MSW Initial/Refresher Training:
Excavation

Purpose, Objectives and Scope

Purpose of the Training

– Learn the requirements of the Excavation standard and the specific safety instructions for excavation activities and equipment

Objectives of the Training

– To ensure the protection of all company and contractor personnel from injury and facilities from damage due to work associated with excavations.

Scope

– This Standard applies to all company and/or contractor personnel performing and/or monitoring construction, operational or maintenance activities at any Chevron facility/property that involves work associated with excavation

– This Standard does not include:

- Rescue techniques for emergency response
- Civil engineering detailed design requirements

Excavation Standard

Introduction

- Excavation (e.g. digging, cut & filling, micro-tunneling, pipe bursting, vibratory plowing, trenching, etc.) standards are designed to help prevent injuries to personnel, property damage and adverse environmental impact as a result of potential hazards associated with excavation work, including encountering underground utilities, potential overhead hazards, subsurface installations, hazardous atmospheres, falls, cave-ins and/or collapses.
- This Excavation module covers work performed by Chevron employees and their delegates and contractors within Chevron.

Excavation Standard

Key Definitions

Excavation

- Any man-made cut, cavity, trench, or depression in an earth surface formed by earth removal.
- Any man-made cut or hole in a hard surface such as asphalt, concrete, cement, etc. through the use of a drill bit greater than or equal to 2 inches (5 cm) diameter, jackhammer, saw, excavator (i.e. backhoe, etc.), or any other mechanical means.

Barricade

- An obstruction, such as tape, rope, netting, flasher units, or traffic cones that is placed to prohibit personnel and/or equipment from passing into an area where hazards may be present. A barricade must a present and easily recognizable warning against entry

Benching

- Method of protecting workers from cave-ins by excavating the sides of an excavation to form one or a series of horizontal levels or steps, usually with vertical or near vertical surfaces between levels.

Excavation Standard

Key Definitions

Day-Lighting

- In the context of excavation, the process of safely exposing an underground utility to precisely locate and identify it. Day-lighting is done with hand tools, vacuum excavation, or other means that cannot damage the utility.

Shields

- A structure capable of withstanding the forces of a cave in. The structures, also called trench boxes, are designed to protect workers within the structure and can be permanent or can be designed to be portable and moved as the work progresses.

Shoring

- Hydraulic, mechanical or timber reinforcement used to support the sides of an excavation to prevent cave-in.

Excavation Standard

Key Definitions

Sloping (Battered)

- Removing soil from the sides of an excavation, so they are inclined away from the excavation sufficiently to prevent cave-ins. The angle of incline required varies with differences in soil type, environmental conditions of exposure and application of surcharge loads.

Utility Locator

- An electronic device for scanning and locating underground services/utilities.

Utilities

- Any piping, wiring, conduit (or other equipment that serves as a conduit for electricity), fuel, water, compressed air, sewer, and telecommunication to or from a facility.

Excavation Standard

Key Definitions

Trench

- A narrow excavation (in relation to its length) made below the surface of the ground. The depth is greater than the width but the width of a trench (measured at the bottom) is not greater than 15 feet (4.6 meters). Trenches that are greater than or equal to 4 feet (1.2 meters) in depth are considered confined spaces.

Support system

- A system, such as underpinning, bracing or shoring, that provides support to an adjacent structure, underground installation, or the sides of an excavation

Protection Systems

- Methods used to protect workers from cave-in, from material that could fall into an excavation, or from collapse of an adjacent structure. Protection systems include support systems, sloping, shoring, benching, and shields.

Excavation Standard

Pre-job Planning and Hazard Analysis

- The scope of the job and the hazards will dictate the planning that is required.
- Pre-job planning and hazard assessment is the first step in any excavation process and is covered by the Hazard Analysis Standard.
- Prior to commencing any work, the maximum amount of data that can be reasonably collected should be gathered about the site conditions and location of utilities.
- In addition, a site inspection may be required noting the proximity to other buildings, roads and structures as part of the site data collection.
- Soil samples may also need to be collected and tested to determine soil classification to ensure appropriate protection systems are identified.

Excavation Standard

Pre-job Planning and Hazard Analysis

- Hazard Analysis shall be performed in accordance with the Chevron F&L Hazard Analysis Standard when planning excavation activities to:
  a. Identify significant, potential hazards.
  b. Identify the need for special processes such as gas testing.
  c. Identify if work will require permits (e.g., Permit to Work, Hot Work, Confined Space, and Excavation).
  d. Assess the need for Simultaneous Operations (SimOps), and if so, to evaluate potential hazards associated with the SimOps.
  e. Identify and evaluate precautions to ensure that work may be conducted safely.

- A Job Safety Analysis (JSA) or equivalent shall be conducted at the work site in accordance with the Chevron F&L Hazard Analysis Standard prior to Excavation activities.

- Hazard Analysis shall include evaluation for potential exposure to hazardous vapors when the worker is required to crouch down to perform work in excavations between 3 feet/ 900 mm and 4 feet/1.2 m.

Excavation Standard

Pre-job Planning and Hazard Analysis

There are 5 key hazard / risk assessment steps when working with excavations:

- **Step 1** - There will be a hazard identification process to identify the likely hazards arising from excavation work. This step includes consulting the Task Consequence Catalogue (TCC) which will identify the requirements based on excavation type and depth.

	Task Consequence Catalog, Version 9	January 31, 2020		Additional documents to be determine by Site	BLANK cells to be determined by Site Management in alliance with Site SME				Notes and References may be updated by Site
ID#	TASK	Consequence	TASK TYPE	Other Relevant Documents	Permit Issuer MUST attend Pre-job Briefing	Site Check Requirement	Approval Requirements	CCP Review Team	Notes and References
E20H	Excavation < 4ft deep using a powered mechanical tools or device	High	Non-Open Flame	Underground Drawings SWC-EXC-1					DS&C Excavation Standard
E21L	Excavation using hand tools where depth is less than 4ft - Includes hand auguring up to 5 ft.	Low	Cold Work						DS&C Excavation Standard
E22L	Excavation using hydro or pneumatic excavation techniques	Low	Non-Open Flame						DS&C Excavation Standard
E23C	Excavation: > 20 ft. deep (6.1m) (Confined Space Entry)	Critical	Task Dependent	Site generated CCP Underground Drawings Engineered Drawing	Yes	Yes	Maintenance or Engineering Manager	Civil Engineering SME	DS&C Excavation Standard
E24H	Excavation: > 4ft (1.2m) (Confined Space Entry)	High	Task Dependent	Underground Drawings SWC-EXC-2					DS&C Excavation Standard

- **Step 2** - Assess the risk of injury to a person and/or to adjacent structures arising from excavation work
- **Step 3** - Control the risks by having systems which will prevent collapse of the excavation, ingress of water or hazardous materials/vapor encountered
- **Step 4** - Document the results of the hazard assessment using the JSA form
- **Step 5** - Monitor controls for effectiveness

Excavation Standard

Pre-job Planning and Hazard Analysis

The area to be excavated must be planned

No matter how many trenching, shoring, and backfilling jobs you have done in the past, it is important to approach each new job with the utmost care and preparation. Many on-the-job accidents result directly from inadequate initial planning. Waiting until after the work has started to correct mistakes in shoring or sloping slows down the operation, adds to the cost, and increases the possibility of a cave-in or other excavation failure.

Develop a high level work plan, which should include:

- The specific location of the drilling, cutting, or breaking of the asphalt/concrete/cement/etc. This should include the path of the excavation or cut, or the area to be jackhammered, drilled or otherwise disturbed. .
- The tools to be used (drill, jackhammer, wet saw, grinder, etc.)

Planning Phase Hazard Analysis (PPHA)

Things to consider during the Planning Phase Hazard Analysis

- Traffic,
- Proximity and physical conditions of nearby structures,
- Soil type and stability,
- Surface and ground water,
- Location of the water table,
- Overhead and underground utilities,
- Soil – contamination and disposal, and
- Weather.

Excavation Standard

Pre-job Planning and Hazard Analysis

Planning Phase Hazard Analysis (PPHA) (continued)

Additional things to consider during the Planning Phase Hazard Analysis

- Review all available drawings for buried conduits, cables, and piping that may run through the proposed excavation and work area.
- Discuss with Operations and Maintenance the history of operation and maintenance in the area where the excavation will take place. This information is helpful in understanding what might be in the area
- Identify the need for Utility Locating and schedule
- Potential hazards and/or surface encumbrances (e.g., trees, utility poles, rocks, proximity of structures, excavated material, vehicles/equipment) shall be removed or secured prior to beginning excavation work.
- Notifications of planned excavations shall be made to the appropriate entities prior to beginning work.
- Arrangements shall be made with the appropriate utility company or agency for the protection, support, removal, shutdown, isolation or relocation of utilities or subsurface installations.
- Contractor OE Management (COEM) requirements

Excavation Standard

Work Authorization and Permitting

An Excavation Form shall be required prior to breaking the surface, including but not limited to the:

- Breaking the surface with power tools and/or heavy equipment (e.g. trencher, backhoe, pile driver, boring machine, jackhammer, saw, drill, or similar) regardless of depth.

  Note: Breaking the surface excludes scraping the ground (e.g. removal of weeds, small oil spills, hydro-excavation, etc.)

- Excavating 4 feet/1.2 m or deeper using hand tools.
- When specialized work permits (e.g., Hot Work, Confined Space Entry) are required to manage the risks of the excavation.
- Any time gas testing of the excavation area is required.

The Excavation Form is valid for the duration of the excavation as long as the scope of the excavation is planned in detail (depth, path/dimension, etc.) and mapped in advance. The scope of the excavation must not change, otherwise the Form must be cancelled and a new one issued.

An Excavation Form shall be used in conjunction with a Permit to Work in accordance with the Chevron F&L Work Authorization Standard.

Note: an excavation permit is not required for breaking/cutting/drilling concrete, asphalt, cement, etc. if the depth of the break/cut/hole is confined to the depth of the hard surface (doesn't go into the earth).

A Confined Space Entry Permit is required for any work in excavations 4 feet (1.2 meters) or greater. This depth makes the excavation a Confined Space.

For excavations carried out in hazardous area, a Hot Work Form is required and required safeguards related to Hot Work followed.

Excavation Standard

Preventing Cave-Ins

Steps shall be taken to protect workers from cave-ins for excavations including, but not limited to the following:

- When excavations are 5 feet/1.5 m or greater.
- When an inspection by a competent person concludes that an excavation less than 5 feet/1.5 m has the potential for a cave-in.

Personnel entering excavations 5 feet/1.5 m or deeper (or when inspection by a competent person identifies the potential for cave-in for depths less than 5 feet/1.5 m) shall be protected by protective systems including support systems (e.g., bracing, shoring), sloping, benching, and/or shield systems designed by a civil engineer or other qualified professional (e.g., Registered Professional Engineer):

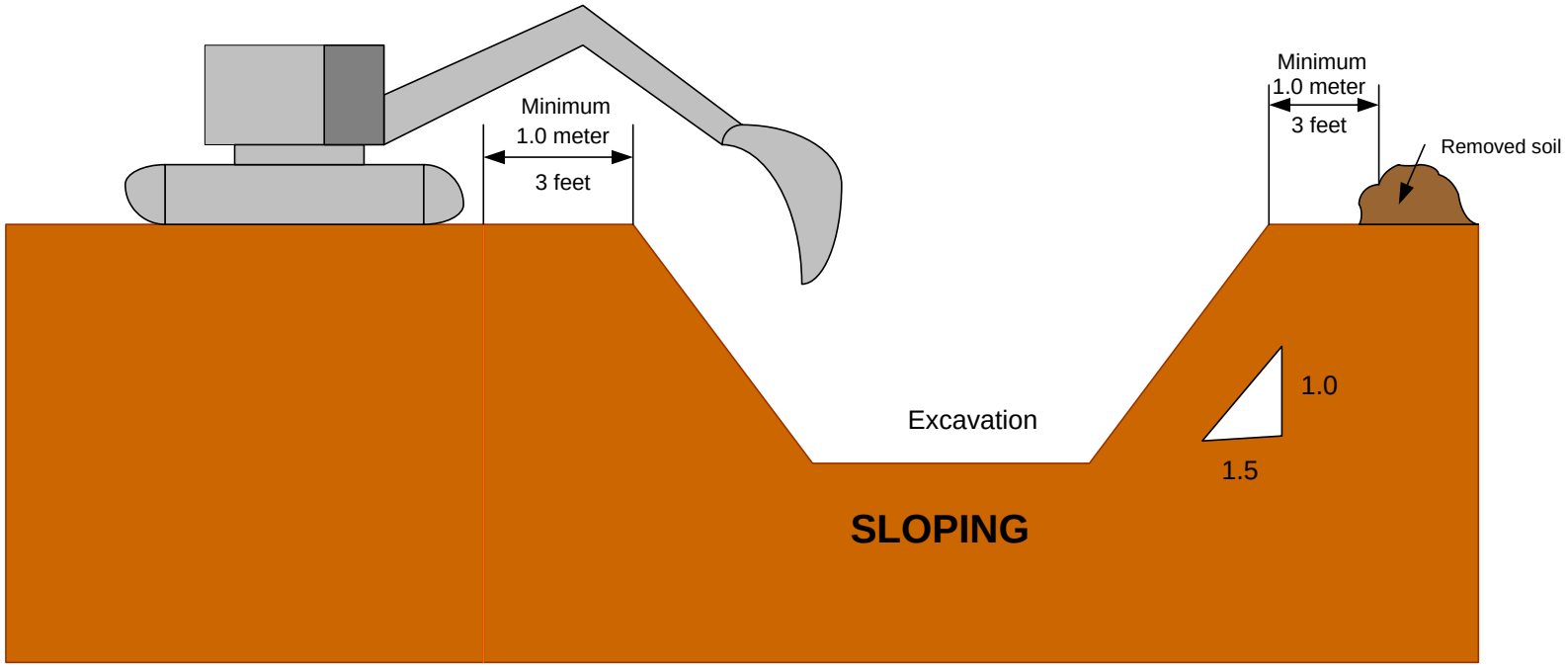
- Materials and equipment used for protective systems are free from damage or defects and installed and maintained in a manner consistent with manufacturer recommendations.
- Protective systems shall have the capacity to resist without failure all loads that are intended or could reasonably be expected to be applied or transmitted to the system.
- Designs of protective systems shall meet applicable legal requirements, as well as Chevron standards and/or accepted best practices.

Excavation Standard

Preventing Cave-Ins

Sloping of the excavation's sides.

- Removing soil from the sides of an excavation, so they are inclined sufficiently to prevent a cave-in. The angle of the incline required varies with the type of soil. Typically a safe slope is 1.0 rise to 1.5 run, as shown below. Notice that equipment and soil is kept back 1 meter (3 feet)

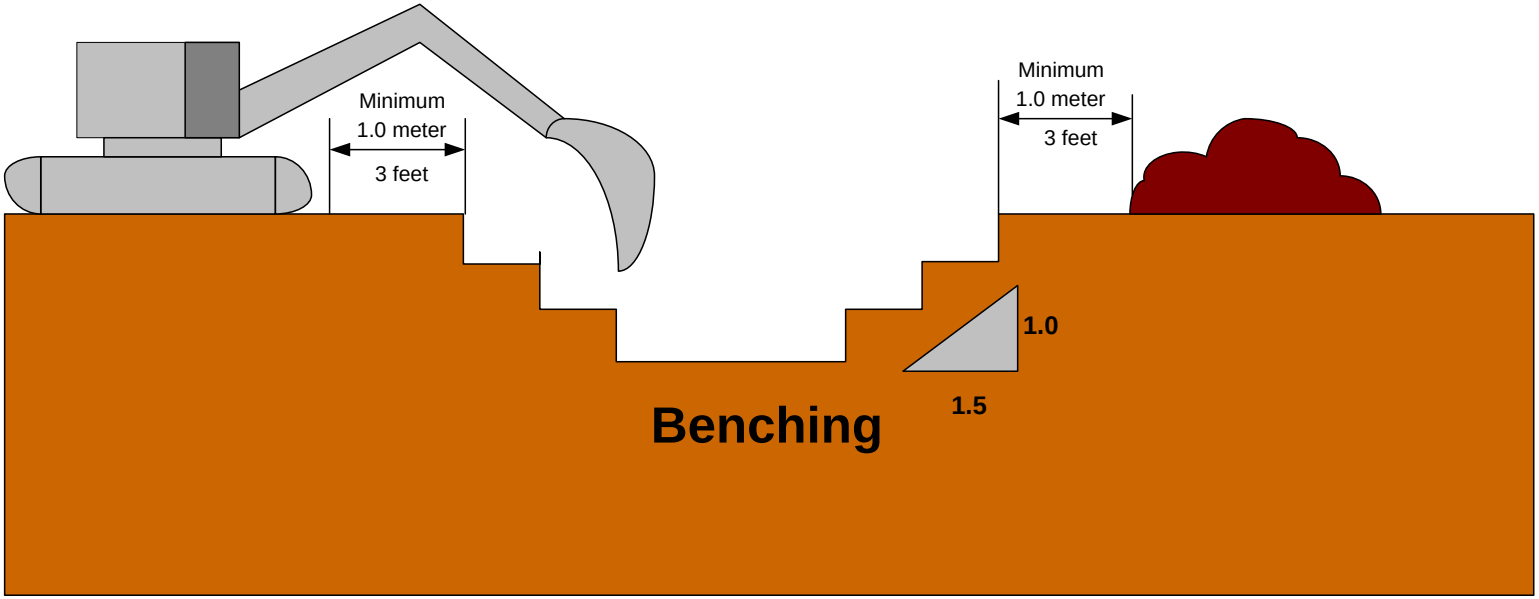


Excavation Standard

Preventing Cave-Ins

Benching of the excavation's sides

- Terracing or stepping the sides of an excavation to prevent a cave-in. The forming of one or more horizontal levels or steps. Typically a bench slope is 1.0 rise to 1.5 run, as shown below. Notice that equipment and soil is kept back 1 meter (3 feet)

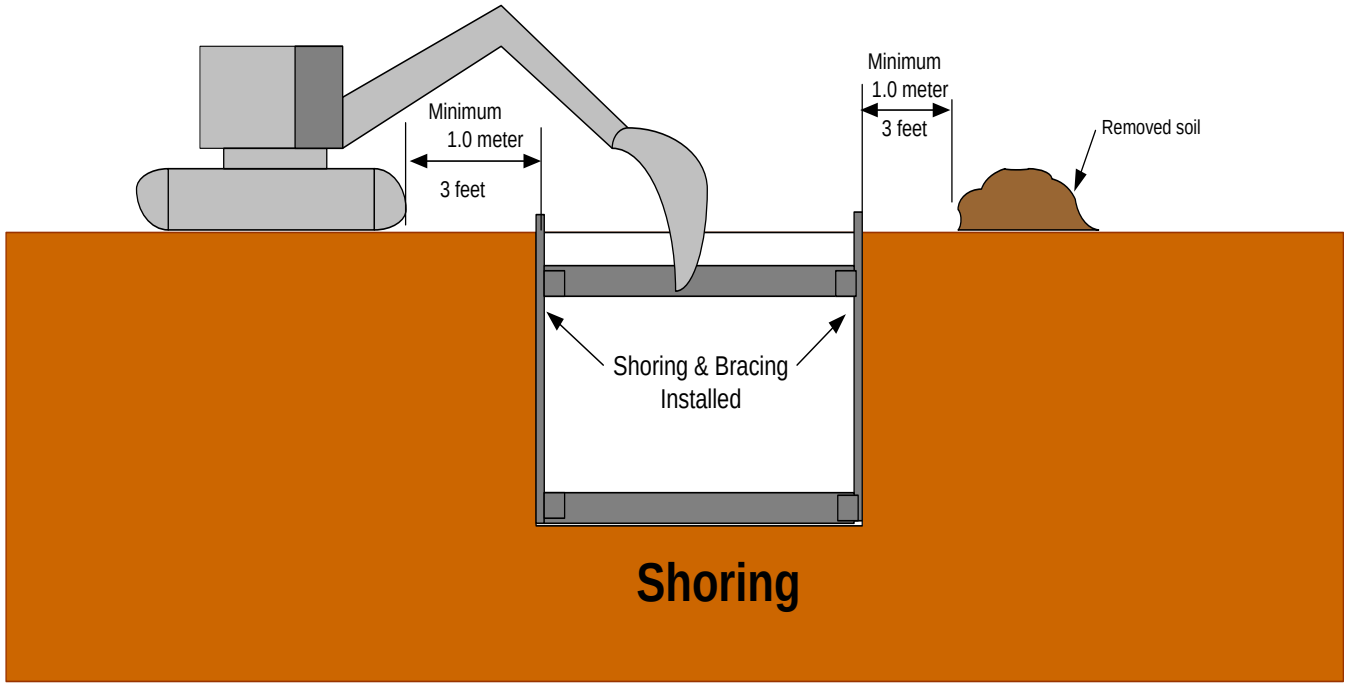


Excavation Standard

Preventing Cave-Ins

Shoring the excavation's sides

- Hydraulic, mechanical, or timber reinforcement used to support the sides of an excavation to prevent cave-in. Notice that equipment and soil is kept back 1 meter (3 feet)

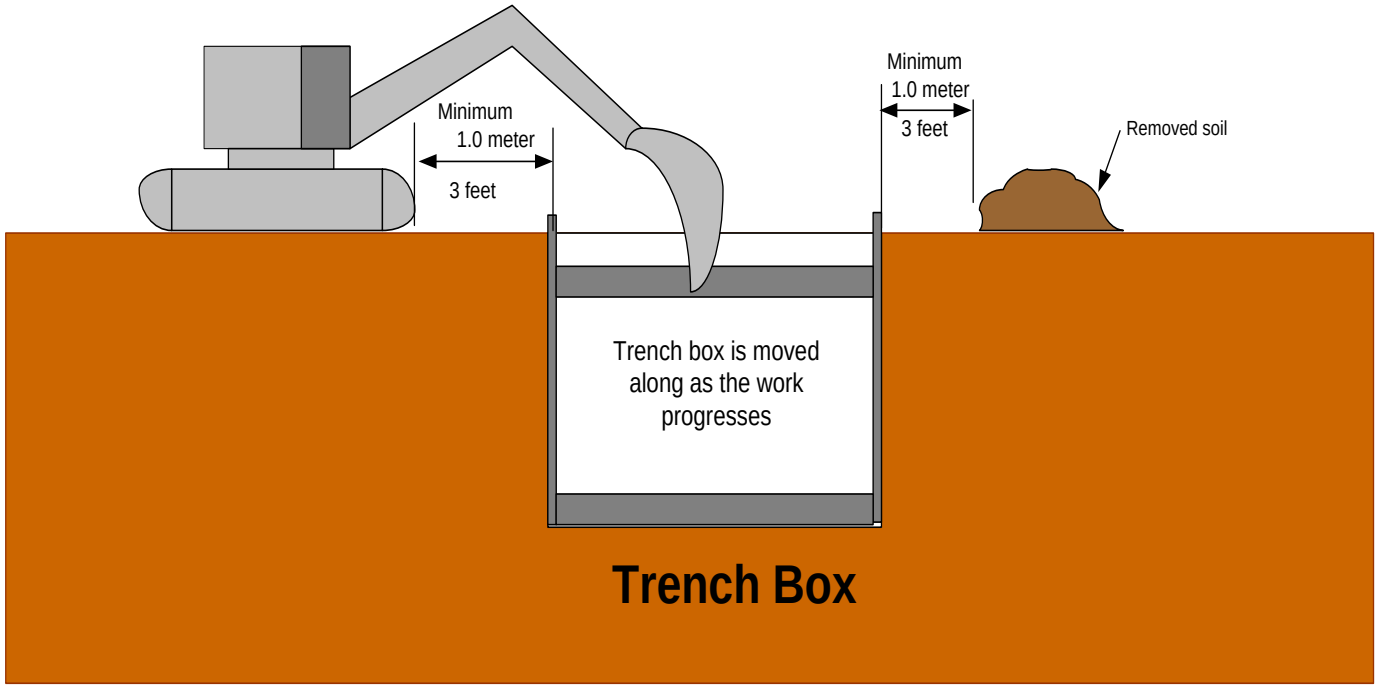


Excavation Standard

Preventing Cave-Ins

Shields supporting the excavation's sides

- Structures capable of withstanding the forces of a cave-in. Designed to protect employees within the structure and to be moved as the work progresses. Also called "trench boxes". Notice that equipment and soil is kept back 1 meter (3 feet)



Excavation Standard

Surface Water and Drainage

- The safety of faces and fillings often depends on the effectiveness of the control of surface and ground water
- To control surface water, cut-off drains may be constructed to divert the water clear of the working area
- Drains may also be necessary inside the excavation itself
- Any inflow should be collected in sumps and pumped clear of the excavation.

Excavation Standard

Excavation Wall

- If there is too much water the excavation walls get heavy and collapse.
- Ground water and storm run-off can undermine the bottom of the trench.
- Freezing and thawing ground makes the trench wall unstable and can overstress shoring.
- If there is too little water, the trench bank can dry out and crack.

Excavation Standard

Inspections

While work is proceeding or an excavation is otherwise open, a competent person shall conduct and document inspections of the excavation, adjacent areas, and protective systems including, but not limited to:

- Daily, before the start of work each shift.
- As dictated by the work performed.
- After every rainstorm
- When fissures, tension cracks, sloughing, underground cutting, water seepage, bulging at the bottom, or other similar conditions occur.
- When there is a change in the size, location, or placement of the soil pile.
- When there is an indication of change or movement in adjacent structures.
- After any event that may damage protective equipment.
- After other events that could increase potential hazards (e.g., windstorm, earthquake, dramatic change in weather).

Excavation Standard

Gas Testing in Excavation

Inside the excavation (below ground level), the following gas detection requirements must be met:

- If the soil could be contaminated with hydrocarbons, gas detection for flammables must take place and permits are required in accordance with the Hot Work Standard
- For any excavation 4 feet (1.2 meters) or greater, a Confined Space Entry permit is required and gas testing must occur in accordance with the CSE standard.
- Gas testing for any suspected toxins must take place prior to entry

Excavation Standard

Contaminations

Soil Contamination

- If the soil or material being excavated appears contaminated, work will stop and advice from an Environmental Specialist sought on the precautions to be taken and any disposal requirements. The Third-Party Waste Stewardship process is to be reviewed.
- Preplanning the handling and disposal procedure can minimize work disruption if contamination is anticipated

Water Contamination

- Groundwater may contain hydrocarbon contamination. If so, the water will be suitably treated prior to off-site discharge.

Air Contamination

- There is always the possibility of odors being present during excavation. Any unusual odor should be investigated and reported.
- Odors may indicate soil contamination by hydrocarbons or other sources they may also indicate a leak in an underground utility.
- Explosion protected pumping equipment, suitably bonded and grounded to eliminate the risk of a static discharge, may also be required if hydrocarbon vapors are present.

Excavation Standard

Change in Conditions

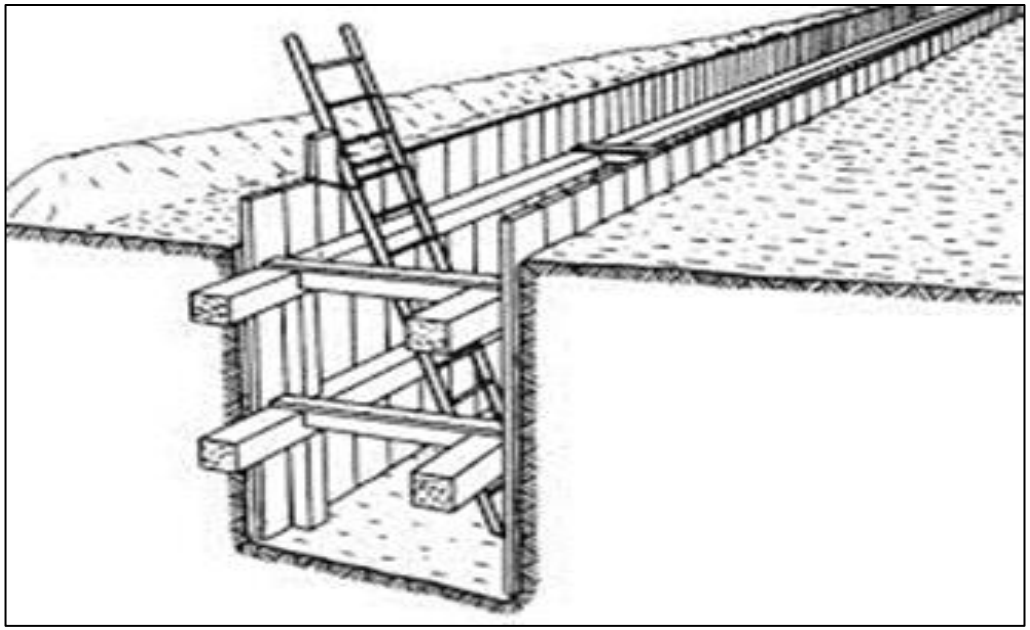
Change in Conditions

- Any change in work conditions will result in a reassessment of the work tasks to ensure existing safeguards implemented will still be effective
- Changes in work conditions may result in the Work Permit / permit forms being suspended or withdrawn
- Changes in work conditions can include, but are not limited to:
  - Activities being performed (e.g., need to now perform hot work, entry, or work at height)
  - Other facility activities being performed
  - Scope of work
  - Weather
  - On-site work personnel
  - Emergency situation at the facility work

Excavation Standard

Ladder requirements for Excavation

- Ladders shall be installed in excavations deeper than 1.2 meters to provide a safe means of access and egress for workers.
- Ladders shall be placed a maximum of 7.5 meters (25 feet) apart.
- Ladders should extend 1 meter (3 feet) above the top of the excavation.
- Additional ladders should be installed if more than one worker will be in the excavation, it is suggested that for 5 persons two ladders should be installed and an additional ladder for every additional 5 persons.
- Workers should follow the general safety rules when using ladders.



Excavation Standard

Underground Utilities

Identifying Underground Utilities

- Underground utilities or subsurface installations (e.g., electric, fuel, water, compressed air, sewer and telecommunication lines) shall be identified.
- Methods of determining the location of underground utilities include:
  - Reviews of drawings
  - Probing with a non-conductive blunt tipped probe
  - Discussions with Operations and Maintenance regarding the history of the site
  - Line locating technologies
    - The type of technology is determined by what you could find underground and the surface and subsurface mediums.
  - Etc.

Regulatory Requirements

- Review regulations to determine if “One Call” or other Government or Utility Companies need to conduct line locating. Verify each stakeholder formally responds. Contact those who don’t respond. Do not break ground without getting a formal response from each stakeholder.
- Schedule if required.
- Verify local regulatory requirements around day-lighting utilities prior to breaking ground. (Jurisdiction may require)

Note: Regulations that require this service typically will only require the locating to be done from the street to the building, so we will likely need to perform our own line locating.

Other Considerations

- Bring in experienced contractor to conduct the line locating.
- Verify personnel performing utility locating activities are properly trained and using the equipment best suited for the conditions of the locate.

Excavation Standard

Underground Utilities

The chart below shows the requirements regarding for methods to determine the location of underground utilities. As you can see, more than one method is required as none of the methods is perfectly accurate.

Task	Review of Drawings	Discussion w/ Area Owner and Other Facility Staff	Use of Line Cutting Technology
Hand digging with blunt edge tools	X	X	N/A
Drilling small diameter hol (<2" – 5 cm)	X	X	If lines are suspected in the area
Drilling large diameter hole (> / = 2" – 5 cm)	X	X	X
Cutting	X	X	X
Jack hammering	X	X	X

Utility Locating Technologies descriptions

Line Locating Technologies	
Method	**Description**
Acoustic (Ultra Sonic)	Ultra-sonic utilizes modulated, ultra-high radio frequencies to find differences in subsurface densities. This offers the best method for locating any other subsurface object that has a linear edge.
Electromagnetic (Conductive)	Locating equipment(connected to the line) generates an electromagnetic radio frequency and when applied to the ground, the subsurface utilities containing conductive material can be detected on a receiver.
Electromagnetic (Inductive)	Locating equipment(near the line) generates an electromagnetic radio frequency and when applied to the ground, the subsurface utilities containing conductive material can be detected on a receiver.
Ground Penetrating Radar (GPR)	Transmits high frequency electromagnetic waves into the ground and detects the energy reflected back to the surface.
Magnetometer	As the detector moves closer to a magnetic object, the shape and intensity of the magnetic field causes an imbalance in the sensors. This imbalance creates a reading that the equipment operator can interpret.
Sonde (Internal Trace wire)	A long wire with a beacon attached is inserted into the subsurface pipe. This beacon transmits a signal which is detected by the receiver at the surface.
Probe	A long shaft of nonconductive material with a blunt rubber grounded nosed. The rounded point is thrust into the ground to confirm the location of a utility
Hydroexcavation	Utilizes high pressure water to cut/loosen the soil. A connected vacuum aparatus then removed the soil into a debris tank.
Air Knife	Utilizes high pressure air to cut/loosen the soil. Once loosened it can be removed via hand tools or soil vacuum extraction.

Excavation Standard

Underground Utilities

Each technology has a different effectiveness dependent upon how the technology works and the composition of the utility itself and the surface and subsurface. It is critical to conduct this work (utility locating) as early in the process as possible as it can take time to coordinate.

	Variables ---->	Access Required ?	Utility Material		Subsurface Medium				Surface	
Type	Technology	Yes/No	Metallic	Non-Metallic	Sand	Clay	Fill	Rocky	Asphalt	Concrete
Non-Contact	Acoustic (Ultra Sonic)	No	E	E	E	E	E	E	E	G
	Electromagnetic (Inductive)	No	E	p	E	E	E	E	E	E
	Magnetometer	No	E	p	E	E	E	E	E	P
	Ground Penetrating Radar (GPR)	No	G	G	E	P	P	P	G	P
Contact	Electromagnetic (Conductive)	Yes	E	p	E	E	E	E	E	E
	Sonde (Internal Tracewire)	Yes	G	G	E	E	E	E	E	E
Soft Dig	Hydroexcavation	No	E	E	E	E	E	G	P	P
	Air Knifing	No	E	E	E	G	G	G	P	P
	Probe	No	E	G	E	E	G	P	P	P

Scoring:		
Excellent	E	Recommended technology
Good	G	Suitable technology
Poor	P	Least suitable technology

Excavation Standard

Underground Utilities

Marking lines:

- If conduits, cables, or piping are found on a drawing, their field location must be positively identified. Once positively identified, the centerline and depth must be marked or staked on the ground and added to the appropriate drawings.
- Mark lines using regulatory standard markings or if no regulations, use the guidance on the next slide. Utility locate marks should be in good condition and maintained. Marks deteriorate, re-mark the utility when necessary. Follow the universal color code.

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

Excavation Standard

Underground Utilities

Prior to breaking ground:

- Isolate the hazardous energy from any located lines.
- Verify the accuracy of the utility survey equipment used. This should be discussed & verified with private utility locater.

Work in progress:

- If utilities are marked or are suspected, soft dig around the area to verify depth of utilities prior to before breaking into material.
- Use only rounded/blunt edged tools when hand digging near utility lines. Do not aggressively use hand tools when digging (e.g. hand picks, rock bars, sharp edge shoves, etc.).
- When excavating with power tools, proceed cautiously by making shallow cuts, removing small piece of debris, and inspecting the area frequently.
- Follow lines out to their termination points or isolation points. Lines often will branch out or will split and go in different directions so it is critical that care is taken to follow each branch or split to its end or point where we can isolate.

Excavation Standard

Underground Utilities

Working within 1.5 meters (5 feet) of subsurface power lines:

- Verify the voltage of the line by qualified electrical personnel
- Prior to breaking ground, de-energize, LOTO and verify zero energy state of electrical line by qualified electrical personnel.
- Ensure the main electrical service is located and marked by both the utility operator/public locator (e.g., on sidewalk) and the private locator (e.g., on-site).
- Use non-conductive handled tools (fiberglass) when digging or probing near any electrical lines.
- Consider wearing electrically insulated gloves when working with hand tools near any electrical lines.

Working within 1.5 meters (5 feet) of a subsurface gas, main water, product, injection, etc.:

- Utility/Production operators of potential high hazard lines (e.g. high pressure gas) should be met on-site. Verify pressure & depth of line prior to breaking ground.
- Gas lines may be plastic, lack a tracer line and not installed to code (e.g. shallow or run under slabs/walls).

Excavation Standard

Underground Utilities

Working within 1.5 meters (5 feet) of subsurface irrigation or telecommunication lines:

- Worker(s) breaking ground should visibly verify direction of lines by opening valve boxes or telecom vaults.
- Irrigation sprinkler heads and control boxes should be flagged and marked (e.g. purple). Have the site owner turn sprinkler heads on to help verify locations. Locate and mark all lines feeding the flow back preventer valves, valve boxes, and irrigation heads

Working near storm water or sewer lines

- If a drain is near the proposed borehole or trench, it should be located and marked. This may require pulling the grate, utilize sonde transmitting locator in the line and using appropriate locating equipment.
- Is there two similar looking man-holes in line on the site that may indicate a water or sewer line consider utilize sonde transmitting locator to locate and verify.

Excavation Standard

Safeguards for Underground Utilities

Day Lighting

Where it is not possible to positively determine the precise location of underground utilities or when excavating within 300 mm (12 inches) of a known utility, the utility will be precisely located by hand digging or probing with a blunt object.

Positive Isolation

- Where reasonably practicable, underground conduits, electrical cables, and product lines or sewers within the limits of the excavation should be isolated
- Lockout/Tag-Out steps identified in the Isolation of Hazardous Energy Standard should be followed.

Support of Underground Utilities

- Where the excavation exposes underground utilities, they must be either protected, supported, or removed as necessary
- Where the excavation is near buildings, roads and other structures implement controls to address the risk of cave-in

Excavation Standard

Overhead Power Lines

- Overhead power lines present risk of electrocution. If using powered equipment working in proximity to overhead power cables, always check every time for the location of overhead power cables.
- Ensure a safe clearance distance.
- Risk of electrocution exists not only from touching the power lines, but also by working too close to high voltage cables.

- For the recommended minimum safe clearance of 50kV cables the minimum safe clearance is 3 meters (10 feet) for unqualified electrical persons. Table 1 in the Electrical Safe Work Standard recommends minimum clearance when excavating near overhead power lines.

Voltage (nominal, kV, alternating current)	Minimum (proximity) Clearance Distance (feet)
Up to 50	10 (3.1 meters)
Over 50 to 200	15 (4.6 meters)
Over 200 to 350	20 (6.2 meters)
Over 350 to 500	25 (7.6 meters)
Over 500 to 750	35 (10.7 meters)
Over 750 to 1,000	45 (13.7 meters)
Over 1,000	As established by the utility owner/operator or registered professional engineer who is a qualified person with respect to electrical power transmission and distribution.

Excavation Standard

Barricades

- Vehicles and personnel not working on the excavation are to be kept a safe distance from the area.
- Barriers should be erected to prevent people from entering the area if they are not performing work or from accidental falls into the excavation.
- Barriers should also be erected to prevent vehicles or equipment contacting overhead utilities

Safety Consideration

Colored warning tape, rope, cones or flasher units alone do not serve as a physical barrier and should only be used as a temporary measure (no longer than 4 hours) until permanent barriers are provided.

Excavation Standard

PPE and Emergency Equipment

Personal Protective Equipment will be worn in accordance with these guidelines:

- Where workers could be injured by objects falling from above, adequate overhead protection must be provided
- Hard hats must be worn both in the excavation and out of the excavation where there is an identified risk
- Where gases or vapors may exist, workers must wear appropriate respiratory equipment
- Where dermal exposure to contaminants is anticipated, workers must wear appropriate gloves and clothing
- Where there is a foreseeable risk of injury to the eyes, suitable eye protection must be worn
- Where workers are exposed to excessive noise, i.e., any noise above 85 dBA, they must use ear protectors

Emergency rescue equipment and trained responders must be available on site and as determined by the hazard analysis especially if a hazardous atmosphere is likely to be encountered.

Excavation Standard

Stop Work Scenarios

Excavation work must be stopped/suspended, and the worksite made safe in the following circumstances:

- Protective systems (e.g., shoring, benching, etc.) are damaged and/or not in place when required
- Gas testing results exceed permissible levels.
- Utilities (e.g., underground power lines, water pipes, etc.) break, leak and/or are damaged.
- Unexpected odors (e.g., exhaust fumes, H2S odors, etc.).
- Unexpected subsurface structures (e.g., pipelines, drums, tanks, etc.).
- Unexpected leaks, releases, seeps or discharges of vapors or liquids (including water).
- After every rainstorm
- When fissures, tension cracks, sloughing, underground cutting, water seepage, bulging at the bottom, or other similar conditions occur.
- When there is a change in the size, location, or placement of the soil pile.
- When there is an indication of change or movement in adjacent structures.
- After any event that may damage protective equipment.
- After other events that could increase potential hazards (e.g., windstorm, earthquake, dramatic change in weather).

Excavation Standard

Job Completion and Record Retention

Job Completion

- When the work has been completed, the Permit Requester/Holder must return the General Work Permit and all related documents to the Permit Issuer
- The Permit Issuer or the nominated Responsible Person will review the job site to ensure that:
  - i. The work area has been left in a safe, clean and tidy condition
  - ii. The work performed meets the specific work scope and task specifications
- If the above conditions have been met the Issuer or Responsible Person will sign and date the General Work Permit as completed.

Record Retention

- Copies of all Permit to Work and associated documents retained one year or from audit to audit, whichever is the lesser
- If an accident occurred while work was in-progress, then documentation must be retained for incident investigation
- If permitted job involved potential health hazard, consider retaining permit documentation for an extended period (beyond 90 days).