

## 4-0 Excavation Best Practices



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### 4-1: The Notification Service Facility Locate Request

**Practice Statement:** The excavator requests the location of underground facilities at each site by notifying the owner through the notification service. Unless otherwise specified in law, the excavator contacts the notification service at least five working days prior to beginning excavation procedures.

**Practice Description:** Increased participation in a notification service provides for improved communication between excavators and facility owners necessary to reduce damage.

To avoid unnecessary waste of resources, a project and/or portion of the work for which a locate has been requested for and not yet provided, has been cancelled, deferred for an extended period of time, or just altered in the queue of execution, then that locate request should be cancelled.

### 4-2: Privately Owned Facility Awareness

**Practice Statement** - Prior to excavating, the excavator must be aware that privately owned buried facilities may exist within the work area and should request the private facility owner (e.g. landowner) to locate his/her underground facilities.

**Practice Description** - Privately owned underground facilities may not be marked by representatives of the public facility owners beyond the demarcation point of each facility (e.g. Private Property). The private facility owner is responsible for identifying the location of these buried facilities. Identification activities may include, but are not limited to: provision of maps, provision of engineering drawings from previous workings and/or retaining or authorizing the deployment of a private locator.

### 4-3: White Lining

**Practice Statement:** As a method of reducing damages to underground infrastructure, pre-marking of the boundaries of the work area using white paint or equivalent (or alternate colour during the winter as noted on the locate request) by the excavator should be completed prior to locating.

*Note: Electronic or virtual pre-marking can be an alternative.*

**Practice Description:** The route of the excavation is marked with white paint, flags, stakes, or a combination of these to outline the dig site prior to notifying the notification service and before the locator arrives on the job. Pre-marking allows the excavators to accurately communicate to owners or their locator where excavation is to occur. The 1997 safety study "Protecting Public Safety through Excavation Damage Prevention" by the NTSB reached the conclusion that pre-marking is a practice that helps prevent excavation damage.

## 4-4: Locate Reference Number

**Practice Statement:** The excavator receives and maintains a reference number from the notification service that verifies the locate was requested.

**Practice Description:** All calls from excavators processed by the notification service 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 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 notification service, the requestor and the owner. This number separates this ticket from all other tickets so that it can be archived and recalled upon request with the details of that request only.

## 4-5: Pre-Excavation Meeting

**Practice Statement:** When necessary, the excavator or the locator may request a pre-excavating meeting at the jobsite just prior to the actual marking of facility locations. Such pre-excavating meetings are important for major, or unusual, excavations.

**Practice Description:** The meeting will facilitate communications, coordinate the marking with actual excavation, and assure identification of high priority facilities. An on-site pre-excavation meeting between the excavator, the facility owners and locators (where applicable) is recommended on major or large projects. This include projects such as road, sewer, water, or other projects that cover a large area, progress from one area to the next, or that are located near critical or high priority facilities. Potential facilities include, but are not limited to, high-pressure gas, high voltage electric, fibre optic communication, and major pipe or water lines.

## 4-6: Facility Relocations

**Practice Statement:** The excavator coordinates work with the affected owner and the project owner where temporary or permanent interruption of a owner's service is required.

**Practice Description:** Any temporary or permanent interruption requires the active participation by the owner and the excavator to ensure protection of facilities through a joint preplanning meeting or conference calls.

## 4-7: Locate Requests

**Practice Statement:** Every excavator on the job has an appropriate locate form before excavating.

**Practice Description:** Often, there are several excavators on a job site performing work. The construction schedule may dictate different types of work requiring excavation from different specialty contractors simultaneously.

It is preferable for each excavator to obtain their own individual locate before excavating to ensure that the specific areas have been appropriately marked by any affected owner. However, where a single locate is relied upon by multiple users on the same project, it is the responsibility of the excavator to ensure that the locate is appropriate for the intended excavation, giving due consideration to the limits of the located area, depth of excavation, ticket life, and the existence of any facilities installed since the locate was performed.

#### **4-8: Notification Service Access (24x7)**

**Practice Statement:** The excavator has access to the notification service 24 hours per day, 7 days a week (24x7).

**Practice Description:** Utilities service the public needs 24x7 and thus should be protected the same amount of time. Certain conditions exist which require excavators to work during off-hours (city/road congestion, off peak utility service hours). While most excavators are on the job site during regular work hours, the ability to access (phone, internet, or other methods) in future work locations after five p.m. allows more flexibility to schedule work, not to mention getting around peak hours of locate requests at the notification service.

#### **4-9: Positive Response**

**Practice Statement:** The excavator is notified in writing by the underground owner of the tolerance zone of the underground facility by marking, flagging, or other acceptable methods at the work site shown on a locate sheet provided to the excavator, or is notified verbally and in writing, if possible, that an “all clear” situation exists. This takes place within three working days of the notification to the owner of the locate request or a mutually agreed upon date between the locator and the excavator.

**Practice Description:** If the notification service or a owner determines that the excavation or demolition is not near any of its existing underground facilities, it notifies the excavator that no conflict exists and that the excavation or demolition area is “clear.” This notification from the Notification service or the owner will include a written “all clear” response. If an excavator has knowledge of the existence of an underground facility and has received an “all clear,” response, the excavator should notify the notification service and the owner if known, that a conflict does indeed exist. The notification service and the owner should make marking these facilities a priority before excavation begins.

Positive response is a term used to describe the two types of action to be taken by a owner after it has received notification of intent to excavate.

The owner is required to 1) mark its underground facilities with stakes, paint or flags or 2) notify the excavator that the owner has no underground facilities in the area of excavation. This process allows the excavator to begin work on time or in a timely manner.

The excavator should maintain written records of all locates requested and received.

#### **4-10: Owner Failure to Respond**

**Practice Statement:** If the owner fails to respond to the excavator's timely request for a locate (e.g. within the time specified by provincial requirements) or if the owner notifies the excavator that the underground facility cannot be marked within the time frame and a mutually agreeable date for marking cannot be arrived at, the excavator re-calls the notification service. The notification service contacts the owner to ascertain the nature of the delay and heightens the locate status to an overdue locate. Where practicable, the facility owner will respond with the locate and supporting documentation within 2 hours.

**Practice Description:** It is determined that the owner and the excavator will partner together to ensure facilities are marked in an acceptable time frame to allow for underground facility protection.

#### **4-11: Locate Verification**

**Practice Statement:** Prior to excavation, excavators verify the limits of the locate markings correspond with the limits of the proposed excavation. The excavator, to the best of their ability, checks for readily visible, unmarked facilities. If a locate is found to be incomplete, inaccurate, or any other discrepancies are found, the excavator may call the locator directly. If the locate is not corrected within 4 hours, the excavator can escalate the locate to the notification service as an overdue locate.

**Practice Description:** Upon arrival at the excavation site prior to beginning the excavation, the excavator ensures that the limits of the locate are clearly identified on the locate. The excavator verifies that all facilities have been marked, reviewing colour codes if in doubt. The excavator checks for readily visible signs of underground facilities, such as pedestals, risers, meters, new trench lines and service feeds from buildings and homes. Where readily visible evidence of unmarked facilities exists, the excavator contacts the project owner to get them located. Use of a pre-excitation checklist is recommended by insurers and practiced by responsible excavating contractors.

#### **4-12: Work Site Review with Company Personnel**

**Practice Statement:** Prior to starting work, the excavator reviews the location of underground facilities with site personnel. Any locate documentation is kept on the project site.

**Practice Description:** Sharing information and safety issues during an onsite meeting between the excavator and his excavating crews will help to avoid confusion and needless damage to underground facilities.

#### **4-13: Contact Names and Numbers**

**Practice Statement:** The excavator’s designated competent person at each job site has access to the names and phone numbers of all facility owner contacts and the notification service. Such names and numbers shall be displayed on the locate sheet.

**Practice Description:** Situations arise on the job site that require immediate notification of the owner, notification service or local emergency personnel. To avoid costly delays, the excavator ensures the designated job site personnel have all appropriate names and phone numbers.

#### **4-14: Facility Avoidance**

**Practice Statement:** The excavator uses reasonable care to avoid damaging underground facilities.

**Practice Description:** Foremost on any construction project is safety. Excavators using caution around underground facilities significantly contribute to safe excavation of existing facilities.

#### **4-15: Federal and Provincial Regulations**

**Practice Statement:** The excavator adheres to all applicable federal and provincial occupational health and safety legislation and regulations.

**Practice Description:** It is important to include reference to worker safety and training in the best practices. Excavators are required to comply with federal and provincial occupational safety and health requirements to protect employees from injury and illness. These regulations include reference to training each employee in how to recognize and avoid unsafe conditions and the regulations applicable to his/her work environment to control or eliminate any hazards or exposures to illness or injury. Therefore, the excavator’s crew, as part of its safety training, is informed of regulations applicable to the protection of underground facilities, workers and the public.

#### **4-16: Marking Preservation**

**Practice Statement:** The excavator, where practical, protects and preserves the staking, marking, or other designations for underground facilities until no longer required for proper and safe excavation. The excavator stops excavating and notifies the notification service for re-marks if any facility mark is removed or no longer visible.

**Practice Description:** During long complex projects, the marks for underground facilities may need to be in place far longer than the locating method is durable. Paint, staking and other marking techniques last only as long as the weather and other variables allow. When a mark is no longer visible, but work continues around the facility, the excavator requests a remark to ensure the protection of the facility.

#### **4-17: Excavation Observer**

**Practice Statement:** The excavator has an observer to assist the equipment operator when operating excavation equipment around known underground facilities.

**Practice Description:** The observer is a worker who is watching the excavation activity to warn the equipment operator while excavating around a utility to prevent damaging that buried facility. This is common practice among excavators and large facility owners.

#### **4-18: Excavation Tolerance Zone**

**Practice Statement:** The excavator observes a tolerance zone which is comprised of the width of 1 metre from the centreline of a located cable or conduit and 1 metre from either side of the outside edge of the underground facility on a horizontal plane. This practice is not intended to pre-empt any existing provincial or federal requirements.

**Practice Description:** (See Practice Description for #4-19 following.)

#### **4-19: Excavation within Tolerance Zone**

**Practice Statement:** When excavation is to take place within the specified tolerance zone, the excavator exercises such reasonable care as may be necessary 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, vacuum excavation methods, pneumatic hand tools, other mechanical methods with the approval of the owner, or other technical methods that may be developed. Hand digging and non-invasive methods are not required for pavement removal.

**Practice Description:** Safe, prudent, non-invasive methods that manually expose a facility are considered "safe excavation practices". Some guides for excavation in the vicinity of utilities specifically allow for the use of power excavating equipment for the removal of pavement and sidewalk but not curbs or base materials. Differing geologic conditions and weather related factors must be taken into consideration when using types of excavation within the tolerance zone.

## 4-20: Unidentified Facilities

**Practice Statement:** The excavator notifies the owner directly or through the notification service if an inaccurately marked or unidentified underground facility is found. Following this notification, the excavator may continue work if the excavation can be performed without damaging the facility.

**Practice Description:** When an excavator finds an inaccurately marked or unidentified facility, excavation stops in the vicinity of the facility and notification takes place. If excavation continues, the excavator plans the excavation to avoid damage and interference with other facilities and protects facilities from damage.

## 4-21: Exposed Facility Protection

**Practice Statement:** Excavators support and protect exposed underground facilities from damage and those methods comply with the requirements set by the infrastructure owners.

**Practice Description:** Protection of exposed underground facilities is as important as preventing damage. Protecting exposed underground facilities helps to ensure that the utility is not damaged and as the same time protect 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 support or brace facilities and protect them from moving or shifting. This can be accomplished in different ways, for example, by shoring the facility from below or by providing adequate support. Workers are also instructed not to climb on, strike, or attempt to move facilities while exposed.

## 4-22: Relocate Request

**Practice Statement:** The excavator calls the Provincial Notification Service to request a relocate ticket based on the validity period of the locate. The locate validity period is critical to all parties in protecting underground facilities. The locate validity period is determined by the facility owner and is noted on the locate sheet. The facility owner will clearly identify the length and conditions of the validity period of the locate, unless otherwise specified by provincial or federal law. If the excavation is not completed according to the validity period and corresponding conditions, the excavator must call the notification service for a relocate. One utility should be identified per locate sheet to avoid congestion and address variable locate validity periods.

**Practice Description:** Requesting a locate or refreshing the locate ticket recognizes that markings are temporary and provides notification to facility owners of ongoing excavation when a job is requested to started or has not been completed as planned. Any excavation that covers a large area and will progress from one area to the next over a period of time is broken into



segments as agreed to between the excavator, owner and/or the locator in order to coordinate the marking with actual excavation. The possibility exists that new facilities have been installed in the area where the excavation is to be conducted after the original notification and marking.

Many facility owners 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 owner another chance to identify the location of their facilities and to avoid a possible damage and disruption of service should something have been marked incorrectly or missed on a previous locate.

### **4-23: Facility Damage Notification**

**Practice Statement:** An excavator discovering or causing damage to underground facilities notifies the owner as identified on the locate form. All breaks, leaks, nicks, dents, gouges, grooves, or other damages to facility lines, conduits, coatings or cathodic protection will be reported immediately.

**Practice Description:** The possibility of facility failure or endangerment of the surrounding population dramatically increases when a facility has been damaged. While the facility may not immediately fail, the underground owner should have the opportunity to inspect the damage and make appropriate repairs.

### **4-24: Notification of Emergency Personnel**

**Practice Statement:** If the damage results in the escape of any flammable, toxic, or corrosive gas or liquid or endangers life, health, property or the environment, the excavator responsible immediately notifies the appropriate authorities and the owner.

The excavator takes reasonable measures to protect workers and others in immediate danger; the general public; property, and the environment.

**Practice Description:** This practice minimizes the danger to life, health 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 owner.

The excavator takes reasonable measures based on their knowledge, training, resources, experience and understanding of the situation to protect

workers, the public, property and the environment until help arrives. The excavator responsible remains on site to convey any pertinent information to responders that may help them to safely mitigate the situation.

## 4-25: Emergency Excavation

**Practice Statement:** In the case of an emergency excavation, the excavator notifies the notification service and owner and requests an emergency locate.

**Practice Description:** Provincial regulations require excavators to request locates including emergency situations.

An Emergency excavator locate request is defined as a loss of essential service by a utility and an excavator work crew is on site or dispatched, or there is an imminent safety hazard requiring a locate response by facility owners within two (2) hours.”

## 4-26: Backfilling

**Practice Statement:** When backfilling, all facilities should be protected from damage and unintended movement by following facility standards.

**Practice Description:** The excavator should provide suitable bedding material to surround and protect the facility(s). The backfill should be comprised of “clean material” (free from trash or debris), with the removal of large rocks, sharp objects, and large chunks of hard packed clay which could potentially penetrate the bedding material and damage the facility(s). All backfill should be compacted to prevent undesired displacement of both the backfill material and the facility(s).

## 4-27: Notification of Installation/Construction Changes

**Practice Statement:** After installing underground facilities a contractor should notify the owner if the as-built placement differs from the placement shown on the construction drawings.

**Practice Description:** In order for a owner to maintain accurate records of its underground facilities, contractors who have installed these facilities should be required to notify the owner of the as-built location of the underground facilities. In particular it is important to identify changes in the planned alignment of the underground facilities these changes can be horizontal and/or vertical deviations from the planned alignment. The owner should establish standards that require notification if a deviation is beyond specified tolerances (e.g. vertical deviation  $\geq 150$  mm, horizontal deviation  $\geq 300$  mm). It is the owner's responsibility to take appropriate action to update and maintain its mapping records (As-built drawings) so that accurate locates can be provided in the future.

## 4-28: Vacuum Excavation Definition

**Practice Statement:** Vacuum excavation is defined as a mechanical means of soil extraction through vacuum when using water or air jet devices for breaking ground. This method of excavation is commonly referred to as “soft excavation technology” and is commonly accepted as being equivalent or safer than hand digging within the “tolerance zone” around underground facilities.

**Practice Description:** Vacuum excavation may be used to excavate safely around utilities if the equipment has been designed and engineered for excavating. The equipment is used following the manufacturer’s recommended practices, documented procedures and meets facility owner guidelines. Only competent and qualified workers shall operate vacuum excavation equipment.

## 4-29: Operator Competency – Vacuum Excavating

**Practice Statement:** Vacuum excavation equipment shall only be operated by a “competent worker” as defined by OH&S regulations for Construction Projects. The operator must have knowledge, training and experience to perform the work, be familiar with the OH&S Act and the regulations that apply to the work and have knowledge of all potential or actual danger to health and safety in the work place. It is a best practice that workers have training recognized by the industry, defined work practices and manufacturer’s recommended procedures specific to the equipment they are operating.

**Practice Description:** Vacuum excavation equipment operators should have also completed at a minimum the training outlined by the “IHSA Safe Practice Guide for Excavating With Hydrovacs in the Vicinity of Underground Electrical Plant” and training specific to any known facilities in the area of excavation.

## 4-30: Safe Operation of Vacuum Excavation Equipment

**Practice Statement:** Vacuum excavation can be used to excavate safely around utilities if the equipment has been designed and engineered for vacuum excavating according to the manufacturer. Equipment must be operated in accordance with recognized practices and procedures that provide necessary levels of worker and public safety and prevent damage to underground utilities.

**Practice Description:** Excavators shall have as a minimum:

- A documented company Safety Program in place which can be made available for review on request by a representative of a facility owner.
- Written vacuum excavation Job Procedures must be in place and made available for review on request by a representative of a facility owner.
- The contractor’s equipment specifications and or job procedures must comply with applicable regulations.

#### **4-31: Frozen Ground Excavation**

**Practice Statement:** A preferred method for excavating within the tolerance zone around any underground utility in frozen ground is to use a hydrovac designed and built for this purpose.

**Practice Description:** Conventional excavation methods in frozen ground pose a risk to buried facilities if the facility is surrounded by frozen ground. The use of conventional mechanical excavation equipment can not only damage plant via direct contact but can also move frozen ground encasing plant; potentially causing damage.

The best practice for excavating in the tolerance zone in frozen ground is to use a hydrovac with heated water not exceeding 45 degrees C at the wand tip. This is currently the practice used by many vacuum excavators.

#### **4-32: Utility Owner Acceptance of Vacuum Excavation Practices**

**Practice Statement:** Each utility has a specific criterion for safe excavating practices. Some utilities view Vacuum Excavation as the equivalent to hand digging when exposing their utility and others have restrictions on their use. It is recommended excavators contact the utility owners to determine the extent of their restrictions for the use of this method of excavation around their plant.

**Practice Description:** Every excavator who wishes to utilize vacuum excavation as a method to excavate within the “tolerance zone” of any underground plant should contact the owner of the utility to determine the specific criteria they deem acceptable prior to starting the excavation. Some utilities will accept this practice as the equivalent to hand digging; others may have very specific procedures and operating criteria that need to be followed.

Utility owners generally recognize the benefits for damage prevention by utilizing this process. Utility owners should work together to establish a common set of standards, process and procedures that can be accepted by all damage prevention stake holders.

## 4-33: Protection of Survey Infrastructure

**Practice Statement:** Every excavator is responsible for recognizing and ensuring the integrity of survey infrastructure.

**Practice Description:** Every excavator should recognize the importance of not disturbing monumented boundaries. Utility infrastructure must be installed to avoid disturbing survey infrastructure. Survey infrastructure may include iron bars, iron pipes, wood posts, cut stone monuments, rock mounds, rock bars and building corners.

**References:**

1. Because of their significance, survey monuments are protected by both federal and provincial law.

**The Criminal Code of Canada R.S. 1985, c. C-46** under Part XI, Sec. 442 and 443 states, "Everyone who willfully pulls down, defaces, alters or removes anything planted or set up as the boundary line or part of the boundary line of land is guilty of an offence punishable on summary conviction."

## 4-34: Excavation and Public Safety

**Practice Statement:** Excavations are performed safely.

**Practice Description:** It is the responsibility of the owner and Excavator to establish when and how the excavation will be performed. All hazards associated with excavating are identified. Appropriate measures conforming to federal, provincial, local and industry standards are established. Employees are made aware of these hazards and properly trained in worker safety standards. Appropriate safeguards are put in place to protect the public.

The following items should be considered as part of the above.

- Soil classification
- Traffic control, including passing vehicles and pedestrians
- Construction vehicular movement
- Trip and fall hazards
- Adjacent structures and/or facilities
- Maintaining clear distances on top of excavations for materials and equipment
- Sources of energy (overhead and other)
- Environmental factors

## 4-35: Pre Demolition Verification Process

**Practice Statement:** The excavator/demolition contractor should have a process to verify that all owner infrastructures, above and below ground, are isolated and/or disconnected with confirmation from the owner prior to demolition activities starting.

**Practice Description:** The excavation/demolition contractor shall receive and review any required permits and ensure that all above and below ground facilities have been isolated and/or terminated. This may include utility locates, site inspection, obtaining confirmation/as built drawings from facility owner.

## 4-36: Trenchless Excavation

**Practice Statement:** To prevent damages to existing facilities when using Trenchless Excavation. Trenchless Excavation is a type of subsurface construction work that requires few trenches or non-continuous trenches. Trenchless Excavation includes such construction methods as tunneling, micro tunneling (MTM), horizontal directional drilling (HDD) also known as directional boring, pipe ramming (PR), pipe jacking (PJ), pneumatic piercing, horizontal auger boring (HAB) and other methods for the installation of pipelines and cables below the ground with minimal excavation.

**Practice Description:** Create a bore plan considering all affected facilities prior to excavation. Request the location of underground facilities within the work area including, but not limited to, the position of the excavation equipment, the entrance pit, trenchless excavation path and the exit pit. Physically expose all existing located facilities, both vertically and horizontally, according to the facility owner's specifications.

The excavation equipment operator or other competent person shall review the utility locates and perform a site specific inspection, including walking the entire proposed trenchless excavation path, prior to commencing work. Findings shall be communicated to all relevant parties.

Proximity to all facilities should be considered at all times during the installation process. The excavation equipment operator or competent person shall maintain the bore path and confirm the minimum clearances established by any affected facility owner. The installation process includes the pilot bore, all pre-reaming passes and the final product installation. Means of tracking trenchless excavations include electronic locating/guidance devices, pipe lasers, water levels, etc.

When existing facilities are known to be present but are not exposed as a result of local conditions, the facility owner and the excavator shall meet to agree on how to safely proceed with the excavation. The trenchless excavation operations shall stop if an abnormal condition, unknown

substructure, or other hidden hazard is encountered. The trenchless excavation operations shall proceed only after a risk assessment is completed in the field. Visual confirmation of the product installation relative to existing facilities is the preferred method of proper installation clearance verification.

**Horizontal Directional Drilling (HDD)**

- Equipment set up
- Facility Locating and Equipment set back
- Drill pit/receiving pit
- Pilot Bore
- Back Reaming
- Recording – Data logging, manual maps, electronic, GPS

**Pipe Jacking & Micro Tunneling**

- Equipment set up
- Facility Locating and Equipment set back
- Drill pit/receiving pit