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# **MONTANA EXCAVATION**

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## **SAFETY HANDBOOK**



**2020**

# Preface

This booklet is to help reduce damage to utilities, avoid interruption of service, and to protect the worker and the general public. Where this is mainly intended for excavation professionals, we encourage use by anyone.

It is a compilation of items from various sources. It is intended to provide guidelines for safe excavation, particularly involving underground utilities. It does not provide guidelines for laborers working in and around trenches and equipment. For guidelines for working in and around trenches please refer to your company's policy, OSHA or other reliable source.

This handbook for safe digging contains certain sections of Montana code, regulations, and 2017 updates to – MCA 69-4-5. In addition, it contains information, provided by the Montana Utilities Coordinating Council (MUCC), a nonprofit organization established in 1988, on using the 811-call center, as well as details on how to comply with the Montana dig law. Links to national best practices for damage prevention are also included. With an increasing number of utilities installed underground, the MUCC works to achieve the orderly planning and installation of buried facilities.

We acknowledge the contribution of the Common Ground Alliance (CGA) who's *Best Practices* Version 16.0 is used in the contents of the handbook. For a complete copy of the latest CGA *Best Practices* you can go to [www.commongroundalliance.com](http://www.commongroundalliance.com). It is available for download in pdf format or for hardcopy order.

We want to know how you use this booklet! What information is useful and not useful? How often do you use it? If a future printing occurs, what would you like added? What would you like removed?

Please send feedback to [Montana811.org](http://Montana811.org) or the MUCC

Montana811—Call Center

Call—Dial “811” or “1-800-424-5555”

Online—Montana811.org

Montana811– Questions Clint Kalfell

Call—406-442-3070

Email– Clint.kalfell@montana811.org

Copy of Submitted Ticket

[www.managetickets.com](http://www.managetickets.com)

General Excavation Safety Guidance

[www.osha.gov/SLTC/trenchingexcavation/](http://www.osha.gov/SLTC/trenchingexcavation/)

To review the full dig law which has precedence over anything in  
this book go to:

## Montana Code Annotated 69-4-5 Excavations Near Underground Facilities

[https://leg.mt.gov/bills/mca/title\\_0690/chapter\\_0040/part\\_0050/sections\\_index.html](https://leg.mt.gov/bills/mca/title_0690/chapter_0040/part_0050/sections_index.html)

Quick Link URL - <https://qr.go.page.link/Uc7xH>



### Acknowledgments:

Washington Utilities Coordinating Council, Common Ground Alliance, Montana Utilities Coordinating Council, Washington 811, Northwest Utility Notification Center, One Call Concepts, and ELM Locating.

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## Important Numbers

Two full business days before You Dig: CALL **811** or **1.800.424.5555**

You can request a locate online, using ITIC, or ITIC Mobile or the Montana811 App for tablets and smartphones. Go to Montana811.org then choose *contractor* or *homeowner*. Professional excavators must sign up by providing contact info and choosing a username. Once a staff member at the Call Center emails you a password, you are good to go. Homeowners will have to provide an email address. In both cases, no more waiting on the phone!

For a Life or Death Emergency call - **911**

**“Call 811 (or go online) Before You Dig”** is abbreviated as CBYD.

**“Notice”** Two full business days before commencing any excavation (exceptions can be found in the dig law); the excavator shall call 811 or 1.800.424.5555 to provide notice of their scheduled start of excavation. On busy days (M-W) hold time can be very lengthy. Entering your locate request online, via ITIC, eliminates the hold time.



# Guidelines for a Safe Excavation

## Limits of Locating and Marking

### Private Property

Utilities and other underground facility owners will only mark the lines that they own, which is in a lot of cases the meter.

However, each utility owner is different please contact your utility using the number on your locate ticket to find out exactly what they will be locating and what they will not locate. Underground lines beyond the meter or service entrance usually belong to the property owner, and are that person's responsibility (e.g., apartment houses, mobile home parks, schools, etc.) Private locators are available to provide this service for a fee. **A list of private locators can be found at: [www.montana811.org](http://www.montana811.org).**

## Six Basic Steps to a Safe Dig:

- 1. Identify your excavation area and obtain location descriptions. It is recommended to outline / mark your planned dig site in white marking paint or flags. Ensure access is made available to the locators.**
- 2. Two business days before you dig, CALL 811 (Remember, the day you call does not count).**
- 3. Do not dig until all known utilities are marked.**
- 4. Preserve the marks.**
- 5. Determine the precise location of the marked utilities by hand digging.**
- 6. Dig safely using proven excavating methods.**

Identify your proposed dig site on a map, taking note of city, county, and obvious landmarks. Determine distance and direction from nearest cross street, proximity of planned work to overhead electric lines, location of right-of-way and easements. If no specific street or address is available or not clear, the township, range, section, and quarter-section of

the work site will be used. Accurate and timely locates are crucial for a successful dig. All owner/operators of buried facilities should endeavor to provide current as-built plans to their locators. Markings should follow industry recommendations (see Single Point Excavation Markings illustration below).

Locate request size is now restricted to:

- 2 miles long by 1,000 feet wide in a rural area.
- 2,000 feet long by 300 feet wide within city limits and an area of an authority (see MCA 75-6-304).
- For agricultural activity including requests for locates prior to soil probing or testing it is limited to the size of the field being excavated.

Note: Locates that require a larger area can be broken up into two or more locates. Keep in mind locates are for work you expect to start within 10 days.

An excavator shall provide adequate information to the owners of underground facilities in order to locate and mark the location of underground facilities.

(a) Adequate information must allow the person completing the locate to determine the area where the proposed excavation will occur. The information may include but is not limited to marking the path of the proposed excavation with white paint, marking the path of the proposed excavation with white flagging, or other clear marking that allows a person to determine the path of the proposed excavation.

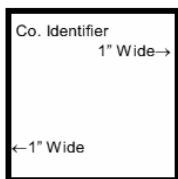
(b) If the person completing the locate is unable to determine the path of the proposed excavation based on markings or other communications with the excavator, the excavator shall meet with the person completing the locate at the proposed site.

Pre-marking allows the excavators to accurately communicate to facility owners/operators and their locator where excavation is to occur. The 1997 safety study "Protecting Public Safety through Excavation Damage Prevention" by the National Transportation Safety Board reached the conclusion that pre-marking is a

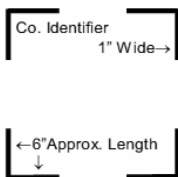
practice that helps prevent excavation damage. Facility owners/operators can avoid unnecessary work created when locating facilities that are not associated with planned excavation.

## Single Point Excavation Markings

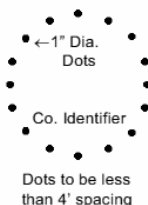
### Single Point Excavations Markings



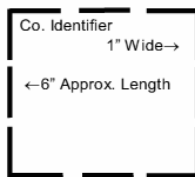
**Full Line**



**Four Corner**



**Radius or Arc**



**Dash Line**

Provide notice of the scheduled excavation to owner/operators of buried utilities at least two full business days in advance, but we recommend no sooner than ten business days by **CALLING 811, 1.800.424.5555**, or online at [www.callbeforeyoudig.org](http://www.callbeforeyoudig.org).

Be prepared to provide details as shown in Guidelines Step 1 on page 9, as well as the nature of the work, the date and time you plan to begin digging, the name of your customer, and a number where you can be reached. When finished, you will be given an excavation confirmation number, or ticket number. The ticket number is proof that you called. If you need to call back for any reason, you will be asked for the ticket number – please keep it handy. Utility companies might require your ticket number or

Locate Reference Number<sup>1</sup> if you contact them about your locate request or excavation plans. When you call before digging the CBYD personnel will provide a list of member utility operators who will be notified of your intent to excavate. Those members have two business days to locate and mark their locatable buried facilities, or provide reasonably available information on their lines that are un-locatable

Wait two full business days after the day you give notice before beginning your excavation. ***Please remember, the day of your call doesn't count.***

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<sup>1</sup> The excavator receives and maintains a reference number from the one call center that verifies that the locate was requested. All calls from excavators processed by the one call center receive a unique message reference number, which is contained on all locate request messages. The excavator records this number; it is proof of notification to the underground facility owners/members. The computer-generated request identifies the date, time, and sequence number of the locate request. Each locate request ticket (notification) is assigned a unique number with that one call center, the requestor, and the facility owner/operator. This number distinguishes this ticket from all other tickets so that it can be archived and retrieved upon request to provide the details of that request only.

# Private Lines

## PRIVATELY-OWNED LINES CAN BE LOCATED FOR A FEE

Water, natural gas, and residential electric lines are **usually** owned by the utility up to the meter. Some sewer districts own only the mains; others extend their ownership to laterals up to the property line. The customer typically owns everything beyond these points. **Check with your local utility provider to verify what they will be locating.** You can find their phone number on your locate ticket.

Customer-owned lines usually include propane tanks and lines, water wells, hot tubs, security lighting, pools, natural gas grills and any lines that serve outbuildings.

The free locating service available through 811 applies **ONLY** to facilities owned by utilities. The diagram below shows a variety of utilities, some owned by the utility and some by the homeowner.

Those utilities marked by dotted lines are typically owned by the homeowner. Private locating services will mark these for a fee.

WATER	ELECTRIC
SEWER	PHONE AND CABLE
GAS AND OIL	

**811**

Know what's below.  
Call before you dig.

**DON'T FORGET!**  
After calling 811, wait two business days before you begin digging!

Homeowner Property Line

## Pre-excavation Meeting or Meet on Site

When practical, the excavator can request a meeting with the facility locator at the job site prior to marking the facility locations. An on-site pre-excavation meeting between the excavator, facility owners/operators, and locators (where applicable) is



recommended on major or large projects. This includes projects such as road, sewer, water, or other projects that cover a large area, that progress from one area to the next, or that are located near critical or high-priority facilities. Such facilities include, but are not limited to, high-pressure gas, high-voltage electric, fiber-optic communication, and major pipe or water lines.

If a pre-excavation meeting or meet on site is requested, it does not obligate a locator to complete their markings at that time. The completion of the meeting will not affect the requirement to have the locates completed within 2 business days.

NO digging is to take place until ALL known utilities are marked or otherwise accounted for with information provided by the facility operator (MCA 69-4-502(1)(a)).

Any excavator that violates these rules, and damages buried lines, may be liable for fines and penalties and may be held responsible by the owner to pay to restore the damaged facility.

## Large Non-Continuous Work Areas (i.e. Highway signage project or delineator installation)

The preference on how to submit locate requests largely depends on the density of the work or excavation areas.

Locate request size is restricted to:

- 2 miles long by 1,000 feet wide in a rural area.
- 2,000 feet long by 300 feet wide within city limits and an area of an authority (see MCA 75-6-304).
- For agricultural activity including requests for locates prior to soil probing or testing it is limited to the size of the field being excavated.

Note: Locates that require a larger area can be broken up into two or more locates. Keep in mind locates are for work you expect to start within 10 days.



In all cases the excavator will need to designate the starting and ending points of the route, along with each point along the way. If you are unsure of how to proceed, call the Call Center and request the Help Desk to assist you with making the locate request work for everyone involved.

### Large Area – Low Density Example

If you have a highway sign project that covers 2 miles of roadway and has only 9 points along that route where excavation is taking place, it usually means there will be further distance between locations and make it difficult to manage and describe the

locations of each. In this case it is recommended that you to submit a separate ticket for each excavation location.

### **Smaller Area – Hi Density Example**

If you have smaller area such as 2 miles that has 39 points along that route where excavation is taking place. You could put them on one ticket providing that each excavation site along the route would be marked. Ideally the marking would be a white arrow on the pavement edge pointing to the excavation area. The excavation area would be marked with a stake with a white ribbon and placed at the center of the excavation area. It would also be very helpful to have a unique number or identifier on the stake identifying site and how it matches the information provided on the Locate Request Ticket.

Other ways to help with the identification of the excavation areas would be to provide the nearest named intersection, refer to mile post markers, or provide GPS coordinates.

Providing some sort of document or mapping of the project is very beneficial to the locators to understand and locate the excavation area. Documentation can be in the form of maps in pdf format or any other widely accepted form.

## **Large, Multiple-contractor Projects (i.e. Community wide Fiber Optic Installation, Sewer Replacement Projects)**

It is strongly recommended for project managers and engineering firms to contact the Montana811 Representative to coordinate a “Safe Excavation Roundtable” several months prior to the project start. If the project has a pre-construction meeting, it is great time to schedule a roundtable.

Provide contact information for all general and subcontractors involved with the project. Also include the scope of the project including area, dates, and crews involved.



The Montana 811 Program Coordinator and Trainer will contact all potentially affected parties may have an opportunity to understand and discuss the requirements needed to provide underground locates for the project effectively and safely. This preconstruction meeting is a valuable tool that has proved to help alleviate confusion and frustration when these large multi-contractor projects happen. It also allows the affected underground facility owners time to ensure they are staffed adequately to complete the locates in a timely manner throughout the project.

## **Large Continuous Work Area (i.e. Fiber Optic Long Haul installation, Transmission Pipeline Construction, Road Construction)**

Excavation requests should be submitted with small excavation areas.

Montana law limits the size of a locate request to:

- 2 miles long by 1,000 feet wide in a rural area.
- 2,000 feet long by 300 feet wide within city limits and an area of an “authority” (see MCA 75-6-304).

Tickets should be staggered over several days and submitted 5 - 10 days prior to the excavation work to be started. If you can provide information on the full project at the beginning of the project to the affected underground facility owners, it will allow them time to ensure they are staffed well enough to complete the locates in a timely manner throughout the project.

The excavation area should be marked with stakes with a white ribbon and placed along the center line of the route defining the excavation area. It would also be very helpful to have a unique number or identifier on the stake identifying site and how it matches the information provided on the Locate Request Ticket. It should include the distance and direction from the centerline to the outer edge of the excavation area.

Other ways to help with the identification of the excavation areas would be to refer to mile post markers, GPS coordinates or nearest named intersection.

Providing some sort of document or mapping of the project is very beneficial to the locators. It helps them understand and locate the excavation area, as well as the scope of work. Documentation can be in the form of maps in pdf format or any other widely accepted form and can be uploaded via ITIC.

## **Separate Locate Requests**

Every excavator on the job should have their own separate one call reference number before excavating. There are often several excavators on a job site performing work. The construction schedule may dictate different types of work requiring excavation from different specialty contractors simultaneously. In these situations, it is imperative for each excavator to obtain a one call reference number before excavation to ensure that the specific areas have been appropriately marked by any affected underground facility owner/operator.

## **Keep a Copy of Your Locate Request**

After you submit your locate request you should print a copy of your locate request. On your ticket you will have a list of companies responding and their contact phone numbers. If you submitted via ITIC or provided an email address you will get a copy emailed to you. You can also go to [www.montana811.org](http://www.montana811.org) to obtain a copy.

# Underground Facility Location Markings

Underground facility owners are required to complete markings within two full business days of receiving notification of excavation and request for underground facility location marks. (MCA 69-4-503(3)(a)).

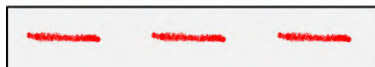
The markings will use the American Publics Works Association (APWA) Uniform Color Code to identify the type of underground facility.

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 Conduit
BLUE	Potable Water
PURPLE	Reclaimed Water, Irrigation and Slurry Lines
GREEN	Sewers and Drain Lines
WHITE	Proposed Excavation
PINK	Temporary Survey Marking

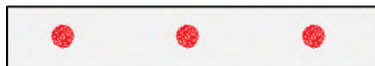
The markings will be either one or a combination of paint, pin-flags, or whiskers in the color identifying the type of underground facility depending on the terrain, vegetation, and weather conditions.



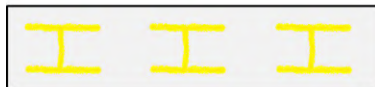
## Common Paint Marks



**Stripe** – used to mark smaller sized cables & pipes. Marks should be approximately 18 inches long and 2 inches wide.



**Dots** – used to mark cables & pipes in decorative, landscaped areas & sidewalks. Dots should be approximately the size of a grapefruit or softball.



**Lazy "H"** – **Not used everywhere** used to mark larger sized pipes, usually 4 inches in diameter or larger. Width of "H" should match diameter of pipe. Sometimes used to mark an "unknown" number of cables, or ducts.



**Duct** – Marks can vary regionally used to mark multiple cables which are buried together and placed in conduit. Width of marks should correspond to number and arrangement of conduit.

## Locate Verification

Upon arrival at the excavation site and prior to beginning the excavation, an excavator does the following:

- Verify that the dig site matches the one call request and is timely
- Verify that all facilities have been marked and review color codes and discuss with the facility owner if in doubt.
- Verify all service feeds from buildings and homes.
- Check for any visible signs of underground facilities, such as pedestals, risers, meters, and new trench lines.
- Check for any facilities that are not members of the one call center and contact someone to get them located, e.g. propane lines and tanks, water well service, sprinkler systems, and private electrical lines.

Use of a pre-excavation checklist is recommended by insurers and practiced by responsible excavating contractors. A sample checklist is available from the Montana 811 Program Coordinator and Trainer.

## **Facility Owner/Operator Failure to Respond**

If the facility owner/operator fails to respond to the excavator's timely request for a locate (within two full business days) or if the facility owner/operator has NOT notified the excavator that the underground facility cannot be marked within the time frame, then the excavator should contact the locator listed on the ticket for the missing utility, re-call the one call center, or if it is a chronic problem, contact the Montana 811 Program Coordinator and Trainer. Talking directly with the locator is always the best and fastest method since they may have already been there (and you just missed the marks), they are on the way, or simply forgot, or missed the request. The facility owner/operator and the excavator need to partner together to ensure that facilities are marked in an acceptable time frame to allow for underground facility protection.

## **Preserve the Marks**

Respect the marks which identify the location of the buried facilities. Once the owner/operator of the underground utility marks their buried lines, it is the responsibility of the excavator to preserve the marks (MCA 69-4-503(5)) for the length of the project. It is required to get marks refreshed every 30 days. Compliance with preserving marks may be attained by following the recommended guidelines below.

## **Best Practices for preserving Locate Marks**

Onsite personnel, responsible for maintaining the marks, should determine which method will be most effective for the job. Depending on the job/area and size/complexity, individual utility companies may impose separate compliance requests.

Preserve or protect as much of the original marks as possible.

Use off-set staking in areas where original locate marks will be continuously destroyed by excavation or weather. The off-set staking must be uniformly aligned and must accurately indicate the location of the original locate markings.

Digital photo, or other permanent imaging, or drawings (both to scale) may be used in areas where original locate marks will be destroyed by excavation or weather.

Use white paint or flags to maintain the original markings.

Bookend the original locate marks with solid white squares or brackets.

Paint dots between the original locate marks, using white paint, every eighteen to twenty-four inches, for the whole length of the original marking may be used. Include the type of facility marks, e.g., T for telephone, G for natural gas, W for water, etc.

On multiple requests for re-locates the utility owner/operators reserve the right to recover costs of remarking. Requests for re-locates should include information such as the specific sight (area) that needs to be re-located and which utilities need to be re-located.

**DO NOT, UNDER ANY CIRCUMSTANCES, PAINT OVER UTILITY LOCATING PAINT.**

## **Documentation of Marks**

An excavator should use dated pictures, videos, or sketches (with distance from markings to fixed objects recorded) to document the actual placement of markings. In most situations when underground facilities are not properly marked, excavators have no way of knowing where underground utilities are located. If locate markings are adequately documented through the use of photographs, video tape, or sketches before excavation work begins, it is easier to resolve disputes if an underground facility is damaged as a result of improper marking, failure to mark, or markings that have been moved, removed, or covered. It is important for excavators and locators to document the location of markings before excavation work begins. The primary purpose of this best practice is to avoid unnecessary litigation and expensive legal fees for all parties involved.

## **Work Site Review with Company Personnel**

Prior to starting work, the excavator should review the location of underground facilities with site personnel. Sharing information and safety issues during an on-site meeting between the excavator and the excavating crews helps avoid confusion and needless damage to underground facilities.

## **Facility Avoidance**

The excavator should use reasonable care to avoid damaging underground facilities. The excavator should plan the excavation so as to avoid damage or to minimize interference with the underground facilities in or near the work area. Foremost on any construction project is safety. Excavators using caution around underground facilities significantly contribute to safe excavation of existing facilities.

It is recommended to dig parallel to and slightly away from the underground facility marks while using mechanical excavation. Many pipeline companies will require staying 5 feet from the marks with mechanized equipment until the line is exposed by safe excavation methods. Checking with any pipeline companies prior to excavation around their facilities will aid in knowing any requirements.

## **Excavation Observer**

The excavator should use an observer to assist the equipment operator when operating excavation equipment around known exposed underground facilities. The excavator designates a worker (an observer) who watches the



excavation activity and warns the equipment operator while excavating around a utility to prevent damaging that buried facility.

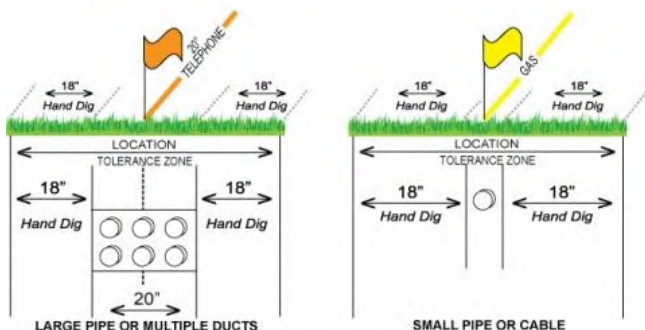
## Locate Mark Expiration

Locate marks expire **30 days** from the date of the locate request. The date of expiration is listed on the ticket. If you need to continue to excavate, we recommend calling 3 days before it is due to expire so you will not have a gap between tickets.

## Excavation Tolerance Zone

Owner/operators of buried utilities are required to mark their locatable buried lines with reasonable accuracy. MCA 69-4-501(26) states “Reasonably accurate means location within 18 inches of the outside dimensions of both sides of an underground facility.” This area is called the “Tolerance Zone” (See Tolerance Zone illustration below).

### TOLERANCE ZONE



### Excavation Within Tolerance Zone

When excavation is to take place within the specified tolerance zone, the excavator must exercise necessary and reasonable care for the protection of any underground facility in or near the



excavation area. Methods to consider, based on certain climate or geographical conditions, include hand digging, when practical (pot holing), soft digging, vacuum excavation methods, pneumatic hand tools, other mechanical methods (with the approval of the facility owner/operator) or other technical methods that may be developed. Hand digging and non-invasive methods are not required for pavement removal. Safe, prudent, non-evasive methods that require the excavator to manually determine the actual location of a facility are considered “safe excavation practices”. MCA 69-4-503(8) states the excavator must excavate in a careful and prudent manner. To avoid damaging underground facilities an excavator shall determine the precise location of underground facilities which have been marked. Accepted industry opinion is that precise determination can only be made by exposing the buried utility. Depending on site conditions, one, or a combination of the following options, is recommended: careful hand digging, potholing and vacuum excavation, hand tools that use air or water under pressure, or other non-invasive methods. (Although considered non-invasive by many, care should be taken when using these methods near pipe coating; they have been known to cause damage to the wrapping.) A list of non-invasive or low-impact excavators that are available are listed at [www.montana811.org](http://www.montana811.org).

Exposing buried utilities via any mechanized method (e.g., backhoe, grader, jack hammer, etc.) is not acceptable.

## **Potholing**

Potholing is the practice of digging a test hole to expose underground utilities to ascertain the horizontal and vertical location of the facility.

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. For detailed guidance go to the Potholing Practice section.

## Vacuum Excavation

Vacuum excavation, when used appropriately, is an efficient, safe, and effective alternative to hand digging within the designated underground facility tolerance zone. The safe exposure of underground facilities within the tolerance zone is essential to damage

prevention.

Site

conditions

may make

the use of

hand tools

to expose

underground

facilities



difficult or even impractical. Vacuum excavation is often an

appropriate alternative. Locates must be obtained prior to the

commencement of work. Many underground facility

owners/operators have specific criteria for safe

excavation/exposure practices around their facilities. Some

underground facility owners/operators accept vacuum excavation

as an equivalent to hand excavation for exposing their facilities,

and others have restrictions on its use. You should contact all

utility companies listed on your tickets to find out their particular

restrictions. Vacuum excavation is an appropriate method of

excavating safely around underground facilities provided that the

equipment:

- has been specifically designed and built for this purpose;
- is operated by a worker trained and experienced in its operation;
- is operated in accordance with practices that provide appropriate levels of worker and public safety and prevent damage to buried facilities; and is used in compliance with state/provincial laws and/or local ordinances.

## **Service Laterals**

Special attention is needed by excavators in regard to service laterals within public rights-of-way and utility easements. Each municipality, homeowner's association, water and sewer districts have their own set of guidelines as to who owns service laterals and subsequently who is responsible for locating laterals. Excavators will need to contact the underground facility owner directly to see what their ownership policy is.

We recommend facility operators:

- Locate and paint service laterals if able to do so with reasonable accuracy;
- Place a triangle at the main utility pointed at the structure or property connected to your service;
- Arrange to meet with the excavator at their worksite and provide available information about the location of service laterals; or
- Provide copies of available records of the service laterals via other delivery methods (including electronic or mail).

An underground facility owner may attempt to identify the location of a private underground facility connected to the owner's facility, but the facility owner is not liable for the accuracy of the locate (MCA 69-4-503(7))

## **Excavations Near Pipelines.**

Some Pipeline Companies require permits and the presence of a representative of the company while excavating near or crossing their pipelines. Make sure that you understand and comply with each Pipeline Company's requirements while excavating near their facilities.

## **Mismarked Facilities**

The excavator must notify the facility owner/operator directly, or through the one call center, if an underground facility is not found where one has been marked or if an unmarked underground facility is found. Following this notification, the excavator may continue work if the excavation can be performed without

damaging the facility. When an excavator finds an unmarked or inaccurately marked facility, excavation should stop in the vicinity of the facility and notify suspected facility owner or the Call Center. If excavation continues, the excavator should plan the excavation to avoid damage and interference with other facilities and protect all facilities from damage.

## **Exposed Facility Protection**

Excavators should support and protect exposed underground facilities from damage. Protecting exposed underground facilities is as important as preventing damage to the facility when digging around the utility. Protecting exposed underground facilities helps ensure that the utility is not damaged and, at the same time, protects employees working in the vicinity of the exposed facility. Exposed facilities can shift, separate, or be damaged when they are no longer supported or protected by the soil around them. Excavators should support or brace exposed facilities and protect them from moving or shifting, which could result in damage to the facility. This can be accomplished in different ways; for example, by shoring the facility from below or by providing a timber support with hangers across the top of an excavation to ensure that the facility does not move or bend. In addition, workers are instructed to not climb on, strike, or attempt to move exposed facilities that could damage protective coatings, bend conduit, separate pipe joints, damage cable insulation, damage fiber optics, or in some way affect the integrity of the facility. The Occupational Safety and Health Administration (OSHA) also has addressed this issue in Subpart P—Excavation Standard 29 CFR 1926.651(b)(4), which states “While the excavation is open, underground installations shall be protected, supported, or removed as necessary to safeguard employees.” For example, an unsupported sewer main could shift, causing the pipe joints to separate, which could result

in the trench where employees are working to flood, consequently endangering the safety of employees.

## **Locate Request Updates**

Any excavation that covers a large area and will progress from one area to the next over a period of time should be broken into segments when notifying the one call center in order to coordinate the marking with actual excavation.

On long projects over 30 days, the excavator needs to call the One Call Center to refresh the ticket every 30 days from the date of the previous request. Any excavation not begun within the 10 days of the request should consider requesting an update.

The possibility exists that new facilities have been installed in the area where the excavation is to be conducted since the original notification and marking. This practice also helps in situations where multiple excavators are working in the same area at essentially the same time and one installs a new underground line. An example of when this can occur is when two facility owners, such as a cable television company and a telephone company, are planning to serve a new section of a subdivision. In their pre-planning process, they see a vacant space in the right-of-way to



place their new facility. Each excavator (internal or external) calls the one call center for locates and each facility owner/operator comes and marks their respective facilities indicating that nothing exists. For one reason or another, one of the excavators gets delayed and does not start construction as planned, and when returning to the job site to place their new facility, end up damaging the recently install line what wasn't there during the request and subsequent marking.

Keep in mind many facility owners/operators do not perform their own locates and utilize the services of a contracted facility locator. These contracted facility locators may not be aware of work planned in the near future. By excavators refreshing the locate ticket, the contract locator has another opportunity to identify newly placed facilities. This practice also gives the facility owner/operator another chance to identify the location of their facilities and to avoid possible damage and disruption of service if something was marked incorrectly or missed on a previous locate. Excellent planning, generation, and updating of tickets enhance safety and reduces the unnecessary use of locate resources. **We also encourage utility owners to mark all new construction underground lines after burying the lines to help prevent this lag in notification and marking issue.**

## Facility Damage Notification

If the underground facility is a jurisdictional pipeline and there is a release of a gas or a hazardous liquid, MCA 69-4-523 requires the excavator to immediately make a 9-1-1 call and request emergency services. As soon as practicable, the excavator is required to contact the owner of the underground facility. If the excavator is unable to reach the underground facility owner, the excavator shall contact the proper notification center.

If you need a repair phone number for the facility owner/operator, look at a copy of locate request ticket. If you need to update the ticket to have the site marked/remarked, or if you have questions contact the One Call Center.

All breaks, leaks, nicks, dents, gouges, grooves, or other damages to facility lines, conduits, coatings, or cathodic protection must be reported. The possibility of facility failure or endangerment of the surrounding population dramatically increases when a facility has been damaged. Although the facility may not immediately fail, the underground facility owner/operator must be provided the opportunity to inspect the damage and make appropriate repairs.

## Notification of Emergency Personnel

If the damage results in the escape of any flammable, toxic, or corrosive gas or liquid or endangers life, health, or property, the excavator is responsible to **immediately notify 911** and the facility owner/operator. The excavator must take reasonable measures to protect everyone in immediate danger, the general public, property, and the environment until the facility owner/operator or emergency responders arrive and complete their assessment. This



practice minimizes the danger to life, health, and/or property by notifying the proper authorities to handle the emergency situation. In these situations, local authorities are able to evacuate as appropriate and command substantial resources unavailable to the excavator or underground facility owner/operator. The excavator needs to take reasonable measures based on their knowledge, training, resources, experience, and understanding of the situation to protect themselves, people, property, and the environment until help arrives. The excavator responsible should remain on-site to

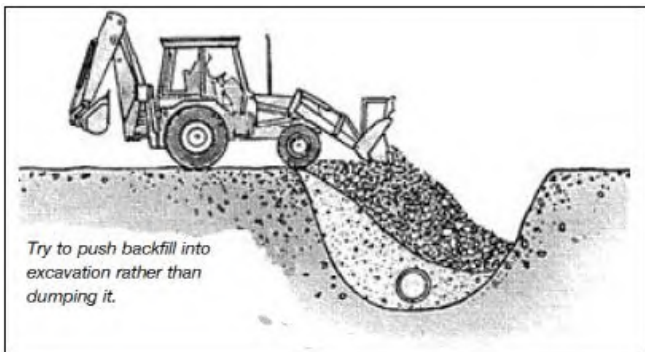
convey any pertinent information to responders that may help them to safely mitigate the situation.

## Emergency Excavation

In the case of an emergency excavation, maintenance or repairs may be made immediately, provided that the excavator notifies the One Call Center and facility owner/operator as soon as reasonably possible. This includes situations that involve danger to life, health, or property or that require immediate correction in order to continue the operation of, or ensure the continuity of, public utility service or public transportation. (MCA 69-4-508).

## Backfilling

The excavator needs to protect all facilities from damage when backfilling an excavation. Trash, debris, coiled wire, or other material that could damage existing facilities or interfere with the accuracy of future locates should not be buried in the excavation. Extra caution must be taken to remove large rocks, sharp objects, and large chunks of hard-packed clay or dirt. No trash or pieces of abandoned lines are to be backfilled into the trench. This will help prevent inadvertent damage to the facility during the backfill process.





## **As-built Documentation**

Contractors installing underground facilities should notify the facility owner/operator if the actual placement is different than the expected placement. For a facility owner/operator to maintain accurate records of the location of their facilities, it is critical that the contractor installing the new facility notify the facility owner/operator of deviations to the planned installation. Some facility owners/operators do not require a full-time inspector and use a sampling process to ensure that a new facility is correctly installed in compliance to specifications. When this occurs, it becomes much more critical for the contractor to notify the facility owner/operator of changes. For example, it is common for the contractor to make adjustments to the location of the new facility when rocks or other underground obstructions are encountered or when the location of the new facility conflicts with another existing underground facility. A change in plan can represent changes in horizontal or vertical distances from the specified plans. The facility owner/operator establishes standards that require notification if a deviation is beyond specified tolerances, such as changes in depth of 6 in. or more and lateral measurement changes of greater than 1 ft. When changes to the expected location are communicated to the facility owner/operator, it is the owner/operator's responsibility to take appropriate action to update their records so that an accurate locate can be conducted in the future.

## **Trenchless Excavation**

All stakeholders should comply with all best practices and the following general guidelines prior to, during, and after any trenchless excavation (as applicable). Also see the "Potholing Practice" section.

- The excavator requests the location of underground facilities at the entrance pit, trenchless excavation path, and the exit pit by notifying the facility owner/operator through the One Call Center.
- The trenchless equipment operator performs a site inspection, walking the trenchless excavation path prior to commencing work, and has a good understanding of the job.

- All utilities along the route should be potholed to verify location and depth. Gas lines and liquid lines should be day lighted to verify the trenchless excavation tool cleanly passes under the pipeline without showing up in the excavation window.
- When existing facilities are known to be present but cannot be potholed as a result of local conditions, the facility owner and the excavator must meet to discuss how to safely proceed with the excavation.
- The trenchless excavation operator confirms and maintains the path and minimum clearances established by the project owner and design engineer by tracking and recording the path of the trenchless excavation until complete. Means of tracking trenchless excavations include electronic locating/guidance devices, pipe lasers, water levels, visual inspection, etc.
- The excavator stops the trenchless excavation operations if an abnormal condition, unknown substructure, or other hidden hazard is encountered. The excavator proceeds safely only after making positive identification.

## **Emergency Coordination with Adjacent Facilities**

Emergency response planning includes coordination with emergency responders and other aboveground and/or underground infrastructure facility owner/operators identified by the Incident Commander through the Incident Command System/Unified Command (ICS/UC) during an emergency. During emergency situations, there are many stakeholders involved: excavators, locators, owner/operators, first responders, One Call Centers, and the general public. Any actions taken by one stakeholder could adversely affect other stakeholders. Accordingly, emergency planning and response need to be coordinated.

# **Additional Safety and Excavation Information**

## **Potholing Practice**

This section is to describe potholing methods and recommend procedures for potholing.

Potholing is the practice of digging a test hole to expose underground utilities to ascertain the horizontal and vertical location of the facility.

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. OSHA, state statutes, and local ordinances must always be followed.

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

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.

## **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.

## **Hand Dig**

Hand digging a test hole is the method of digging a pothole by manual means with handheld 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.

## **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.

### **Air-Vac.**

Air vacuum excavators utilize 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 using a powerful vacuum. A test hole is then 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. Holes can be considerably deeper 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.

### **Water-Vac.**

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.

### **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.

### **Contact Information**

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

## **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 Centers 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 cannot be located through potholing used in conjunction with drawings and locate marks, the facility owner should be contacted, and/or the state One Call Center should be notified.

## **Conditions Requiring Potholing**

State statutes require excavation within 18 inches 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.

### **Close Proximity.**

It is recommended that potholing be used to expose utilities for any excavation especially 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 18 inches on either side.

For HDD operations with a bore path that parallels a utility within 3 feet, potholing is recommended 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 recommended at the beginning and end of the bore and every 200 feet along the route.

Potholing is recommended to be performed for all utilities crossing the path of HDD operations. It is important to watch the boring bit enter and travel through the pothole to ensure clearing of the existing facility. It is equally important to watch while pulling equipment back through the bore. Especially back

reamers, since they are usually bigger than the initial bore and could catch the existing facility.

Backhoe excavation should not be allowed within two feet of existing facilities.

### **Congested Utilities.**

In congested areas that have 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.

### **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.

### **Protecting Exposed Facilities**

As with all excavation, 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.

### **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 material 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 material in an environmentally suitable manner.

Additional information can be found in: Occupational Safety and Health Administration, Construction Industry Regulations, 29 Code of Federal Regulations, 1926, Subpart P, Excavation Standard, OSHA.

## Natural Gas Pipeline Safety

Information about specific natural gas pipeline companies is available by calling them directly using the contact information provided in the Locate Request Ticket.

Note: Most of these guidelines can apply to propane distribution systems, however, please beware that natural gas rises in air and propane sinks. Also, most propane lines are considered private and not included in the One Call Center. Most of these guidelines also apply to liquid gas pipelines. In any case, if unsure, contact the pipeline operator directly.

### Natural Gas Demands Respect

**A leading cause of natural gas pipeline incidents is third party damage.** As with buried electric cable, excavators must take particular care when working and digging near natural gas pipelines.

**Natural gas is a safe, reliable, and predictable fuel when properly handled and consumed.**

**Natural gas ignition occurs** with a gas to air ratio between 4% to 14%, and 1100 degrees temperature. Natural gas has a specific gravity of .6, which is lighter than air, allowing it to rise. A



distinctive odorant is added to aid in leak detection. If a pipeline rupture or leak occurs, natural gas may migrate under paved or hard surfaces, into buildings, and surrounding areas. If you detect a leak, leave the area immediately and contact your natural gas provider or 911. *Do nothing to create a spark.*

**Natural gas is distributed in a variety of pressures and types of pipe.** Steel and plastic pipelines are widely used throughout Montana. Ranging in size from 1/2 inch to 36 inches in diameter. Operating pressures vary between Low pressure (LP 6" Water Column), Intermediate pressure (IP 60 psig), and High pressure (HP100+ psig). Any excavation occurring around **high pressure (HP) pipelines** must be monitored continuously by utility personnel.

## **Natural Gas Incidents**

**Always call 911 first! Then call the local utility company immediately after** to report any damage, leaks or any other natural gas incident. If gas is leaking, immediately evacuate areas where gas is present. Keep people and traffic away and remove any sources of ignition (open flames, turn off engines /equipment, radios, etc.) around the area of the damaged line until first responders and local utility company personnel arrive (key numbers listed at front of book).

**Don't try to repair a damaged or broken natural gas line by covering, crimping, bending, or otherwise restricting the flow.** Don't touch a plastic pipe that is leaking. A spark from static electricity on plastic pipe could become an ignition source. All repairs must be made by the local natural gas provider. *Any time pipe is dented, or the wrap is scraped the local natural gas provider will need to inspect it before it is buried or covered with fill.* Even if the pipe is just nicked or bent, leave it exposed so the local natural gas provider can inspect it and make any necessary repairs. Care should be taken to avoid breaking the small wires located on or near natural gas pipelines. Companies with buried pipelines use different types of wires, some are for locating plastic pipelines and others are necessary to monitor steel

pipelines for proper protection from corrosion. If the wire is broken, call the local utility so repairs can be made to damaged facilities

**Don't try to extinguish a gas flame or fire.** If natural gas is burning, let it burn and call 911.

### **Excess Flow Valve (EFV)**

An EFV is a safety device designed to automatically stop or restrict the flow of natural gas if an underground pipe is broken or severed.

The EFV is installed underground on the service line that runs between the gas main located in public right of way or a dedicated utility easement and the natural gas meter. Generally, the EFV is installed as close as possible to the gas main. In some instances, the location may need to be installed further from the gas main to accommodate interference from other buried structures.

Such damage is usually the result of some type of excavation. Although an EFV may help limit the effects or damage of such an incident, the best way to protect against such incidents is to ensure that anyone excavating on your property has called 811 to have buried pipelines properly marked before digging.

### **Work Practices**

**Directional boring:** Gas lines must be pot-holed and identified prior to boring operations. Contact the local utility to verify pot-holed facilities prior to the bore operation. Leave pot-holes open and periodically inspect the facilities during the bore operation. Notify utility immediately of any concerns.

**Open trenches:** Once exposed, all facilities must be properly supported and protected from damage. If excavating parallel to a gas pipeline, call your local natural gas company for help with determining adequate support, protection, and separation of the pipeline. Failure to properly support pipelines could result in a break or rupture. Use acceptable back-fill material with no sharp

rocks, gravel, or slurry which can damage the coating on steel pipelines and cause failure of plastic pipelines over time.

**Encroachment:** Don't build any structures such as sheds, decks, etc. over any pipelines or other facilities. Aside from being a serious safety issue, natural gas utilities must have access to their buried gas lines at all times. Always check with the utility owners when planning on building any structure, fence or other facility near a gas or liquid pipeline.

For the reason listed above, a minimum of 12 inches of separation shall be maintained when crossing or running parallel to distribution lines. High-pressure supply lines require 24 to 36 inches of separation unless special permission is granted by the utility owner.

### **Supporting Exposed Gas Pipeline**

Excavators are required to provide structural support for underground facilities that have been undermined or exposed by excavation activity. Each structural support used for an exposed pipeline must be made of a durable, noncombustible material, and must be designed and installed such that:

- Free expansion and contraction of the pipeline between supports, or anchors is not restricted.
- Movement of the pipeline does not cause disengagement of the support equipment.
- Damage to the pipe and its coating is prevented where the pipe contacts the support or anchor.

When steel piping is supported or anchored, the pipe shall be insulated from the support or anchor. The temporary support or anchor shall be removed in its entirety without damage to the pipe and its coating. Steel cables, steel chain, or any sharp object shall not be used to support gas piping.

## Backfilling Natural Gas Pipelines and Hazardous Liquid Pipelines

When a trench or bell hole is backfilled, it must be backfilled in a manner that provides firm support under the pipe and prevents damage to the pipe and pipe coating from equipment or from the backfill material. Always use sand or rock free dirt and backfill six inches above and below natural gas pipelines and avoid compacting directly over the pipeline.

Backfill material shall *not* contain: garbage, cans, glass, recycled glass products, decomposable organic material, construction debris, washed gravels (including pea gravel), material that will not compact, sharp objects, frozen clods, large rocks or stones, pieces of pavement, wood skids or wedges, timbers, hay bales, boulders, or other material that may cause damage to the pipe, pipe coating, or casing/conduit.

NOTE: Do not unload backfill or pile it directly on top of any pipe until proper support from compacted backfill is provided for the pipe. The area under utilities must be backfilled and compacted without voids that will allow movement or stress to the pipe.

### Backfill for General Construction

**Initial backfill** shall be sand, rock-free native soil, or soil-based select material that does not contain any rocks. If the native soil contains rocks, then a total of 12 inches of initial backfill shall be placed over the gas pipeline and across the full width of the trench.

Final backfill may be soil-based select material or native soil but shall not contain rocks larger than 10 inches in diameter to prevent impedance of gas system maintenance.

Final backfill shall be sufficient to withstand normal wear and tear from foot traffic, weather, and other activities that may cause erosion.

## Compaction

All backfill shall be consolidated according to the terms of applicable permits and right-of-way agreements. In unimproved areas, the backfill shall be consolidated to match the original soil structure.

Care shall be taken to prevent damage to the buried gas facilities and other underground lines when compacting backfill.

Care shall be taken when compacting around service and branch connections and points of transition between polyethylene and steel to insure well-compacted support and to protect the pipe and fittings from excessive external loads.

Backfill material shall be compacted in lifts thick enough to prevent damage to the pipe. If the trench is wide enough, the spaces to the sides of the pipe shall be compacted first. If compaction is done by:

- ☐ Powered hand-operated equipment (such as Bigfoot or Jumping Jack), then the initial backfill lift over the pipe shall be a minimum of 12 inches.
- ☐ Machine-operated equipment (such as Hoe-Pack or Hydro-Hammer), then the initial backfill lift over the pipe shall be a minimum of 24 inches.

## Electricity

### Electricity Demands Respect

Electricity can shock, burn, or kill workers if it is not handled properly on the job site. Since it is always seeking the easiest path to ground, you or any other type of conductor (metal, wet wood, trees, machinery/equipment, tools, etc.) touching a power line could provide an immediate path to ground. The result can be severe injury or death.

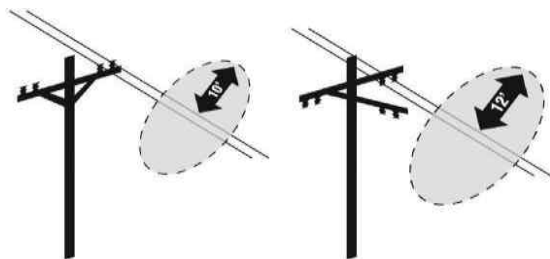
**Before Starting to Work, Think Safety!**

Be observant. If you have work to do near power lines or power facilities **always consider them to be energized or hot.**

Call the local utility company for more information or to make arrangements that will guarantee working conditions are safe. For your safety, the utility company may turn off electricity, place barriers on lines or as a last resort, relocate them. Because it takes time to complete this work, allow for this time in your job schedule and let the utility know. For example, if it is feasible to take lines out of service, advance notice is required. There may be a charge for work performed by the utility company.

### Basic Rules for Electrical Safety

Ten feet is considered a minimum safe and legal clearance for equipment, tools, and people when working near overhead power lines and facilities. Never assume that power installations are insulated. State regulations require that a minimum of ten feet be maintained from energized overhead high voltage electrical conductors (up to 50,000 volts) with additional distance required for higher voltages (for example 12 feet 2 inches is required for 115,000 volts). (See *Legal Clearance* illustration below.)



### Legal Clearance

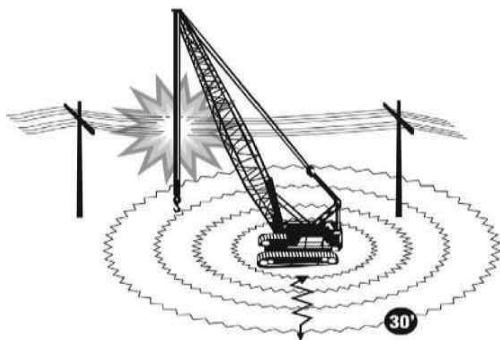
- **Equipment near lines can contact the line accidentally** and injure the worker using the equipment. Hand-carried tools or materials are a common cause of accidents. Use extreme caution when carrying ladders, scaffolding poles, piping, or high-rise metal tools near power lines. Heavy or large equipment can be driven into lines accidentally. Care should be taken not only with

cranes, but also with front-end loaders, backhoes, and concrete pump trucks as they may have sufficient reach to get into power lines.

- **Plan ahead.** If your equipment will be operating in the vicinity of power facilities, check to make sure there is no possibility of accidentally striking a power line or digging into a buried cable.
- **Don't touch electrical equipment** and never attempt to move or raise electric lines or equipment whether they are overhead or underground. If you need help to make the lines safe or have any doubts or questions about the safety of your job site, call the utility company.

### **In the Event Electrical Contact Occurs with Equipment**

- **Do not panic! Remain on the equipment!** You should be safe where you are. Do not try to get off the crane or excavator. Touching the power source and the ground at the same time could be fatal.
- **If the equipment is on fire and it is necessary to exit the vehicle or equipment,** jump clear of the vehicle while keeping both feet together, avoiding any wires that might be on the ground. Stay calm and jump carefully so that you don't fall back against the equipment or touch the ground and the equipment at the same time. Then **shuffle**, with both feet together, keeping both feet on the ground and touching at all times. **Continue shuffling for at least 30 feet from the accident site.**
- **Instruct all other personnel to stay at least 30 feet away** from the equipment, ropes, and the load. All of the equipment, the load, and the ground around them could be energized.



- **The equipment operator may try to remove the contact (only if it is safe to attempt)** unaided, and without anyone approaching the equipment. Move away from the line in the reverse direction to that which caused the contact (for example, if you swung left into the wire, swing right to break the contact). *Remember: Once an arc has been struck, it can draw out a considerable distance before it breaks, so keep moving away from the line until the arc breaks and then continue moving until you are at least 10 to 15 feet away from the line.* *Caution: If the wire rope/material appears to be welded to the power line, do not move away from the line as it may snap and whip. Stay where you are until help arrives.*
- **If the equipment cannot be moved away** or disengaged from the contact, remain onboard until a qualified electrical utility worker de-energizes the circuit and confirms that conditions are safe.
- **Report every incident** involving contact with a live line to the local electric utility company so inspections and repairs can be made to prevent damaged power lines from failing at a later date.

## Underground Power-line Safety

Digging trenches or excavating in areas where there might be underground power lines can be dangerous and expensive. One



misplaced shovel or bucket could cause serious injury, knock out services, or damage surrounding homes and businesses. Excavators are responsible for ascertaining the location and voltage of any underground electric lines that employees may be working around and providing any protective measures and methods for working safely around them.

### **If an accident does happen, stay calm!**

There are several basic steps to follow in case of an electrical accident:

- Do not touch the injured or any equipment in contact with the injured person. Even if it appears that the accident caused the electricity to be de-energized, use caution. Always assume the power lines are hot or energized. Power lines usually relay back into service and become energized several times within a matter of seconds following an accident, or they may not shutdown at all.
- Do not attempt to rescue and be sure to prevent others from approaching the victim and any electrically energized vehicles, objects, or structures.

***DO NOT ATTEMPT TO DE-ENERGIZE HIGH-VOLTAGE POWER LINES. CALL the local electric utility IMMEDIATELY!***

- Send for help. Call 911 to notify both the police and the fire department. Also call the utility so the electricity can be turned off.

## **Water, Sewer and Storm Lines**

The following material is included to help excavators avoid problems when excavating near pressurized water lines.

Pressurized water lines are often used to provide drinking water, fire protection, and irrigation. If a pressurized water line is damaged during construction, it can cause significant loss of service, property damage, and injury. The pressure range can be from 25 psi (pounds per square inch) to above 200 psi. When

working in any area near water lines, make sure the valve boxes remain accessible in case an emergency shutdown is needed.

### **Bends, Tees, Caps and Thrust Blocks**

Bends, tees, and caps are installed on lines to change the direction of piping. Thrust blocks are installed at the bends, tees, and caps to keep the pipe in place and absorb the force the pressurized waterline exerts when deflected in different directions. Thrust blocks are typically designed for the bearing area of the ground around them.

Example: At 25 psi, an 8" line could have 1256 pounds of force exerted on the thrust block. At 200 psi, this 8" line could have 10,048 pounds of force exerted on the thrust block (not considering surcharging).

Do not disturb the ground around the thrust block or the thrust block itself. This may result in major leaks or break in water lines.

Do not expose a pressurized water main line for a distance greater than 1 stick of pipe or it may move vertically or horizontally and rupture. Create a support line and excavate or expose only enough of the pressurized line to complete the crossing.

Do not use calcified backfill material against water lines such as concrete or CDF unless water lines are wrapped in 8 ml plastic.

### **Water Services**

Water services can be made of pliable materials such as soft copper or polyethylene, or more rigid material such as galvanized pipe, schedule 40 or 80 PVC, or other materials. Water service lines should be bedded in sandy, rock-free material prior to backfilling. Caution should be taken when compacting to prevent damaging of service or pulling from mainline.

Do not pull or dent water services. Dents and kinks may not leak immediately, but the water moving inside the service will wear on the defect and create a leak in the future. Report any dents, kinks, or pulling to the water purveyor.

Do not shut down water main lines without the purveyor's permission. Tampering with a public water system is a federal offense (US Code Title 42, Section 300i-1). Most water purveyors also have policies with fine schedules that forbid an excavator from tampering or shutting down the existing public system. Conditions or customers such as clinics, hospitals, and home medical equipment cannot have the water shut off without notice.

Always contact the water purveyor if you have any questions.

## **Sanitary Sewer Lines**

The following material is included to help excavators avoid problems when excavating near sanitary sewer lines.

Sanitary sewer lines are primarily used to dispose of human, industrial, and commercial waste that can contain fecal matter, chemicals, gases, and blood borne pathogens. If damaged during construction, sanitary sewer lines can cause significant loss of service, costly property or wildlife damage, and injury. When working in any area where sewer is nearby, make sure the manhole lids remain accessible in case of an emergency back up or damage occurs.

## **Manholes**

Manholes contain contaminants, flammables, and raw sewage that can affect the air quality inside the manhole. For that reason, confined space entry procedures required by federal, state, or local agencies should be followed for manhole entry, if entry is allowed by the sewer purveyor.

Do not allow construction debris or fluids to enter the manholes or sewer line at any time. This may cause costly blockage and

back-ups. If debris enters sewer system, contact the sewer purveyor.

Do not excavate enough material near the manhole to create uneven loading on the sides of the structure or it may topple.

### **Excavation and backfill practices near sewer main and services**

Sewer lines (mains and services), consist of many different types of pipe such as clay, concrete, PVC, HDPE, ductile iron, steel, cast iron, etc. Older brittle pipe may be present. Extreme caution must be used when excavating near existing sewer lines. An 18" minimum vertical separation is required when crossing perpendicular above existing sewer line. Sewer lines should be re-bedded in rock free material. Caution must be taken when compacting to prevent damaging the pipeline.

Anticipate side sewer laterals to service the structures nearby.

Do not pull, damage, or dent any sewer mainline or service. The damaged area may not leak immediately but could in the future. Report any damage to the sewer purveyor immediately.

Most sewers are gravity flow, but many areas have sewer force mains that are installed like a water main. If working near a sewer force main under pressure, familiarize yourself with the "working around water main guidelines" and contact the sewer purveyor for more information.

## **Fiber Optic Lines**

The following material is included to help excavators avoid problems when digging around or near fiber optic lines.

Fiber optic lines are used by a variety of organizations for the efficient transfer of large volumes of information. They can be very costly and time consuming to repair with additional monetary penalties related to temporary loss of provided services.

The fiber optic owner may have differing requirements than the suggestions and recommendations listed below. The following are suggested guidelines and are not intended to be all-inclusive or exclusive of local requirements.

## **Fiber optic systems**

The amount of underground fiber optic facilities is increasing as more organizations deploy it. Existing facilities can include: direct bury, poly conduit, metal conduit or clay. Damage can disrupt public, private, or governmental services, as well as critical emergency service communications including 911. The cost of repair and lost service justifies any extra effort to avoid damage.

## **Safety**

If a fiber line is damaged, never look directly into the fiber as non-visible laser light can damage the eye. Use caution with the fiber strands themselves, as small particles of glass can enter the body and be undetectable by X-Ray.

## **Always call for locates**

Some fiber optic cables do not contain metal, making them difficult to locate. In some cases, the locating conductor is contained within the conduit or as a separate locating wire. When using a locator, always use the direct connection method as opposed to induction. The fiber optic owner should be contacted if there are any problems in finding a suitable connection.

## **Contact is key**

An on-site pre-construction meeting with the excavator and facility owner will provide an opportunity to acquire plans and contact information. Some organizations insist on having a spotter present during any excavation.

## **Damage**

Always immediately alert the fiber optic owner to even small amounts of damage to a fiber optic cable. Disruptions in service and reliability may not always be visible or may manifest themselves over time. Never attempt to repair a damaged line or backfill over it. Always notify the owner to any damage in the conduit or the locating wires.

## Glossary of Terms and Definitions

For the purpose of the Common Ground Study, a common set of definitions are used. These definitions were established by a consensus process similar to the methodology used to identify the best practices.

**Abandoned Line or Facility:** Any underground or submerged line or facility no longer in use.

**Agricultural Locate Request:** means a request for a locate and mark that is requested based on the perimeter boundary of an agricultural field: (a) by a property owner or excavator prior to agricultural activity; or (b) by a property owner or excavator prior to conducting soil probing or testing. (MCA 69-4-501(1))

**Alternative Dispute Resolution (ADR):** Any process or procedure, other than litigation that is agreed to by the disputing parties as the means for resolving a dispute and is binding or non-binding pursuant to the agreement by the disputing parties. ADR includes, but is not limited to, advisory boards, arbitration, mini-trials, mediation, partnering, and standing neutrals.

**As-built Drawing:** A detailed depiction of facilities as installed in the field.

**Attribute:** Characteristic that helps describe the data.

**Backfill:** To fill the void created by excavating.

**Bar Hole:** means a hole made in the soil or pavement with a hand-operated bar for the specific purpose of testing the subsurface atmosphere with a combustible gas indicator.

**Business Day:** means any day beginning at midnight and ending 24 hours later, other than Saturday, Sunday, New Year's Day, Memorial Day, Independence Day, Labor Day, Thanksgiving Day, and Christmas Day. When a holiday listed above occurs on a Saturday, the preceding Friday is not considered a business day. When a holiday listed occurs on a Sunday, the following Monday is not considered a business day. (MCA 69-4-501(2))

**Cathodic Protection:** The process of arresting corrosion on a buried or submerged structure by electrically reversing the natural chemical reaction. This includes, but is not limited to, installation of a sacrificial anode bed, use of a rectifier-based system, or any combination of these or other similar systems. Wiring is installed between the buried or submerged structure and all anodes and rectifiers; wiring is also installed to test stations that are used to measure the effectiveness of the cathodic protection system.

**Compliance:** Adherence to the statute and its regulations.

**Damage or damages:** means any impact upon or removal of support from an underground facility as a result of excavation or demolition that, according to the operating practices of the underground facility owner, would necessitate the repair of the facility. (MCA 69-4-501(5))

**Damage Reporting:** The immediate reporting to a one call center and the facility owner/operator of any damage caused or discovered in the course of excavation or demolition work; to immediately alert the occupants of premises as to any emergency that such person may create or discover at or near such premises; to contact emergency responders, if necessary, as quickly as practical.

**Demolition Work:** The partial or complete destruction by any means of a structure served by, or adjacent, to an underground line or facility.

**Designer:** Any architect, engineer, or other person who prepares or issues a drawing or blueprint for a construction or other project that requires excavation or demolition work.

**Digital Imagery:** A computer-compatible version of land-related information including, for example, topography, physical features, road/street networks, and buried facility networks obtained from a variety of sources including, for example, aerial photographs, satellite photographs, road maps, survey plans, and buried facility records.



**Downtime:** Lost time reported by a stakeholder on the Damage Information Reporting Tool (DIRT) field form for an excavation project due to failure of one or more stakeholders to comply with applicable damage prevention regulations.

**Electronic Positive Response:** Communication by telephone, fax, e-mail or Internet from a facility owner/operator to an excavator providing the status of an owner/operators statutorily required response to a notice of intent to excavate.

**Emergency:** A sudden or unforeseen occurrence involving a clear and imminent danger to life, health, or property; the interruption of essential utility services; or the blockage of transportation facilities that requires immediate action.

**Emergency Excavation:** means an excavation in response to an emergency locate request that is necessary to: (a) alleviate a condition that constitutes a clear and present danger to life or property; or (b) repair a customer outage involving a previously installed utility-owned facility. (MCA 69-4-501(8))

**Emergency Locate request:** means a request for a locate and mark that is requested for: (a) a condition that constitutes a clear and present danger to life or property; or (b) a customer outage for which repairs on a previously installed utility-owned facility are required. (MCA 69-4-501(9))

**Emergency Notice:** A communication to the one call center to alert the involved underground facility owners/operators of the need to excavate as a result of a sudden or unforeseen occurrence or national emergency involving a clear and imminent danger to life, health, environment, or property (including the interruption of essential utility services or the blockage of transportation facilities) that requires immediate excavation.

**Emergency Response:** A facility owner/operator's response to an emergency notice.

**Event:** means damages to an underground facility, if: (a) the underground facility is not a jurisdictional pipeline; and (b) the

underground facility owner determines the damages are not an incident. (MCA 69-4-501(11))

**End User:** means any utility customer or consumer of utility services or commodities provided by a facility operator.

**Equipment Operator:** means an individual conducting an excavation.

**Excavate or Excavation:** means an operation in which earth, rock, or other material in the ground is moved, removed, or otherwise displaced by means or use of any tools, equipment, or explosives. The term includes but is not limited to grading, trenching, digging, ditching, drilling, angoring, tunneling, scraping, and cable or pipe plowing and driving.

Excavation does not include: surface road grading maintenance or road or ditch maintenance that does not change the original road or ditch grade or flow line;

Or plowing, cultivating, planting, harvesting, or similar agricultural activities in areas cultivated: (A) within the last 10 years, unless the activities disturb the soil to a depth of 18 inches or more; or (B) within the last 14 months, to a depth greater than 18 inches, unless the activities disturb the soil to a depth of more than 24 inches;

Or gardening by homeowners or occupants in a previously established garden area unless the gardening disturbs the soil to a depth of 12 inches or more; or landscaping by homeowners or occupants unless using mechanized equipment or disturbing soil to a depth of 12 inches or more. (MCA 69-4-501(12))

**Excavator:** means a person conducting the excavation activities defined about in Excavate or Excavation. (MCA 69-4-501(13))

**Facility:** An underground or submerged conductor, pipe, or structure used to provide electric or communications service (including, but not limited to, traffic control loops and similar underground or submerged devices); or an underground or submerged pipe used in carrying, providing, or gathering gas, oil or oil product, sewage, storm drainage, water, or other liquid service

(including, but not limited to, irrigation systems) and appurtenances thereto.

**Facility Owner/Operator:** 1) Any person, utility, municipality, authority, political subdivision, or other person or entity who owns, operates, or controls the operation of an underground line/facility. 2) means any person who owns an underground facility or is in the business of supplying any utility service or commodity for compensation. "Facility operator" does not include a utility customer who owns a service lateral that terminates at a facility operator's main utility line.

**Gas:** means natural gas, flammable gas, or toxic or corrosive gas.

**Geographic Information System (GIS):** An organized collection of computer hardware, software, and geographic data used to capture, store, update, maintain, analyze, and display all forms of geographically referenced information.

**Geospatial Data:** Data that identifies the geographic location and characteristics of natural or constructed features and boundaries on the earth.

**Global Positioning System (GPS):** A system consisting of 25 satellites used to provide precise position, velocity, and time information to users anywhere on earth. Location information can be received using a GPS receiver. The GPS receiver helps determine locations on the earth's surface by collecting signals from three or more satellites through a process called triangulation. Simple and inexpensive hand-held receivers provide an accuracy of  $\pm 100$  meters of a true position. More sophisticated receivers that use additional technologies or that post-process the original GPS data can provide sub-meter accuracy.

**Grade:** The surface of the earth (i.e., ground level) upon which a structure is built or prepared.

**Grounding Systems:** A system of one or more ground conductors or ground rods providing a low-resistance path-to-earth ground potential through a mechanical connection to structures, conductors, and equipment.

**Hazardous Liquid:** means: (a) Petroleum, petroleum products, or anhydrous ammonia as those terms are defined in 49 C.F.R. Part 195 as in effect on March 1, 1998; (b) Carbon dioxide; and (c) Other substances designated as hazardous by the secretary of transportation and incorporated by reference by the commission by rule.

**Identified But Unlocatable Underground Facility:** means an underground facility that has been identified but cannot be located with reasonable accuracy. (MCA 69-4-501(14))

**Incident:** means: (a) notwithstanding MCA **69-4-529**(6), unless the underground facility is owned by the excavator, a violation of the provisions of MCA **69-4-502** or MCA**69-4-503** by an excavator that, at a single location on a single day, results in damage to an underground facility; or (b) a violation of the provisions of MCA **69-4-503**(3) by an underground facility owner that, at a single location on a single day, results in damage to an underground facility. (MCA 69-4-501(15))

**Joint Trench:** A trench containing two or more facilities that are buried together by design or agreement.

**Jurisdictional pipeline:** means a pipeline subject to regulation by the U.S. department of transportation pipeline and hazardous materials safety administration in accordance with 49 CFR 190-199, the Montana public service commission, or both. (MCA 69-4-501(16))

**Land Base:** Mapped data that depicts features of the surface of the earth and is tied to real-world geographic coordinates, such as latitude and longitude.

**Large/Complex Project:** A single project, or a series of repetitive, small, short-term projects that are related in scope, that impact facilities over a long period of time or a large area.

**Latitude (Lat):** Distance measured north or south of the equator.

**Line:** See “Geographic Information System (GIS)”

**Locate:** To indicate the existence of a line or facility by establishing a mark through the use of stakes, paint, flagging, whiskers, or some other customary manner that approximately determines the location of that line or facility.

**Locate Request:** A communication between an excavator and one call center personnel in which a request for locating underground facilities is processed.

**Locatable underground facility:** means an underground facility that can be field-located and field-marked with reasonable accuracy. (MCA 69-4-501(17))

**Locate:** means the use of specialized equipment to identify the location of underground facilities or the actual location of underground facilities identified by the use of specialized equipment. (MCA 69-4-501(18))

**Locator:** A person whose job is to locate lines or facilities.

**Longitude (Long):** Distance measured east or west from a reference meridian (Greenwich).

**Mark:** means the use of stakes, paint, or other clearly identifiable material to show the field location or absence of underground facilities, in accordance with the current color code standard of the American Public Works Association. Marking must include identification letters indicating the specific type of underground facility and the width of the facility if it is greater than 6 inches. (MCA 69-4-501(19))

**Marking Standards:** The methods by which a facility owner/operator indicates its line or facility in accordance with the APWA guidelines. (See Appendix A, "Uniform Color Code and Marking Guidelines.")

**Member Database:** Structured collection of data defined for a particular use, user, system, or program; it may be sequential, network, hierarchical, relational, or semantic.

**Membership:** Persons who participate voluntarily in a one call center because they have an interest in the protection of lines or

facilities or because they have a statutory responsibility to protect lines or facilities.

**Minor or Routine Maintenance of Transportation Facilities:** The adding of granular material to unpaved roads, road shoulders, airport runways, airport taxiways, and railroad roadbeds; removal and application of patches to the surface of paved roads, runways, and taxiways; cleaning and sealing road, airport, and canal lock facility cracks or joints; replacing railroad ties and related appliances excluding road crossings; adjusting ballast on top of railroad roadbed; cleaning of paved drainage inlets and paved ditches or pipes.

**Near Miss:** An event where damage did not occur, but a clear potential for damage was identified.

**Notice: See Notify:, :Notice:, or :Notification:**

**Notification center:** means an entity whose membership is open to and is contracting with underground facility owners with underground facilities within a notification center's designated service area. (MCA 69-4-501(20))

**Notify:, :notice:, or :notification:** means the completed delivery of information to a person. The delivery of information includes but is not limited to the use of electronic data transfer. (MCA 69-4-501(21))

**Notification Period:** The time beginning when notice is given and ending when the work may begin.

**One Call Center: See notification center.**

**Orthophoto:** An aerial photograph of a site that has been differentially rectified to correct the distortion caused by the terrain and attitude (tip, tilt, and yaw) of the camera. A multicolored, distortion-free, photographic image.

**Person:** means an individual, partnership, firm, joint venture, corporation, association, municipality, governmental unit, department, or agency and includes a trustee, receiver, assignee, or personal representative of the listed entities. (MCA 69-4-501(23))

**Pipeline or Pipeline System:** means all or parts of a pipeline facility through which hazardous liquid or gas moves in transportation, including, but not limited to, line pipe, valves, and other appurtenances connected to line pipe, pumping units, fabricated assemblies associated with pumping or compressor units, metering and delivery stations and fabricated assemblies therein, and breakout tanks. "Pipeline" or "pipeline system" does not include process or transfer pipelines.

**Pipeline Company:** means a person or entity constructing, owning, or operating a pipeline for transporting hazardous liquid or gas.

**Planning:** An activity at the beginning of a project where information is gathered and decisions are made regarding the route or location of a proposed excavation based on constraints, including the locations of existing facilities, anticipated conflicts and the relative costs of relocating existing facilities, or more expensive construction for the proposed facility.

**Plat:** A map or representation on paper of a piece of land subdivided into lots, with streets, alleys, etc., usually drawn to a scale.

**Positive Response:** means notification through an electronic system provided by a notification center that is available to underground facility owners and excavators and is used for communicating and documenting the status of a request for a locate. (MCA 69-4-501(24))

**Pre-marking or Positive Site Identification:** The marking of the proposed excavation site/work area consistent with APWA guidelines.

**Property Owner:** means a person owning real property in Montana, its agents, and employees. The term does not include the owner of an easement. (MCA 69-4-501(25))

**Public:** The general population or community at large.

**Railroad Operating Corridor:** The property that is essential to a railroad company to enable it to discharge its function and duties

as a common carrier by rail. It includes the roadbed, right of way, tracks, bridges, stations, and such like property.

**Reasonable Accurate:** means location within 18 inches of the outside lateral dimensions of both sides of an underground facility. (MCA 69-4-501(26))

**Request for a Locate:** means the process by which an excavator communicates with a notification center a request for underground facilities to be located and marked in an area where an excavation is planned. A request for a locate that is not an agricultural locate request and is not within city limits or within an area of an authority as defined in **75-6-304** may not exceed 2 miles long by 1,000 feet wide. A request for a locate that is not an agricultural locate request and is within city limits or within an area of an authority as defined in **75-6-304** may not exceed 2,000 feet long by 300 feet wide. (MCA 69-4-501(27))

**Root Cause:** The primary reason an event occurred.

**Service Lateral:** means an underground water, storm water, or sewer facility located in a public right-of-way or utility easement that connects an end user's building or property to a facility operator's underground facility and terminates beyond the public right-of-way or utility easement.

**Subsurface Utility Engineering (SUE):** An engineering process for accurately identifying the quality of underground utility information needed for excavation plans and for acquiring and managing that level of information during the development of a project.

**Test Hole:** Exposure of a facility by safe excavation practices used to ascertain the precise horizontal and vertical position of underground lines or facilities.

**Ticket Number:** A unique identification number assigned by the One Call Center to each locate request.

**Third party:** means a person who is not an excavator or an underground facility owner. (MCA 69-4-501(28))



**Tolerance Zone:** The space in which a line or facility is located and in which special care is to be taken. In Montana it is 18 inches on both sides of the mark.

**Underground Facility:** means a facility buried or placed below ground for use in connection with the storage or conveyance of water, sewage, electronic, telephonic or telegraphic communications, cablevision, fiber optics, electrical energy, oil, gas, or other substances. The term includes but is not limited to pipes, sewers, conduits, cables, valves, lines, wires, manholes, and attachments to the listed items.

The term does not include: (i) shallow underground water systems designed to irrigate lawns, gardens, or other landscaping; (ii) privately owned water and sewer lines from private property extending into public rights-of-way to interconnect with public water and sewer; or (iii) an underground facility used solely to furnish services or commodities to real property, if no part of the underground facility is located in a public street, alley, or right-of-way dedicated to the public use. (MCA 69-4-501(29))

**Underground Facility Owner** means a person owning, controlling, or having the responsibility to maintain an underground facility. (MCA 69-4-501(30))

**Vacuum Excavation:** A means of soil extraction through vacuum; water or air jet devices are commonly used for breaking the ground.

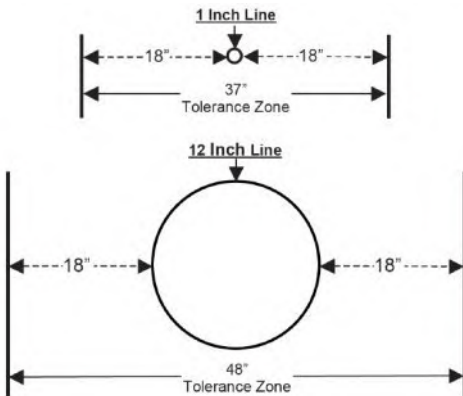
## APPENDIX A

### Uniform Color Code and Marking Guidelines

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 Conduit
Blue	Potable Water
Purple	Reclaimed Water, Irrigation, and Slurry Lines
Green	Sewers and Drain Lines

### Tolerance Zone

The following examples are of tolerance zones for a 1 inch line and a 12 inch line:

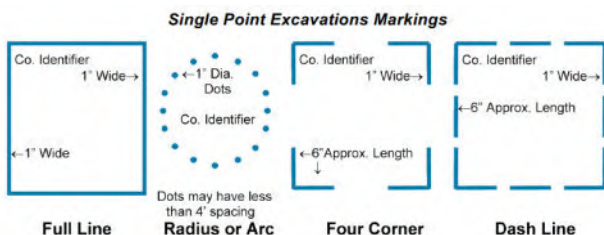


**White Lining:** When the excavation site cannot be clearly and adequately identified on the locate ticket, the excavator designates the route and/or area to be excavated using white premarking, either onsite or electronically (when available through the one call center), prior to or during the request for the locate

## Guidelines for Excavation Delineation

The following marking illustrations are examples of how excavators may choose to mark their area of proposed excavation. The use of white marking products (e.g., paint, flags, stakes, whiskers, or a combination of these) may be used to identify the excavation site.

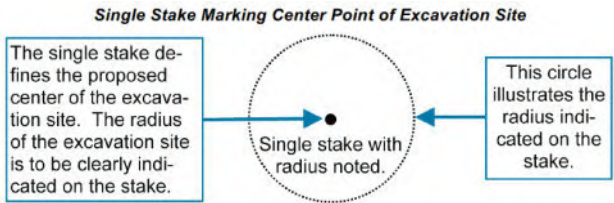
### Single Point Excavations Markings



Delineate in white paint the proposed area of excavation using a continuous line, dots marking the radius or arcs, dashes marking the four corners of the project, or dashes outlining the excavation project. Limit the size of each dash to approximately 6 in. to 12 in. long and 1 in. wide with interval spacing approximately 4 ft to 50 ft apart. Reduce the separation of excavation marks to a length that can reasonably be seen by the operator's locators when the terrain at an excavation site warrants. Dots of approximately 1 in. diameter typically are used to define arcs or radii and may be placed at closer intervals in lieu of dashes.

### ***Single Stake Marking Center Point of Excavation Site***

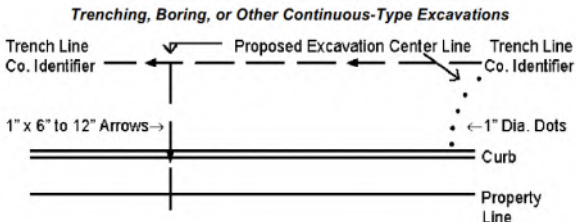
When an excavation site is contained within a 50 ft maximum radius or less, it can be delineated with a single stake that is positioned at the proposed center of the excavation. If the excavator chooses this type of delineation, they must convey that they have delineated the excavation site with a single stake at the center of the excavation and include the radius of the site in the notification to the one call center. This single stake is white in color and displays the excavator's company identifier (name, abbreviations, or initials) and the radius of the excavation site in black letters on the stake or with a notice attached to the stake.



### ***Trenching, Boring, or Other Continuous-Type Excavations***

#### ***Continuous Excavation Marking***

Mark in white paint the proposed centerline of planned excavation using 6 in. to 12 in.  $\times$  1 in. arrows approximately 4 ft to 50 ft apart to show direction of excavation. Reduce the separation of excavation marks to a length that can reasonably be seen by the operator's locators when the terrain at an excavation site warrants. Mark lateral excavations with occasional arrows showing excavation direction from centerline with marks at curb or property



line if crossed. Dots may be used for curves and closer interval marking.

***Stake, Flag, or Whisker Excavation Markers***

Delineate the proposed area of excavation using stakes, flags, or whiskers instead of spray paint to mark radius or arcs; the four corners of the project; or when outlining the excavation project. Limit the interval spacing to approximately 4 ft. to 50 ft. Reduce the separation of excavation marks to a length that can reasonably be seen by the operator's locators when the terrain at an excavation site warrants. Stakes, flags, or whiskers provided to illustrate arcs or radii may be placed at closer intervals to define the arc or radius. Stakes, flags, or whiskers are white in color and display the excavator's company identifier (name, abbreviations, or initials).

***Stake, Flag, or Whisker Excavation Markers***



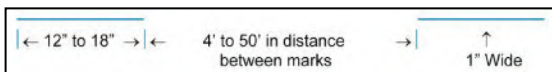
# Guidelines for Operator's Facility Field Delineation

## Operator markings of facilities include the following:

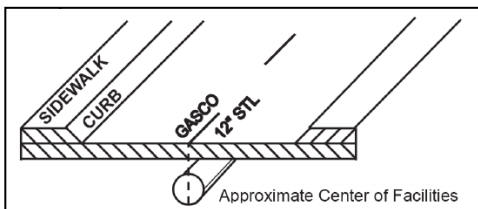
- The appropriate color for their facility type
- Their company identifier (name, initials, or abbreviation) when other companies are using the same color
- The total number of facilities and the width of each facility
- A description of the facility (HP, FO, STL, etc).

Use paint, flags, stakes, whiskers, or a combination to identify the operator's facility(s) at or near an excavation site.

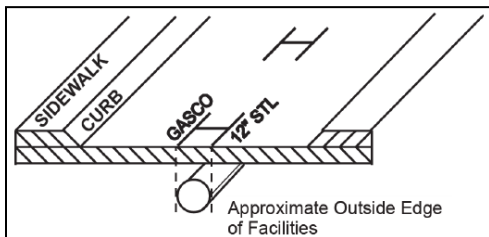
1. Marks in the appropriate color are approximately 12 in. to 18 in. long and 1 in. wide, spaced approximately 4 ft to 50 ft apart. When marking facilities, the operator considers the type of facility being located, the terrain of the land, the type of excavation being done, and the method required to adequately mark the facilities for the excavator.



2. The following marking examples illustrate how an operator may choose to mark their subsurface installations:
  - a. **Single Facility Marking:** Used to mark a single facility. This can be done in one of two ways—
    - 1) placing the marks over the approximate center of the facility:



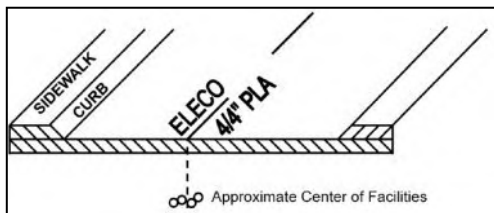
or 2) placing the marks over the approximate outside edges of the facility with a line connecting the two horizontal lines (in the form of an H) to indicate there is only one facility:



These examples indicate an operator's 12 in. facility. When a facility can be located or toned separately from other facilities of the same type, it is marked as a single facility.

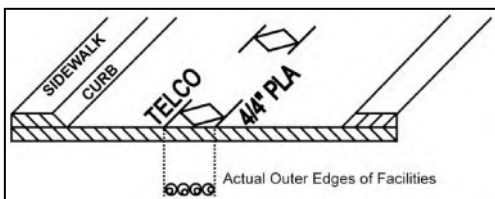
**b. Multiple Facility Marking:** Used to mark multiple facilities of the same type (e.g., electric), where the separation does not allow for a separate tone for each facility, but the number and width of the facilities is known. Marks are placed over the approximate center of the facilities and indicate the number and width of the facilities.

Example: four plastic facilities that are 4 in. in diameter (4/4" PLA)

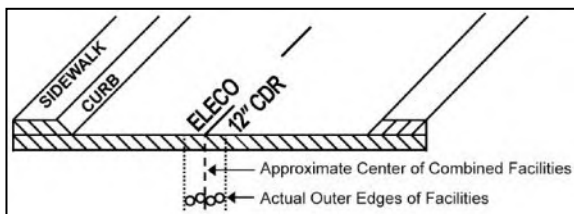


**c. Conduit Marking:** Used for any locatable facility being carried inside conduits or ducts. The marks indicating the outer extremities denote the actual located edges of the facilities being represented.

Example: four plastic conduits that are 4 in. in diameter (4/4" PLA), and the marks are 16 in. apart, indicating the actual left and right edges of the facilities



d. **Corridor Marking:** Used to mark multiple facilities of the same type (e.g., electric), bundled or intertwined in the same trench, where the total number of facilities is not readily known (operator has no record on file for the number of



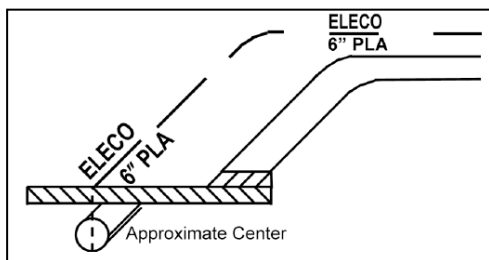
facilities). Marks are placed over the approximate center of the facilities and indicate the width of the corridor. The width of the corridor is the distance between the actual located outside edges of the combined facilities.

Example: a 12 in. corridor (12" CDR)

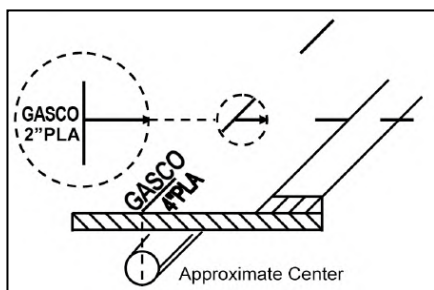
3. Changes in direction and lateral connections are clearly indicated at the point where the change in direction or connection occurs, with an arrow indicating the path of the facility. A radius is indicated with marks describing the arc. When providing offset markings (paint or stakes), show the direction of the facility and distance to the facility from the markings.



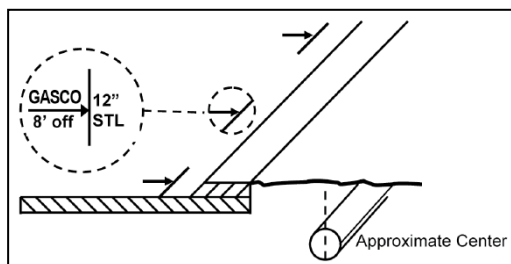
**Example:** radius



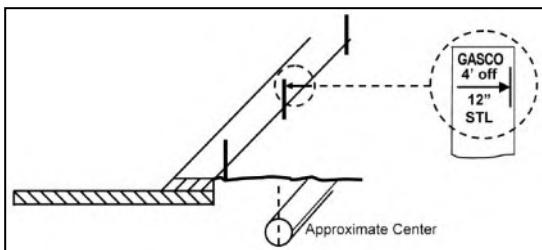
**Example:** lateral connection



**Example:** painted offset (off)



**Example:** staked offset (off)



4. An operator's identifier (name, abbreviation, or initials) is placed at the beginning and at the end of the proposed work. In addition, subsequent operators using the same color mark their company identifier at all points where their facility crosses another operator's facility using the same color. Reduce the separation of excavation marks to a length that can reasonably be seen by the operator's locators when the terrain at an excavation site warrants.

**Examples:**

CITYCO

ELECO

TELCO

5. Information regarding the size and composition of the facility is marked at an appropriate frequency.

**Examples:** the number of ducts in a multi-duct structure, width of a pipeline, and whether it is steel, plastic, cable, etc.

TELCO  
9/4" CAB

GASCO  
4" PLA

WATERCO  
12" STL

6. Facilities installed in a casing are identified as such.

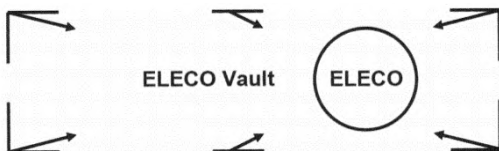
**Examples:** 6 in. plastic in 12 in. steel and fiber optic in 4 in. steel

GASCO  
6" PLA/12" STL

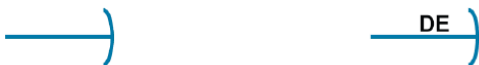
TELCO  
FO (4" STL)

7. Structures such as vaults, inlets, and lift stations that are physically larger than obvious surface indications are marked so as to define the parameters of the structure.

**Example:**



8. Termination points or dead ends are indicated as such.



**Example:**

- 9 When there is "No Conflict" with the excavation, complete one or more of the following:

- Operators of a single type of facility (e.g., TELCO) mark the area "NO" followed by the appropriate company identifier in the matching APWA color code for that facility.

Example: NO TELCO

- Operators of multiple facilities mark the area "NO" followed by the appropriate company identifier in the matching APWA color code for that facility with a slash and the abbreviation for the type of facility for which there is "No Conflict."

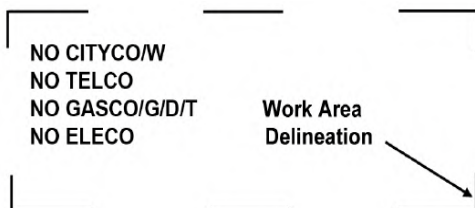
Example: NO GASCO/G/D illustrates that GASCO has no gas distribution facilities at this excavation site. The following abbreviations are used when appropriate: /G/D (gas distribution); /G/T (gas transmission); /E/D (electric distribution); /E/T (electric transmission).

- Place a clear plastic (translucent) flag that states “No Conflict” in lettering matching the APWA color code of the facility that is not in conflict. Include on the flag the operator’s identifier, phone number, a place to write the locate ticket number, and date. Operators of multiple facilities indicate on the flag which facilities are in “No Conflict” with the excavation (see the previous example).
- If it can be determined through maps or records that the proposed excavation is obviously not in conflict with their facility, the locator or operator of the facility may notify the excavator of “No Conflict” by phone, fax, or e-mail, or through the one call center, where electronic positive response is used. Operators of multiple facilities indicate a “No Conflict” for each facility (see the previous examples).
- Place “No Conflict” markings or flags in a location that can be observed by the excavator and/or notify the excavator by phone, fax, or e-mail that there is “No Conflict” with your facilities. When the excavation is delineated using white markings, place “No Conflict” markings or flags in or as near as practicable to the delineated area.

Caution: Allow adequate space for all facility mark-outs.

“No Conflict” indicates that the operator verifying the “No Conflict” has no facilities within the scope of the delineation; or when there is no delineation, there are no facilities within the work area as described on the locate ticket.

Example:



# Common Abbreviations

## Facility Identifier

CH	Chemical
E	Electric
FO	Fiber Optic
G	Gas
LPG	Liquefied Petroleum Gas
PP	Petroleum Products
RR	Railroad Signal
S	Sewer
SD	Storm Drain
SS	Storm Sewer
SL	Steam
STM	Street Lighting
SP	Slurry System
TEL	Telephone
TS	Traffic Signal
TV	Television
W	Water
W	Reclaimed Water "Purple"

## Underground Construction Descriptions

CCDRD	Conduit Corridor Distribution Facility
DB	Direct Buried
DE	Dead End
JT	Joint Trench
HP	High Pressure
HH	Hand Hole
MH	Manhole
PB	Pull Box
R	Radius
STR	Structure (vaults, junction boxes,
T	Transmission Facility

## Infrastructure Material

ABS	Acrylonitrile - Butadiene - Styrene
ACP	Asbestos Cement Pipe
CI	Cast Iron
CMC	Cement Mortar Coated
CML	Cement Mortar Lined
CPP	Corrugated Plastic Pipe
CMP	Corrugated Metal Pipe
CU	Copper
CWD	Creosote Wood Duct
HDPE	High Density Polyethylene
MTD	Multiple Tile Duct
PLA	Plastic (conduit or pipe)
RCB	Reinforced Concrete Box
RCP	Reinforced Concrete
RF	Pipe Reinforced Fiberglass
SCCP	Steel Cylinder Concrete Pipe
STL	Steel
VCP	Verified Clay Pipe

## Guide for Abbreviation Use

Follow these guidelines when placing abbreviations in the field:

- Place the Company Identifier at the top or at the left of the abbreviations.
- Place the abbreviations in the following order: Company Identifier / Facility Identifier / Underground Construction Descriptions / Infrastructure Material.  
Example: TELCO/TEL/FO/PLA indicates that TELCO has a telecommunication fiber optic line in a single plastic conduit. The use of the abbreviation /TEL is not necessary, because the orange marking would indicate that the facility was a communication line; but its use is optional.
- To omit one or more of the abbreviation types, use the order described above but omit the slash and abbreviation that does not apply.  
Example: to omit /TEL), the result would be TELCO/FO/PLA.

## APPENDIX B

### Additional References

The references contained in Appendix B are intended to be supplemental references for existing and/or new practices found within this guidebook and CGA Best Practices.

### References

American Gas Association (AGA), "Directional Drilling Damage Prevention Guidelines for the Natural Gas Industry," Technical Note, December 30, 2004.

American Society of Civil Engineers, ASCE Manuals and Reports on Engineering Practice No. 89, "Pipeline Crossings," 1996.

Bennett, R.D., S.T. Ariaratnam, and C. Como, "Horizontal Directional Drilling Good Practices Guidelines," HDD Consortium, Washington, DC, ISBN 1-928984-13-4, 2001.

California Department of Transportation, CALTRANS, "CALTRANS Encroachment Permits—Guidelines and Specifications for HDD Installations," July 14, 2003.

Directional Crossing Contractors Association (DCCA), "Guidelines for Successful Directional Crossing Survey Standards," Dallas, TX, 1999.

Directional Crossing Contractors Association (DCCA), "Horizontal Drilling Safe Operations Guidelines," Dallas, TX, 1995.

Gas Research Institute, "Final Report—Guideline for the Application of Guided Horizontal Drilling to Install Gas Distribution Piping," GRI-96-0368, September 1996.

National Transportation Safety Board, "Safety Study: Protecting Public Safety Through Excavation Damage Prevention," Washington, DC, December 1999.

National Utility Contractors Association (NUCA), "Trenchless Construction Methods and Soil Compatibility Manual," 3rd Edition, Washington, DC.

National Utility Locating Contractors Association (NULCA), "Excavation Practices & Procedures for Damage Prevention," Spooner, WI, 1996.



# **Notes**

# Safe Digging is No Accident

**Know what's below.  
Tap, Click, or Call  
811 Before you dig.**



This booklet— *Montana Excavation Safety Handbook* —is available to all in the State of Montana to help reduce damage to underground utilities, avoid interruption of service, and to protect the worker and the general public. Where this is mainly intended for *excavation* professionals, we also encourage use by laymen and underground locate professionals. Following the guidelines and safe practices in this handbook can be extremely helpful in preventing injury to you, other people and damage to underground facilities. Including saving you time and money!