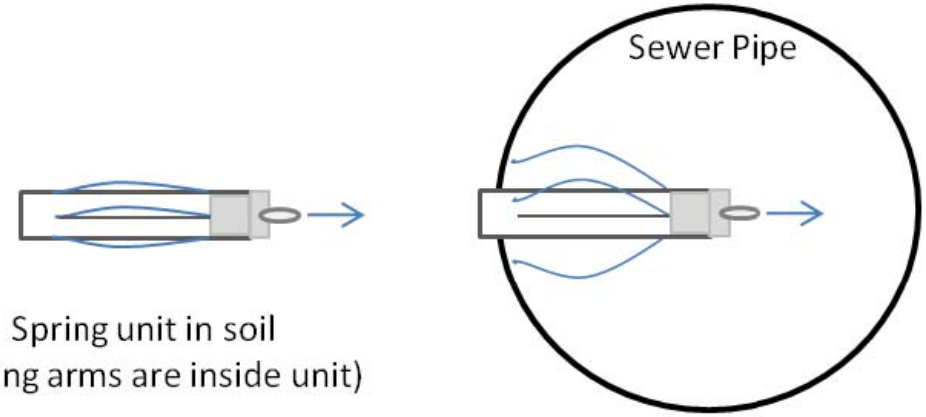
Requirements:

- **No special coupling liquids**
- **Use of same transducers for expected field conditions (dirt, grass, concrete, asphalt, etc.)**
- **Simple to operate and immediate results**
- **Pipe(s) display for locator/surveyor**
- **Cost-effective**

Mechanical Spring – Cross-Bore Detection

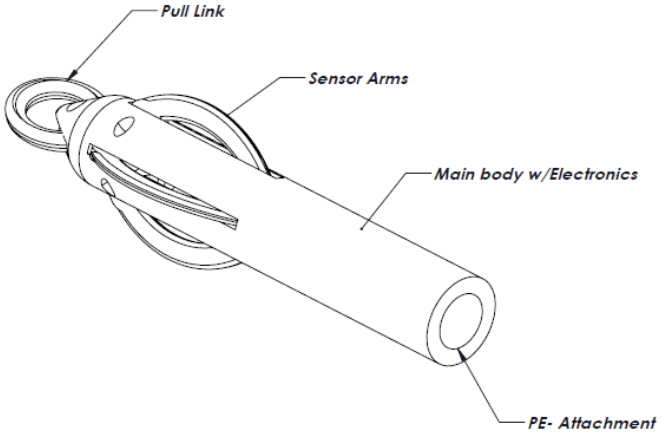
- Develop a tool that will detect a hit to sewer laterals during the HDD or mole installation of PE gas pipe.
- The tool utilizes a low-cost and easy to use mechanical spring system that is attached to the HDD/mole head during drilling or to the PE pipe during pullback. The spring system is activated inside the sewer pipe void; thus locating the lateral and providing a real-time alarm identifying a hit.

Mechanical Spring - Schematic Design



Spring unit in soil
(spring arms are inside unit)

Spring unit in void
(spring arms are open)



Mechanical Spring - Design

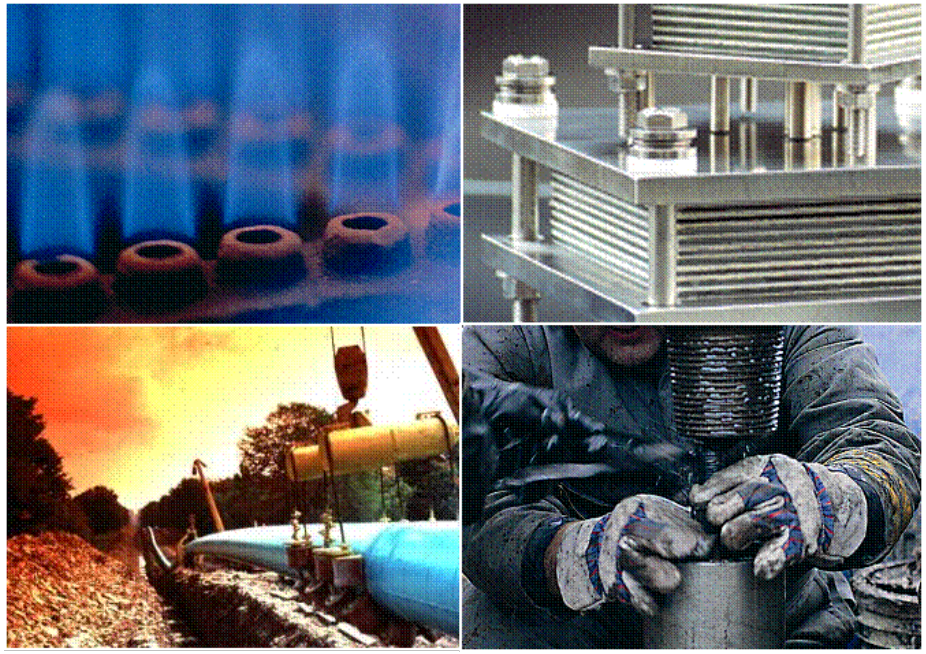
- Resilient to the forces applied during the drilling and pullback operations.
- The spring arms function properly in drilling mud and varying soil conditions.
- Electronics are waterproof and resist the chemical and environmental conditions encountered in the soil and sewer lines.
- Alarm communications are real time via wireless radio or through tracer wire.

OTD Project

Obstacle Detection During HDD

- Requirements:
  - Detect obstacles in advance of HDD operations
  - Sense both ahead of and adjacent to the drill bore
  - Data acquisition and display must be rapid
    - Simple display; Real time processing and display
- Projects:
  - Acoustic-based technology; Sensors on the ground
  - GPR-based technology; Sensors incorporated in the drill head
- Status:
  - Acoustic technology provided detection of pipes about 20 ft. in front of drill head; Applicable for most soils; Requires improved accuracy/repeatability
  - GPR technology detects pipes in close proximity; Good accuracy; Requires increase in pipe detection range; Issue on applicability in different soils
  - Both projects running in parallel; Potential to combine efforts into one system; Very challenging projects

GTI is a company that solves important energy changes, a company that truly has…



…"the Energy to Lead"

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