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PREVENTING DAMAGE TO UNDERGROUND UTILITIES

You must have a plan so accidents are avoided and services are not disrupted.

The possibilities of damaging underground utilities exist at every drilling site. Inadvertently severing an underground power line. Rupturing a natural gas line.

Doing damage to underground utilities can result in costly consequences—disrupting essential services, requiring repairs, downtime, and potentially serious injuries or death.

The number of incidents involving damage to underground utility lines submitted in 2014 reported in the *Damage Information Reporting Tool (DIRT)* was 273,599 for Canada and the United States.

To prevent such incidents, it is critical to first understand the possible causes and industry practices in place. The most common causes for incidents resulting in underground utility damages are shown in Figure 1.

The Occupational Safety and Health Administration has specific requirements (29 CFR 1926.651) designed to protect employees and prevent accidental damage to underground installations. These include establishing the location of underground installations prior to beginning excavation activities.

According to the *DIRT Report* (CGA 2014), calling the national 811 call service before digging or drilling is the most important precaution professionals and homeowners can take. When an excavator or driller notifies a one-call center before digging—damage can be avoided more than 99% of the time!

In addition to power lines, there are phone lines, gas lines, water lines, and sewer lines running underground. Different detection techniques need to be used for different types of buried lines.

Underground utilities can be located by many methods—owner records, other sources of information, and utility locating techniques. However, some methods can result in more uncertainty.

The root cause category for damages in Figure 1 titled “Location Practices Not Sufficient” includes areas where no locating or marking of the utility was completed prior to excavation activities; areas where utility markings or locations were insufficient; the type of utility, its depth, or lack of records prevented locating the installation; and incorrect utility records and maps led to an incorrect location.

Of the events that included utility damages and for which a locate request was made, the majority (68%) had visible but incorrect markings and 29% had markings that were not visible.

The root cause category “Excavation Practices Not Sufficient” includes actions where clearances were not maintained while using power equipment; hand tools were not used where required; markings became deteriorated and not maintained; test holes were not used to verify exact location of buried lines; exposed utility lines were unsupported; and improper materials or compaction were used in backfilling (CGA 2014).

Call Before You Dig

The first step in preventing contact with underground utility lines is to call 811—the number the Federal Communications Commission has designated as the national toll-free “Call Before You Dig” number for the United States.

An 811 representative will take information about your project and notify appropriate utility companies to locate and mark buried lines they own at the location specified in the call ticket.

The call must be placed at least 48 hours before work is scheduled to begin.

Utility locations and markings are often made in utility easements only, not on private property. Therefore, if any drilling or other intrusive activities will be performed outside easements, underground lines will not be marked.



There are also many other variables in locating and marking underground utility lines. Among them:

- Some utility owners feel a service line belongs to the property owner.
- Power and communications cable and water/sewer lines serving buildings of educational institutions, government complexes, and office parks are on private property and are not covered by one-call.
- One-call information does not provide depth, but rather a window of horizontal space where utilities are estimated to be buried.

White-Lining the Dig Site

White-lining is a best practice endorsed by the Common Ground Alliance (CGA 2015). Physical white-lining requires the excavator or drilling contractor to pre-mark the dig or drill site with white paint or an equivalent.

While this practice is known to reduce damages, it may add costs to a job. The product Virtual WhiteLine™ is a

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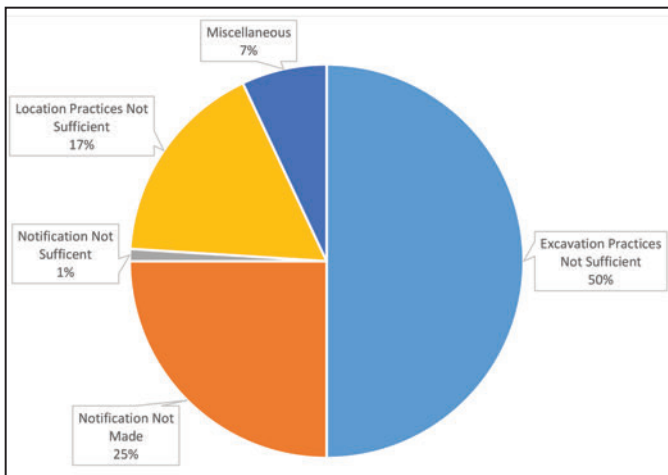


Figure 1. Root cause categories for damages to underground utilities (CGA 2014).

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cent development allowing the landscape and boundaries of the dig area or drill site to be viewed remotely through high-resolution aerial imagery (PAPA 2010).

Utility Locating Techniques

As was mentioned, underground utilities can be found by looking at existing utility owner records or, when needed, using a utility locating service. The source of information and methods used to locate underground utilities could impact the reliability and accuracy of identifying and locating underground lines.

In addition to power lines, there are phone lines, gas lines, water lines, and sewer lines running underground. Different detection techniques need to be used for different types of buried lines. For instance, detection of metal cables and pipes can be done using electromagnetic devices consisting of a transmitter and a receiver. Radiolocation devices use radio waves to find a location and are used for detecting non-ferrous lines (plastic or concrete).

Since there are different types of materials used in underground utilities, not all types can be detected using conventional methods. Non-conventional utility locating techniques include acoustic locating, ground penetrating radar (GPR), and magnetic locators or metal detectors.

GPR detection is an electromagnetic method often used to enhance other locating techniques. It can generate 3D underground images of pipes, power lines, sewer lines, and water mains.

Magnetic locators or metal detectors and magnetometers are often used to locate buried metal objects other than pipes. An acoustic locator most often detects and traces nonmetal water lines and can also be used in identifying the locations of plastic gas lines.

Current utility locating technology cannot assure 100% detection of every underground utility line and pipe. There are limitations with each utility locating technique, which must be considered.

DACUM Codes

To help meet your professional needs, this column covers skills and competencies found in DACUM charts for drillers and pump installers. DO refers to the drilling chart and PI represents the pumps chart. The letter and number immediately following is the skill on the chart covered by the column. This column covers:

DOA-4; DOC-9, 11, 12; DOK-8, 9; DOL-1, 3; PIB-1, 2, 5, 7, 9; PIE-5; PIG-3

More information on DACUM and the charts are available at www.NGWA.org.

Table 1. Color Code Identifiers

White	Proposed excavation
Pink	Temporary survey markings
Red	Electric power lines, cables, conduit and lighting cables
Yellow	Gas, oil, steam, petroleum, or gaseous materials
Orange	Communication, alarm or signal lines, cables, or conduits
Blue	Potable water
Purple	Reclaimed water, irrigation, and slurry lines
Green	Sewers and drain lines

Understanding Locating and Marking Practices

Operator markings of utilities include the appropriate color for the type of facility, their company identifier (name, initials, abbreviation) when other companies are using the same color, the number and width of their installations, and a description of the underground utility.

A combination of paint and flags are used to identify the operator's installations at or near an excavation or drill site. Color code identifiers are summarized in Table 1.

Refer to the CGA's *Best Practices 12.0* (2015) for more specific guidelines for locating and marking practices.

Additional Warning Signs

When an excavator arrives at a job site after contacting the local one-call center to get the job site located, the first step is to look for signs of underground utilities. These signs should be obvious—look for marking flags, paint, pedestals, fire hydrants, and other above-ground indicators.

Even though these indicators may signal there are no underground utilities within the dig area or drill site, be alert to additional warning signs as you start the excavation. If you see any visual signs of a buried utility while excavating or drilling, stop immediately and hand dig until the utility is exposed. Contact the utility owner as necessary and do not proceed until the utility is fully exposed and identified.

Conclusions

Excavators and drilling contractors should come up with a detailed work plan: Train employees on the proper procedures for determining the locations of underground utilities. Contact and coordinate with the local one-call agency and utility companies to establish locations of underground installations. Take necessary precautions to prevent damaging underground utility installations.

If an underground utility is damaged, you must notify the utility operator immediately. They are in the best position to determine the hazards associated with the damage and take appropriate countermeasures. If the damage results in the release of hazardous gases or liquids, both the utility operator and the appropriate emergency response officials should be notified immediately. **WWJ**

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Jerome E. Spear, CSP, CIH, is president of J.E. Spear Consulting and has more than 22 years of experience helping organizations prevent injuries and illnesses, control losses, and achieve regulatory compliance. He held the positions of technical services manager with XL Specialty Risk Consulting and corporate industrial hygiene manager for Chicago Bridge and Iron Co., a worldwide steel fabricator and construction company.

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