

Potholing Practice

1. Objective

The purpose of this practice is to describe potholing methods and recommend procedures for potholing.

2. Requirements

Potholing is accomplished through various types of excavation methods and equipment. This practice covers general methods and procedures. Procedures and practices associated with specific equipment should be based on manufacturer's recommendations.

The Occupational Safety and Health Administration (OSHA) governs construction safety including excavations. OSHA 29 CFR, 1926 addresses construction industry safety regulations. Missouri and Kansas both have state statutes which govern excavation as well. OSHA, state statutes, and local ordinances must be followed at all times.

3. Practice Statement

Potholing shall be utilized, as required and described herein, to prevent excavation damage to underground utilities.

4. Practice Description

Potholing is the practice of digging a test hole to expose underground utilities to ascertain the horizontal and vertical location of the facility. The horizontal and vertical position of the exposed facility must be tied to a survey benchmark or permanent above grade feature. The position may be identified by GPS or traditional survey coordinates or by measuring the distance, with a tape measure, to permanent features in three horizontal directions. In addition, the vertical distance below grade should be obtained.

Some municipalities and utility companies do not consider potholing to be an option. Rather, it is viewed as an essential phase of underground construction for all types of excavation including horizontal directional drilling (HDD) operations. This practice applies to all potholing activities for both construction and design applications.

4.1. Backhoes

In the recent past, potholes were typically dug with backhoes. Digging potholes with a backhoe is a risky endeavor compared to other methods of potholing due to its potentially destructive nature. The backhoe method is inexact and cumbersome; even skilled backhoe operators run the risk of hitting and damaging the very utility they were trying to locate and protect.

The use of backhoes is not the preferred method of potholing. However, if a backhoe is utilized, it is essential that a "spotter" be present for the entire excavation. A spotter is a person that observes the excavation and communicates to the backhoe operator when a buried facility is sighted.

4.2. Hand Dig

Hand digging a test hole is the method of digging a pothole by manual means with hand held equipment such as a shovel. This method is labor intensive and time consuming. The advantage to hand digging is that it does not require expensive equipment and is relatively safe for locating most facilities. As with any excavation, extreme caution should be practiced if digging near hazardous utilities such as electric cable.

4.3. Vacuum Excavation

Vacuum excavation is the preferred method for non-destructive exposure of buried utilities. Vacuum excavation utilizes either air or water pressure to break up the soil and a vacuum device to collect the spoil. Of the two methods, air vacuum excavation is generally preferred, though specific site and environmental characteristics may lead to a decision to use water vacuum excavation.

4.3.1. Air. Air vacuum excavators utilize the kinetic energy in a high velocity air stream to penetrate, expand and break-up soil. The loosened chunks of soil and rock are then removed from the hole through the use of a powerful vacuum. In this way a test hole is created that reveals the buried utility. Holes vary in size and shape. A typical test hole is 6 inches to 12 inches in diameter and 4 feet to 6 feet deep. However, a test hole one-foot square is also common and holes can be considerably deep if required. For example holes in the excess of 20 feet may be required to locate deep sewer mains. Dry or air excavation has several advantages over water vacuum excavation. For example the air method is faster in most soils and eliminates the need for mud disposal. Since the spoil remains dry, it can immediately be used for backfill. Air methods are safer for the operator and the utilities. One shortcoming of air units is that they are not effective in all soil types, especially wet, heavy clay and caliche.

4.3.2. Water. Water vacuum excavation systems dig the pothole using high-pressure water to reduce and loosen the soil. The wet soil and mud slurry is removed to a spoil tank using a powerful vacuum. Like air systems, a hole typically one-foot square or 6 to 8 inches in diameter is common. The maximum hole depth for both systems is dependent on the vacuum limitations. The higher density of water produces powerful forces that are effective in most soils including wet heavy clays. Heated water systems can be used to excavate frozen ground allowing efficient potholing year round. Operational caution is also necessary as high pressure water systems have the potential of cutting through cables or damaging pipe if not used with care.

5. Practice Procedures

This practice describes potholing activities that will occur immediately proceeding or in conjunction with construction activities. Potholing can also be utilized during the planning and design phases of the project.

5.1. Call Before You Dig

As with all excavations, call for utility locates through the state One Call system and refer to the state "Excavator's Manual" prior to potholing and other construction activities.

- Missouri One Call: 1-800-DIG-RITE (1-800-344-7483)

- Kansas One Call: 1-800-344-7233

Facilities of owners that do not participate in the state One Call systems need to be identified as well.

5.2. Construction Drawings

Construction drawings showing new construction and existing facilities should be present and utilized during potholing activities. Construction drawings should be compared to designating/locate paint marks to determine if all facilities shown on the drawings have been identified in the field. If drawings and paint marks do not match, consider additional potholing to determine accurate locations.

5.3. Contact Information

Have contact names and phone numbers for all known underground facility providers available.

5.4. Mis-Designated Facility

If locate paint marks have improperly designated the location of a facility, and the facility is exposed during potholing or other excavation, the facility owner and/or the state One Call systems should be notified. The entity that exposed the facility should document the position of the facility and communicate the information to the facility owner.

If a utility can not be located through potholing used in conjunction with drawings and locate marks, the facility owner should be contacted and/or the state One Call system should be notified.

5.5. Conditions Requiring Potholing

State statutes require excavation within two feet of marked utilities be performed in a careful manner. The following sections are intended to advocate a careful and prudent method to protect existing underground facilities. Refer to State statutes or the “Excavator’s Manual” for more information.

5.5.1. Close Proximity. It is recommended that potholing be used to expose utilities for any excavation including HDD within the tolerance zone of the marked utility. The tolerance zone (also known as the “approximate location”) is typically a strip of land equal to the width of the underground utility plus two feet on either side.

For HDD operations with a bore path that parallels a utility within 3 feet, potholing should be required at the beginning and end of the bore and every 50 feet along the route. For HDD operations with a bore path that parallels a utility within 5 feet, potholing should be required at the beginning and end of the bore and every 200 feet along the route.

Potholing should also be performed for all utilities crossing the path of HDD operations. Backhoe excavation should not be allowed within two feet of existing facilities. Refer to Section 4.1, Backhoes.

5.5.2. Congested Utilities. In congested areas having several facilities in close proximity and/or crisscrossing each other, locates have greater potential to be considerably less accurate. It is recommended that potholing be utilized for excavations near congested utility areas.

5.5.3. Hazardous and Vital Systems. Hazardous systems include electric cables, and all types of natural gas pipelines including transmission, distribution and service lines. Vital systems include telephone transmission lines, fiber optic, and other communication cables.

For the preservation and protection of human life and vital facilities, it is recommended that excavations with 3 feet of hazardous or vital systems utilize potholing to locate the facility.

5.6. Protecting Exposed Facilities

Facilities exposed during potholing must be protected throughout the project. Exposed facilities can shift or sag when the soil that was supporting and protecting the utility is removed. Utilities that are rendered unsupported due to potholing should be temporarily supported by shoring or other means. The utility should also be protected from heavy and sharp items falling into the excavation which could crush or cut the facility.

5.7. Backfill and Restoration

After the underground utility has been located, the pothole should be restored within 24 hours or as otherwise directed. Appropriate sediment controls should be utilized during all potholing activities to prevent storm water pollution. The pothole should be clean and dry prior to backfilling. Backfilling of the excavation and the restoration of pavement or surfacing shall be in accordance with the governing authority's standards and specifications.

Drilling mud or remaining spoil should be cleaned up and the area restored to original condition or better. The contractor is responsible for disposing of any drilling mud or remaining spoil in an environmentally suitable manner.

6. References

- Kansas One-Call, Dig Safely Excavator's Manual, 2001-2002.
- Missouri One Call System, Inc, Missouri One Call Excavator's Manual, 2002.
- Missouri State Law, Underground Facility Safety and Damage Prevention, House Bill No. 425, RSMO Chapter 319.015 to 319.050, Missouri.
- Occupational Safety and Health Administration, Construction Industry Regulations, 29 Code of Federal Regulations, 1926, Subpart P, Excavation Standard, OSHA.

7. Practice Outcomes

7.1. *Collecting and Reporting Data*

The permitting agency should require the Permittee or its contractors to collect data regarding potholing activities. Potholing information should be collected as part of the normal construction records documentation process. The following data should be collected for all exposed facilities:

- Facility Owner (if known)
- Type of Facility
- Diameter of Facility
- Material of Facility
- Horizontal and vertical position of existing facility

It is important to also collect information on potholing activities that can be used to evaluate the successes or failures of potholing. In addition to the data stated above, the following information should be collected and documented. This data should be collected during a trial period for evaluation. However, some of the data may be useful beyond a trial period and consideration should be given to collection for all future projects.

- Size of the project i.e., length of new installed facility.
- The distance interval between potholes for facilities parallel to the new route.
- If facilities are designated in the wrong location by locators, document the actual position of the facility.
- Document if actual positions of existing facilities fall within the designed path of the new facility.
- Note the number of new facility route changes required due to locating of existing facilities during potholing.
- Document any damage caused by potholing activities.
- Document any facilities that are damaged during new construction but after potholing actions.
- Document facilities discovered during construction that were not identified or marked in any way and note if those facilities were damaged.

7.2. *Evaluating the Practice*

By evaluating the collected data, it should be possible to determine the impact potholing has on damage prevention. For example, if potholing exposes a facility that was not accurately designated during utility coordination efforts, then the collected data will show if the new facility was rerouted to avoid an existing facility.

Likewise the data will document any damage that occurs, the frequency of occurrence, the damage prevention measures taken, and the circumstances leading to the damage.