by Marshall Pollock, President/CEO, Utilicor Technologies Inc.

Seeing Is Believing: The Case For Potholing

If the nation's road maps were as inaccurate as many of today's as-built utility drawings, a person relying on them could easily get lost traveling from New York City to Chicago and end up in Cincinnati.

According to best estimates, there are enough buried pipes and cables in North America to stretch to the moon and back more than eighty-three times. And most of them have never been accurately mapped or recorded, making them difficult to find when repairs are necessary, or to avoid, when excavation is required.

Much of the nation's infrastructure, especially in older cities, was installed more than 100 years ago when as-built drawings, if any existed, referred to surface features that have long since disappeared. With so many buried telephone lines, fiber-optic cables, natural gas, electricity, and water and sewer lines, the question remains: how quickly can they be located and accurately identified to avoid an excavation mishap that could possibly result in a serious injury to nearby workers, the public or to perhaps even interrupt service?

Although some studies such as *Mapping the Underworld*, a project currently under way in the United Kingdom, seek to develop standards and procedures for accurately mapping the infrastructure and digitally integrate data with GPS and GSM technologies, they focus more on future installations and are of little assistance in solving current problems for contractors working in the field.

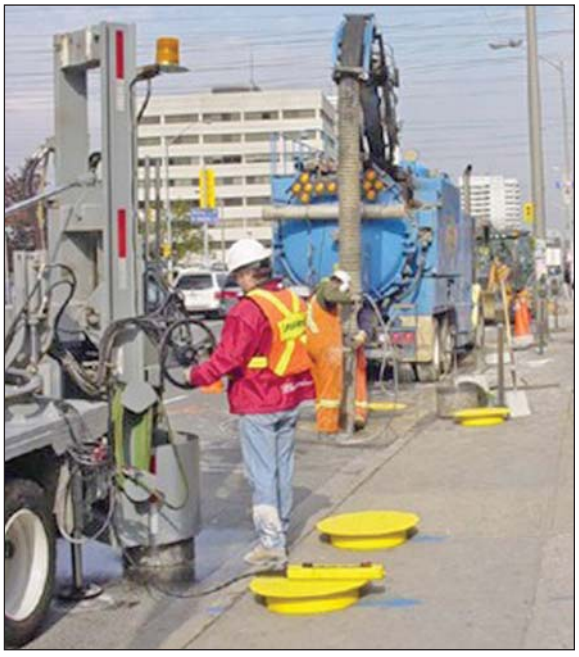
In the past several years, the industry has progressed in its efforts to prevent accidental damage to underground utility infrastructure. The Common Ground Alliance (CGA) has launched a new national 811 "Call Before You Dig" Web site – www.call811.com – designed to serve as a national resource for professional excavators. In addition, a new Damage Information Reporting Tool (D.I.R.T.) has been developed to help catalogue and identify the causes of the estimated 675,000 utility strikes that occur each year in the United States.

Although only a small fraction (7%) of all facility damage events in the U.S. were reported, the 2005 D.I.R.T. report stated that of those incidents, almost half (43.4%), there were no notification calls made to a One-Call Center before digging. This led the authors to conclude that damage prevention awareness programs, and education and training about excavating best practices needed to be targeted towards contractors and facility owners to emphasize the importance of knowing what was underground before digging.

In addition to education, basic economics and risk management principles are also expected to play a significant role in encouraging better and safer excavation practices. As soon as the cost of not knowing what is below ground exceeds the cost of knowing, contractors and facility owners will spend the time and money to find out.

As the residents of Sarasota County, FL, discovered when a major communications company began installing fiber optics to the home, locating underground facilities can be a hit-and-miss operation. In the first four months of their installation program, the company's contractors cut nearly 200 water and sewer lines, some with devastating results for the neighborhoods involved. And in 2004, crews working for the same company installing fiber optic lines further north in Hillsborough County, reportedly hit 200 water and sewer lines, costing more than $100,000 in repairs.

Doug Sword, *Herald Tribune*, comments: "There is plenty of blame to go around for the damaged lines. Sometimes a cut is Verizon's fault, and through negotiations with the county attorney, the company pays for damages. Sometimes it's caused by inaccurate marks by county contractors hired to locate pipes. Sometimes it's because the county sewer and water systems are a quilt work created by two decades of taking over often-troubled systems from developers. In the latter case, either the county inherited inaccurate maps, or the pipes have gotten old and brittle."



Potholing conflicts in advance of HDD with coring truck in foreground, vacuum truck in background, yellow safety road plates to cover hole between operations and several cores awaiting reinstatement.

Potholing or daylighting

Drilling contractors have known for years that the simplest way to reduce damage is to verify the location of buried utilities before drilling by performing small excavations along the intended route where potential conflicts have been marked on the surface by the owners of buried infrastructure. This process, known as "potholing" or "daylighting", is usually performed with vacuum excavation to minimize the risk of hitting or damaging utilities.

If the excavation confirms the location of the potential conflict and no problem is present, the contractor can proceed to the next stage. If there is a large discrepancy and no utility is found, either additional trial holes must be dug or alternative location techniques used until the missing utility is found and its exact location established. This involves visually identifying the precise plan and profile of a utility in all three dimensions.

When the potential conflict is under a paved surface, such as a roadway or sidewalk, removal of the pavement cover is required. When conventional excavation methods are used, both the excavation and the repair can be expensive and potentially disruptive. It also can cause collateral damage.

With conventional excavation, jack-hammers or backhoes are used to break up the pavement and the spoil is trucked away for disposal. After the conflict has been identified, the pavement hole is repaired with a temporary patch to allow traffic to resume

Conflict identified through potholing process.

until a full-strength permanent repair can be made in accordance with municipal standards that may include cut backs, additional paving and special surface treatments.

In addition to the extra inconvenience to the public caused by this two-step repair process, the size of the re-paving requirement can grow from a one- or two-square foot test hole to a paving job that extends from the curb to the centerline and a considerable distance up and down the roadway in each direction. These additional repairs and re-paving can increase costs of potholing to $2,000 or more for each hole, eating into much of the economic advantages that directional drilling offers over trenching.

As a result, many utilities and directional drilling contractors across North America have adopted a new technology for cutting through pavement to identify potential conflicts. The process involves a specially designed truck- or skid-steer-mounted coring unit that cores an 18-inch diameter hole through all kinds of asphalt, asphalt-concrete and reinforced concrete road systems and sidewalks, to allow crews to vacuum excavate and view subsurface installations.

After the potential conflict has been accurately located and either its non-hazardous nature confirmed or appropriate design steps taken to avoid the conflict, drilling operations can safely resume. The hole can be backfilled to the level of the base of the pavement and the core or "coupon" that was originally cut from the pavement can be re-inserted back into the road surface with a special bonding compound called Utilibond that results in a permanent repair. Because the resulting mechanical bond between the core and the original pavement restores the performance capacity of the road to its pre-excavation levels, no further re-paving or site visits are required. In just 30 minutes the reinstated core can support more than 50,000 pounds – five times the H-25 AASHTO Standard – and the road can be safely reopened to traffic.

Because of these operational efficiencies, keyhole coring and reinstatement is fast becoming an integral part of the potholing process and a standard practice on a growing number of projects where much of the planned drill route is found under pavement and in close proximity to existing utilities. Also, many public agencies recognize the value of this process and are adopting regulations that require potholing. Project owners and contractors also are establishing policies specifying potholing before drilling begins.

"In Toronto, we cut and reinstate more than 1,500 cores each year in roads and sidewalks in our directional drilling program for Enbridge Gas Distribution," says Rodger Magee, vice president of operations for R.B. Somerville. "Our success rate in avoiding damage to other underground utilities is 100 percent. It's an excellent process that avoids unnecessary risks, keeps our re-paving costs down and significantly reduces the impact of road work to the public."

Crossbores

Potholing may also be useful in addressing another area of underground damage prevention – crossbores. These occur when a newly installed utility accidentally intersects another utility, usually a sewer lateral, which in many jurisdictions is not properly identified by the public agency that owns the sewer. Because sewer laterals are often located on private property and connect the dwelling or building they serve to the sewer in the public right-of-way, the sewer owner says it is the property owner's responsibility to locate and mark the sewer lateral.

Because the impact of a broken or leaking sewer lateral is local, causing damage through contamination or pollution of the soil only in the immediate vicinity, damaged sewers have been considered to be more benign than other more dramatic forms of underground damage and, until recently, accorded a low priority. But when they have been penetrated by a live gas line or electrical conduit, they pose a unique and significant hazard. Over time, a partially obstructed sewer lateral can get blocked making it necessary for a rotary auger or other potentially damaging equipment to be used to clean the blockage, which can result in a ruptured gas line. In the event this occurs, electrocution through contact with the cable or other serious physical injury can result.

In the case of an electrical crossbore, the damage is usually confined to the operator who may be badly burned or even killed. A crossbore of a fiber optic line, though inconvenient and disruptive, does not pose the catastrophic potential of a severed gas line. When a gas line is ruptured, escaping gas can follow a path into the building as well as into the sewer and migrate throughout the system until it reaches an ignition source, such as a pilot light or electrical switch, where an explosion can occur.

Last year, a gas line exploded in Middletown, OH. According to local news reports, there were no reported injuries or casualties, but the home was destroyed.

The blast occurred shortly after 11 a.m. Fire Chief John Sauter said a plumber from Royal Rooter was using an auger to clear a clogged drain when he accidentally hit a natural gas line. "After he pulled the tool free, the plumber said sewage blasted out of the pipe, and he noticed the smell of gas," Sauter said. "The plumber told a woman and her three granddaughters to immediately get the family out of the house, knowing what would happen next. He didn't let them stop to get any personal items. I be-

lieve their backs were still turned as they were fleeing the scene when the house exploded."

Crossbores occur when crews using trenchless procedures such as horizontal directional drilling or pneumatic piercing tools cut through unmarked sewer laterals. Because this process takes place out of sight under the ground and the downhole sharp-pointed drilling tool passes easily through the walls of the sewer lateral, it often goes unnoticed by the crew on the surface. Unaware of what has happened below ground, the crew pulls the new gas or electrical conduit back through the damaged lateral where it can go unnoticed for years, leading some observers to dub it "an accident waiting to happen" or more colorfully, "a ticking time bomb."

But, is this really a major problem and how often does it occur? All too often it seems. Based on documented results of several closed-circuit video sewer line inspections, including one of 200 miles of mainline sewers and connecting laterals in a medium-size community in the Midwest – 400 crossbores were identified. That is an average of two crossbores per mile of sewer or one in every six blocks! This frequency has been confirmed by other inspections.

Rather than waiting for an explosion or sewer inspection to identify crossbores and repair them after the fact, it would make more sense to require the public agency that owns the sewer to locate all sewer laterals along a prospective drill path. This would be done much the same way that owners are required to identify utilities in order to allow the driller to make an educated decision on how to proceed and whether or not to excavate test holes to ascertain the exact location of the sewer lateral before drilling commences.

Conclusion

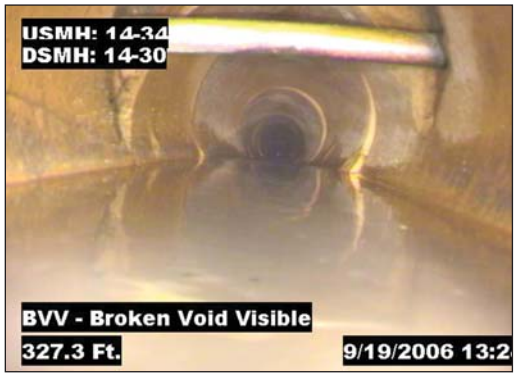
"'Oops!' is not a satisfactory answer to the home owner who has lost power, telephone or water service – or who has become the unwitting victim of a crossbore – as a result of an underground drilling hit," says Colin Donoahue, field operations manager, Utilicor Technologies, a leading developer of the keyhole coring and reinstatement process. "In soft ground, potholing is a no-brainer and under pavement the extra couple of hundred dollars it costs to cut, vacuum and permanently reinstate a cored inspection hole, pales in comparison to the damage that could result if the directional drilling crew hits another utility."

He noted that potholing is a safer alternative to the hit-and-miss approach for contractors who operate on the theory that when and if they hit something, they will repair it.

"With crossbores, a contractor may not know they have hit anything until the house blows up years later," says Donoahue. "Seeing is believing because you can reopen the road to traffic within 30 minutes after repairing the inspection hole, it is not only safer but much more convenient to the public. It's a win-win situation for everyone."

FOR MORE INFORMATION:
Utilicor Technologies, (416) 391-3901, www.utilicor.ca

Pavement core reinstated with Utilibond.



2-inch PE gas pipe cross-bored through an 8-inch sewer lateral.