Chevron

human energy®

excavation & trenching

M&C – remote permit

For use by Remote Permitting Contractors
at NA Retail and C&I Petroleum facilities

training objectives

- To explain the type of work which may constitute excavation work.
- To understand what controls should be in place when excavation work is performed.
- To ensure personnel understand the basic requirements regarding remote permitting of excavation and trenching work.
- To provide details on where additional information can be obtained.

what is an excavation?

Excavation is defined as:

- Any man-made cut, trench, or depression in the earth's surface resulting from rock or soil removal.
- This would include the breaking of any concrete surface of a facility.

pre-planning site evaluation

Collect information and conduct an evaluation to determine potential hazards of the excavation site. This evaluation should include:

- Determination of what is underground at excavation site, e.g. Utility lines and or piping (electrical, natural gas, water, etc)
- Data collected can be found by review of underground drawings, electromagnetic scanning on the site, interviews of personnel with long time knowledge of the facility.
- Excavate all underground utilities by hand using non-sparking tools.

- Location of underground or aerial utilities
- Proximity of buildings, roads and structures
- Flow of vehicular traffic
- Potential for contaminated soil
- Potential sources for gas accumulation
- Potential sources for water accumulation

excavation hazards and requirements

Excavation hazards include:

- Determination made if the site of the excavation has previously been disturbed as it results in it being unstable.
  - If there are already structures on the site or it should automatically be considered as having being disturbed.
- Review of soil analysis report for the site to determine the type and properties of the soil in the area.
- Review of the above ground to determine any potential hazards such as: Overhead power lines within 4 meters (14 feet) of the excavation site and or buildings very close to the excavation that could be impacted by the excavation work.

excavation hazards and requirements

(Continued from previous slide)

- **Determine if the soil in the site is contaminated with hydrocarbons are toxic substances.**
  - If contamination determined all necessary safety precautions and conditions required to safely perform the work must be listed on the work permit.
  - For Excavation work a Job Safety Analysis is also required

assessing & managing excavation hazards

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

- **Step 1** - There will be a hazard identification process to identify the likely hazards arising from excavation work
- **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/vapour encountered
- **Step 4** - Document the results of the hazard assessment using the JSA/JLA form
- **Step 5** - Monitor controls for effectiveness

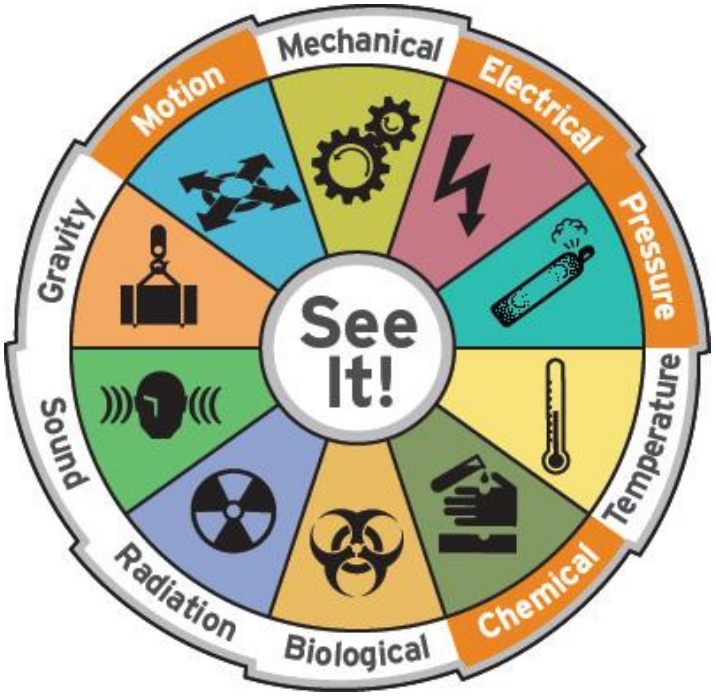
assessing and managing hazards

Underground and Overhead Power Cables

- Both underground and overhead power cables are hazards that present risk of electrocution
- Risk of electrocution exists not only from touching the power cables, but also by working too close to high voltage cables.
- For 230 kV cables the recommended minimum safe clearance is 4 meters (14 feet) and for 50kV cables the minimum safe clearance is 3 meters (10 feet) for unqualified electrical persons.
- All tanks, product piping and other fueling systems components should be marked and all digging work within **2 feet of the mark out zone shall be hand dug.**

excavation

potential significant hazards



- **Lack of situational awareness** while working in the trench can expose workers to significant hazards.
- **Underground electrical lines** can present a hazard during excavations, large or small.
- **Underground pipelines** may contain pressurized, flammable or toxic materials, creating a hazard if released during excavation.
- **Cave-ins** can crush or suffocate workers if proper preventive measures aren't taken.
- **Lack of oxygen** can incapacitate workers.
- **Flammable gases** can be present or build up during the work and create an explosive atmosphere.
- **Some toxic gases**, such as H_2S, are heavier than air and can collect in low spots, resulting in dangerously high concentrations.
- **Drowning** is possible if there is a leak or if rain runoff fills the excavation.
- **Excavation equipment** can become a hazard when it is moved or if it tips over during the excavation work.

prevention means *Always*

excavation

- *Ask*: Is there a **safer way** to **complete** the **job without working** in the **excavation or near heavy equipment**?
- ***Comply with permitting requirements. Use of this field guide is not an equivalent.***
- Provide supervisory job-site **walk-through prior** to permit **approval** and **periodically during work**.
- **Provide** a competent **person** to **assess the soil, plan and permit, inspect the excavation**, and to **engage engineering professionals** as needed.
- **Use** only **qualified** and **authorized personnel** to **operate** your **excavation equipment**.
- **Contact** utility **providers** to **identify**, **locate** and **understand routing** of underground **utilities**.
- **Establish** a job-specific **rescue plan**, including **rescue personnel** and **equipment**, **before entering** the **excavation**.
- **Select** and **use** appropriate **shoring** or **benching methods** as **defined** in the *Safety in Designs* **manual**.
- **Provide** appropriate **means** for **entering** and **exiting excavations**, such as ramps, ladders, etc.
- **Store removed soil** away from the edge (at least 3 ft) to **avoid cave-ins** or **soil falling** on workers.
- **Secure** and **barricade** the work **site** to **prevent unauthorized access** by vehicles and personnel.
- **Prohibit standing** or **working under loads.**
- **Follow** all gas **testing** and **monitoring requirements** and **procedures**, especially **near running engines.**
- **Inspect** the site at **shift start** and **after any change or event** (such as rain, new equipment or an earthquake).

excavation and trenching review

Definition of an Excavation

Any man-made cut, trench, or depression in the earth's surface resulting from rock or soil removal.

See Exceptions for Routine Work on next slide

Excavation and Trenching High risk work requirements

- Excavation and Trenching is considered High risk work which also requires the use of a General Work permit, High risk form and JSA's.
- Excavation activities that qualify as permit required are:
  - Saw cutting through concrete
  - Installing a bollard
  - Excavating plumbing lines outside the store
  - Any work requiring the breaking of concrete around the forecourt
  - Installing signs or polls
  - Any work to excavate fueling lines or tanks
  - Fencing installations

retail work not requiring excavation & trenching permit routine work

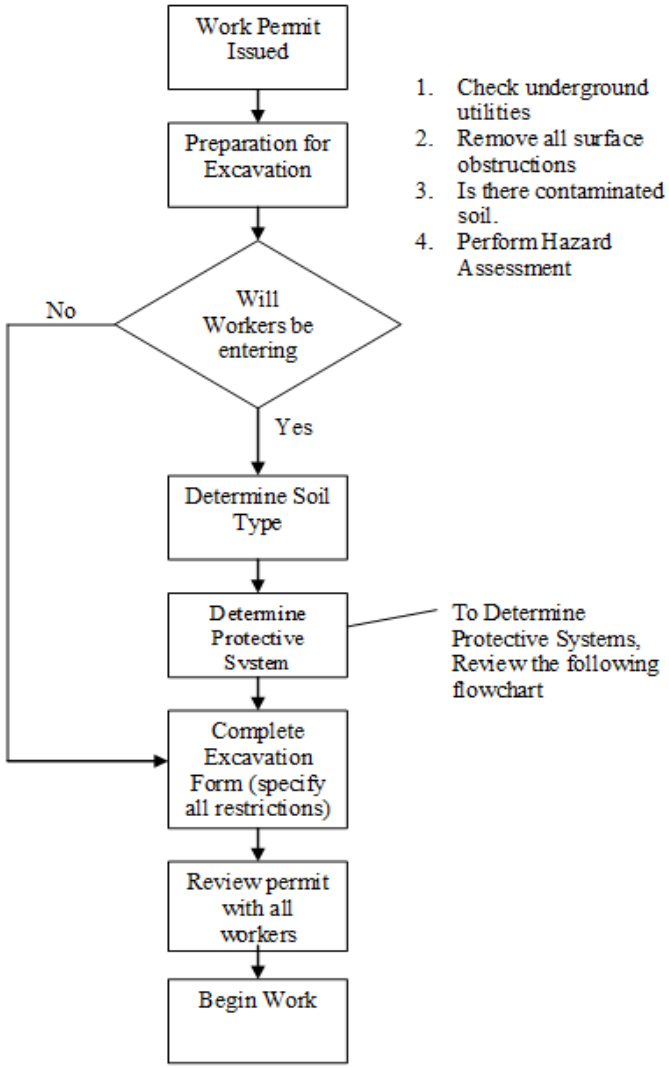
Routine Work – Any task performed in an operating area where all the following apply:

- The operations or maintenance personnel have been adequately trained in the task
- The operations or maintenance personnel are familiar with all the hazards associated with the task
- There is an approved written work procedure and/or JLA for the task
- Generally the task is performed at least once a month
- There is a very low probability of change of work scope or conditions that would generate previously unidentified or unanticipated hazards

Types of items as In kind or same locations;

- Repair/Replace sprinklers or irrigation lines or control valves
- Repair/Replace Planting – seasonal color, replacing plants, removing plants
- Tree removal to grade and not remove stump (no larger than 15 gallon tree)
- Repair/Replace Fence post footing
- Hand dig to 24 inches (in landscape area only).
- Supplier installed signs or banners In planter beds

excavation process flow chart



Flow chart for Excavation process requirements

- Once the General Work permit and Excavation & Trenching permits are completed begin preparing for the excavation.
- Soil type must be determined if the excavation will be entered by workers.

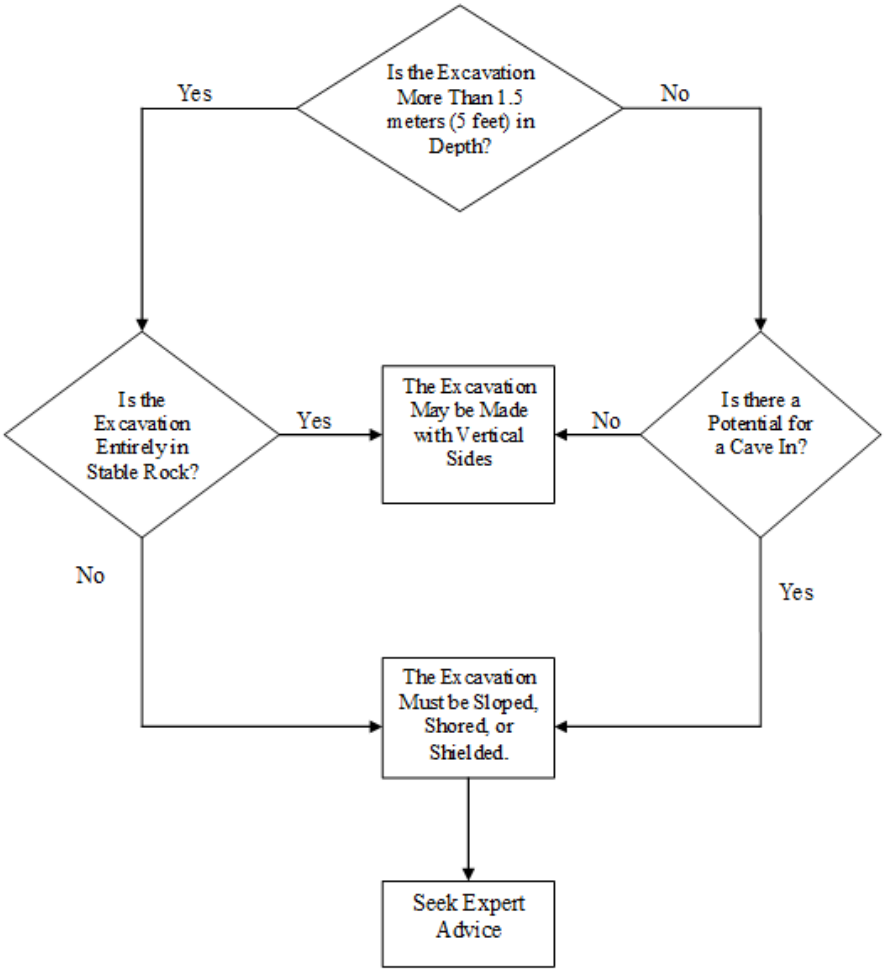
Don't forget!

- Always check for underground utilities for all excavations and trenches.

Lessons learned from recent Near Loss

- Contractor excavating with Air Spade and came within a few inches of hitting a 480 volt line. Worker was unaware of what "red" dyed concrete meant, was performing excavation work, hit dyed concrete and continued working with out stopping to re-asses. Pre job safety meetings failed to cover all hazards in the work area.

excavation protective systems determination flow chart



Excavations greater than 4 feet

- Also qualifies as a confined space (4 feet US OSHA) and additional hazard assessments and high risk forms may be needed.

Excavation protections include

- Sloping, Benching, Shoring and Sheet piling, are some of the ways of protecting people working within an excavation. Whatever the means employed, it must be designed by a qualified person.

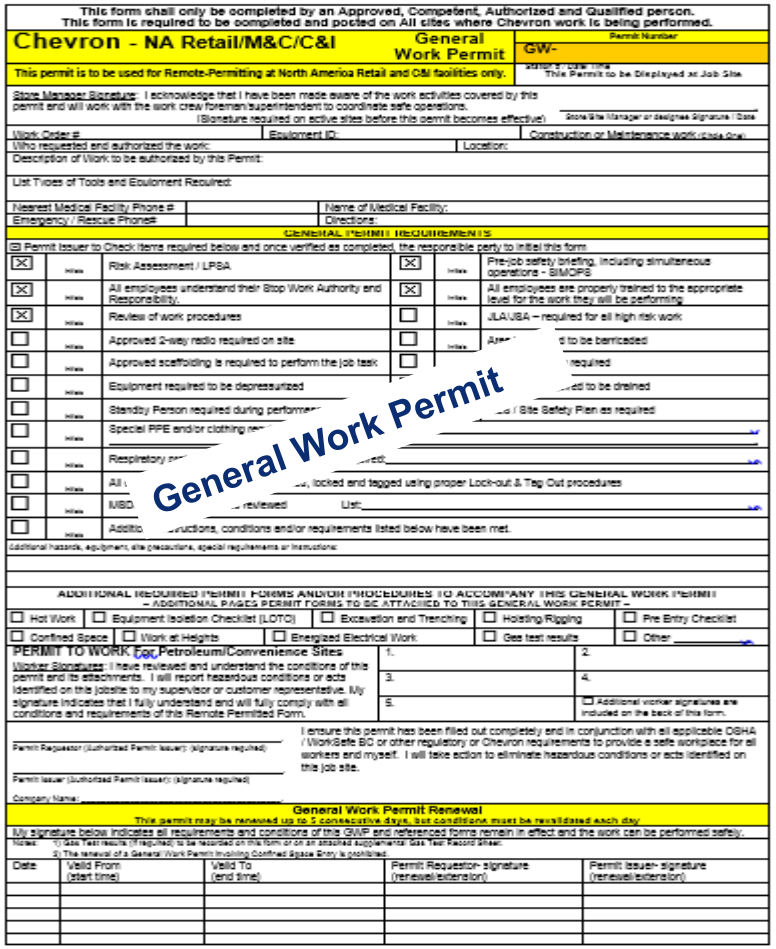
excavation job planning question set

Question	Action Required
Do you know ground conditions?	• Collect site data • Ask appropriate persons • Obtain drawings and plans • Use a utility locator
Do you know precise location of underground utilities?	• Locate all U/G services and utilities • Isolate known utilities if possible
Have you got formal permission to dig?	• Conduct Hazard Assessment • Obtain General Work Permit, Excavation/Hot Work/Electrical/Confined Space Entry Form as appropriate • Identify any regulatory and or utility service provider permits or approval required
Could harmful vapors and gases be present?	• Conduct monitoring • Wear appropriate PPE
Still unsure of precise location of utilities?	• Daylight utilities • Isolate newly discovered utilities if possible
Are odors present?	• Investigate source and manage issues
Do exposed utilities need support?	• Provide temporary supports
Will open excavation provide a hazard?	• Provide barricades
Can water get into the excavation?	• Provide pump-out facilities as necessary

Question	Action Required
Is the soil contaminated?	• Obtain expert advice
Will workers enter the excavation?	• Provide safe access and egress
Is worker exposed to hazards?	• Conduct Risk Assessment & implement controls
Is excavation < 1.2m (4')?	• Consider Protection systems • Provide watchman
Is excavation > 1.2m (4')?	• Provide Protection system • Provide watchman
Will there be materials & loads above excavation?	• Provide safe storage
Will excavation be adjacent to buildings or structures?	• Obtain guidance from competent engineer

authorization - permitting

A **General Work Permit** and **Excavation Form** are required for any excavation work and prior to breaking the surface



This form shall only be completed by an Approved, Competent, Authorized and Qualified person.
This form is required to be completed and posted on All sites where Chevron work is being performed.

Chevron - NA Retail/M&C/C&I — **General Work Permit** — Permit Number: GW-

This permit is to be used for Remote-Permitting at North America Retail and C&I facilities only.

Store Manager Signature: I acknowledge that I have been made aware of the work activities covered by this permit and will work with the work crew foreman/superintendent to coordinate safe operations. (Signature required on active sites before this permit becomes effective)

Work Order #: | Equipment ID: | Construction or Maintenance Work (Circle One)

Who requested and authorized the work: | Location:

Description of Work to be authorized by this Permit:

List Types of Tools and Equipment Required:

Nearest Medical Facility Phone #: | Name of Medical Facility:

Emergency / Rescue Phone#: | Directions:

GENERAL PERMIT REQUIREMENTS

Permit Issuer to Check Items required below and once verified as completed, the responsible party to initial this form

☒	Initials	Risk Assessment / LPSA	☒	Initials	Pre-job safety briefing, including simultaneous operations - SIMOPS
☒	Initials	All employees understand their Stop Work Authority and Responsibility.	☒	Initials	All employees are properly trained to the appropriate level for the work they will be performing
☒	Initials	Review of work procedures	☐	Initials	JLA/JSA – required for all high risk work
☐	Initials	Approved 2-way radio required on site	☐	Initials	Are d to be barricaded
☐	Initials	Approved scaffolding is required to perform the job task	☐	Initials	required
☐	Initials	Equipment required to be depressurized			ed to be drained
☐	Initials	Standby Person required during perform			/ Site Safety Plan as required
☐	Initials	Special PPE and/or clothing re			
☐	Initials	Respiratory pr		ed:	
☐	Initials	All			locked and tagged using proper Lock-out & Tag Out procedures
☐	Initials	MSD		reviewed	List:
☐	Initials	Additio		structions, conditions and/or requirements listed below have been met.	

Additional hazards, equipment, site precautions, special requirements or instructions:

ADDITIONAL REQUIRED PERMIT FORMS AND/OR PROCEDURES TO ACCOMPANY THIS GENERAL WORK PERMIT – ADDITIONAL PAGES PERMIT FORMS TO BE ATTACHED TO THIS GENERAL WORK PERMIT –

☐ Hot Work ☐ Equipment Isolation Checklist (LOTO) ☐ Excavation and Trenching ☐ Hoisting/Rigging ☐ Pre Entry Checklist
☐ Confined Space ☐ Work at Heights ☐ Energized Electrical Work ☐ Gas test results ☐ Other

PERMIT TO WORK For Petroleum/Convenience Sites

Worker Signatures: I have reviewed and understand the conditions of this permit and its attachments. I will report hazardous conditions or acts identified on the jobsite to my supervisor or customer representative. My signature indicates that I fully understand and will fully comply with all conditions and requirements of this Remote Permitted Form.

1. | 2. | 3. | 4. | 5.

☐ Additional worker signatures are included on the back of this form.

Permit Requestor (Authorized Permit Issuer): (signature required)

Permit Issuer (Authorized Permit Issuer): (signature required)

I ensure this permit has been filled out completely and in conjunction with all applicable OSHA / WorkSafe BC or other regulatory or Chevron requirements to provide a safe workplace for all workers and myself. I will take action to eliminate hazardous conditions or acts identified on this job site.

Company Name:

General Work Permit Renewal

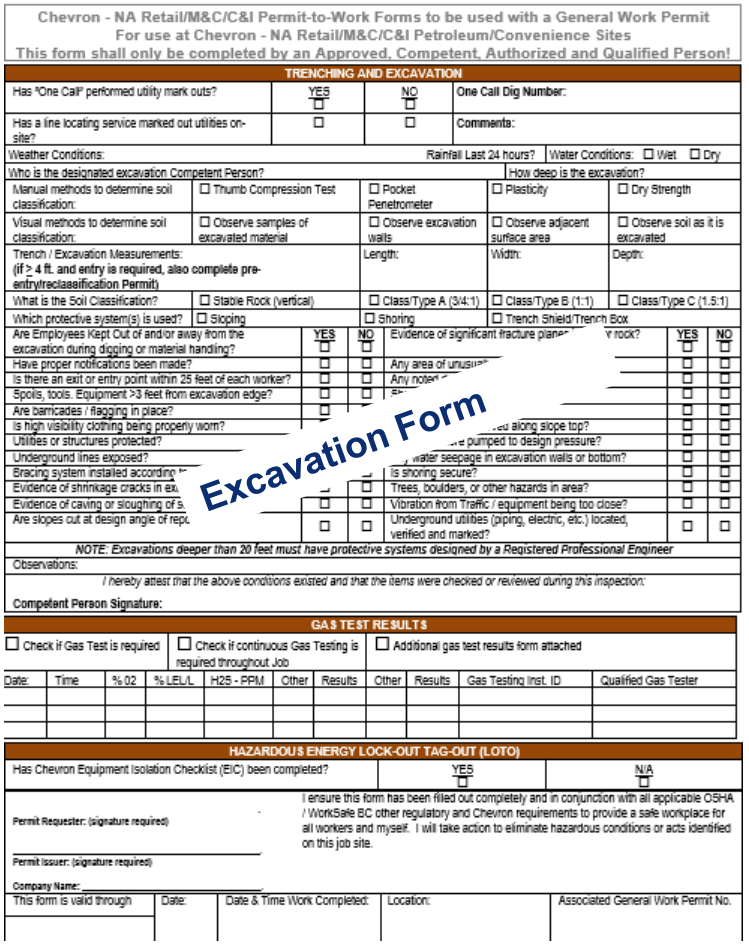
This permit may be renewed up to 5 consecutive days, but conditions must be revalidated each day

My signature below indicates all requirements and conditions of this GWP and referenced forms remain in effect and the work can be performed safely.

Notes: 1) Gas Test results (if required) to be recorded on this form or on an attached supplemental Gas Test Record Sheet.
2) The renewal of a General Work Permit involving Confined Space Entry is prohibited.

Date	Valid From (start time)	Valid To (end time)	Permit Requestor- signature (renewal/extension)	Permit Issuer- signature (renewal/extension)

General Work Permit



Chevron - NA Retail/M&C/C&I Permit-to-Work Forms to be used with a General Work Permit
For use at Chevron - NA Retail/M&C/C&I Petroleum/Convenience Sites
This form shall only be completed by an Approved, Competent, Authorized and Qualified Person!

TRENCHING AND EXCAVATION

Has "One Call" performed utility mark outs?	YES ☐	NO ☐	One Call Dig Number:
Has a line locating service marked out utilities on-site?	☐	☐	Comments:

Weather Conditions: | Rainfall Last 24 hours? | Water Conditions: ☐ Wet ☐ Dry

Who is the designated excavation Competent Person? | How deep is the excavation?

Manual methods to determine soil classification:	☐ Thumb Compression Test	☐ Pocket Penetrometer	☐ Plasticity	☐ Dry Strength
Visual methods to determine soil classification:	☐ Observe samples of excavated material	☐ Observe excavation walls	☐ Observe adjacent surface area	☐ Observe soil as it is excavated
Trench / Excavation Measurements: (if > 4 ft. and entry is required, also complete pre-entry/reclassification Permit)		Length:	Width:	Depth:
What is the Soil Classification?	☐ Stable Rock (vertical)	☐ Class/Type A (3/4:1)	☐ Class/Type B (1:1)	☐ Class/Type C (1.5:1)
Which protective system(s) is used?	☐ Sloping	☐ Shoring	☐ Trench Shield/Trench Box	

	YES	NO		YES	NO
Are Employees Kept Out of and/or away from the excavation during digging or material handling?	☐	☐	Evidence of significant fracture plane r rock?	☐	☐
Have proper notifications been made?	☐	☐	Any area of unusu	☐	☐
Is there an exit or entry point within 25 feet of each worker?	☐	☐	Any noted	☐	☐
Spoils, tools, Equipment >3 feet from excavation edge?	☐	☐	Sl	☐	☐
Are barricades / flagging in place?	☐			☐	☐
Is high visibility clothing being properly worn?	☐		ed along slope top?	☐	☐
Utilities or structures protected?	☐		e pumped to design pressure?	☐	☐
Underground lines exposed?	☐		water seepage in excavation walls or bottom?	☐	☐
Bracing system installed according to	☐		Is shoring secure?	☐	☐
Evidence of shrinkage cracks in ex	☐	☐	Trees, boulders, or other hazards in area?	☐	☐
Evidence of caving or sloughing of s	☐	☐	Vibration from Traffic / equipment being too close?	☐	☐
Are slopes cut at design angle of repu	☐	☐	Underground utilities (piping, electric, etc.) located, verified and marked?	☐	☐

NOTE: Excavations deeper than 20 feet must have protective systems designed by a Registered Professional Engineer

Observations:

I hereby attest that the above conditions existed and that the items were checked or reviewed during this inspection:

Competent Person Signature:

GAS TEST RESULTS

☐ Check if Gas Test is required ☐ Check if continuous Gas Testing is required throughout Job ☐ Additional gas test results form attached

Date:	Time	% 02	% LEL/L	H2S - PPM	Other	Results	Other	Results	Gas Testing Inst. ID	Qualified Gas Tester

HAZARDOUS ENERGY LOCK-OUT TAG-OUT (LOTO)

	YES	N/A
Has Chevron Equipment Isolation Checklist (EIC) been completed?	☐	☐

Permit Requester: (signature required)

Permit Issuer: (signature required)

Company Name:

I ensure this form has been filled out completely and in conjunction with all applicable OSHA / WorkSafe BC other regulatory and Chevron requirements to provide a safe workplace for all workers and myself. I will take action to eliminate hazardous conditions or acts identified on this job site.

This form is valid through	Date:	Date & Time Work Completed:	Location:	Associated General Work Permit No.

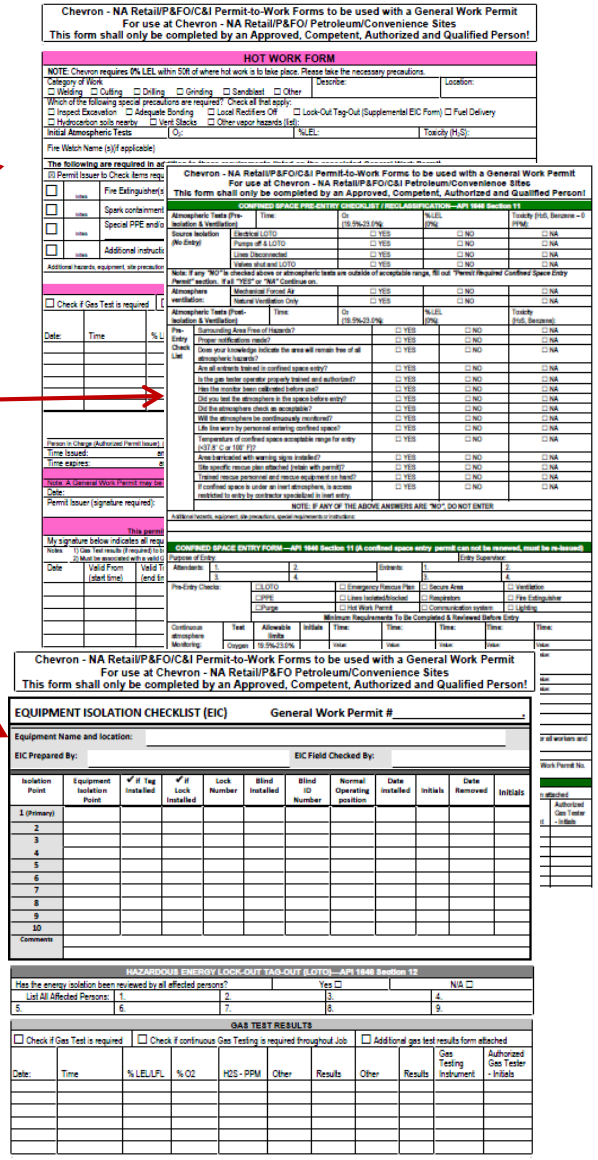
Excavation Form

authorization - permitting

Depending on the nature of the work other high risk forms may be required:

- Hot Work Form
- Confined Space Entry Form
- Equipment Isolation Checklist

Some utility companies or telecom companies also require you to obtain their prior approval if excavating within a certain distance of their underground services.


Chevron - NA Retail/P&FO/C&I Permit-to-Work Forms to be used with a General Work Permit
For use at Chevron - NA Retail/P&FO/ Petroleum/Convenience Sites
This form shall only be completed by an Approved, Competent, Authorized and Qualified Person!

HOT WORK FORM

CONFINED SPACE ENTRY FORM

EQUIPMENT ISOLATION CHECKLIST (EIC) General Work Permit #

HAZARDOUS ENERGY LOCK-OUT TAG-OUT (LOTO)—API 1646 Section 12

GAS TEST RESULTS

Excavation Form – Top section

- The Excavation Form can only be used in conjunction with a General Work Permit, it is not a permit itself.
- Competent Person Signature box is the sign-off by the competent person acknowledging the items checked off have been review and work can be carried out

Chevron - NA Retail/M&C/C&I Permit-to-Work Forms to be used with a General Work Permit
For use at Chevron - NA Retail/M&C/C&I Petroleum/Convenience Sites
This form shall only be completed by an Approved, Competent, Authorized and Qualified Person!

TRENCHING AND EXCAVATION

Has "One Call" performed utility mark outs?	YES ☐	NO ☐	One Call Dig Number:
Has a line locating service marked out utilities on-site?	☐	☐	Comments:
Weather Conditions:		Rainfall Last 24 hours?	Water Conditions: ☐ Wet ☐ Dry
Who is the designated excavation Competent Person?			How deep is the excavation?

Manual methods to determine soil classification:	☐ Thumb Compression Test	☐ Pocket Penetrometer	☐ Plasticity	☐ Dry Strength
Visual methods to determine soil classification:	☐ Observe samples of excavated material	☐ Observe excavation walls	☐ Observe adjacent surface area	☐ Observe soil as it is excavated
Trench / Excavation Measurements: (if ≥ 4 ft. and entry is required, also complete pre-entry/reclassification Permit)		Length:	Width:	Depth:
What is the Soil Classification?	☐ Stable Rock (vertical)	☐ Class/Type A (3/4:1)	☐ Class/Type B (1:1)	☐ Class/Type C (1.5:1)
Which protective system(s) is used?	☐ Sloping	☐ Shoring	☐ Trench Shield/Trench Box	

	YES	NO		YES	NO
Are Employees Kept Out of and/or away from the excavation during digging or material handling?	☐	☐	Evidence of significant fracture planes in soil or rock?	☐	☐
Have proper notifications been made?	☐	☐	Any area of unusually weak soils or materials?	☐	☐
Is there an exit or entry point within 25 feet of each worker?	☐	☐	Any noted dramatic dip in bedrock?	☐	☐
Spoils, tools. Equipment >3 feet from excavation edge?	☐	☐	Short term excavation (<24 hours)?	☐	☐
Are barricades / flagging in place?	☐	☐	Trench box(s) certified?	☐	☐
Is high visibility clothing being properly worn?	☐	☐	Tension cracks observed along slope top?	☐	☐
Utilities or structures protected?	☐	☐	Hydraulic shore pumped to design pressure?	☐	☐
Underground lines exposed?	☐	☐	Any water seepage in excavation walls or bottom?	☐	☐
Bracing system installed according to design?	☐	☐	Is shoring secure?	☐	☐
Evidence of shrinkage cracks in excavation walls?	☐	☐	Trees, boulders, or other hazards in area?	☐	☐
Evidence of caving or sloughing of soils?	☐	☐	Vibration from Traffic / equipment being too close?	☐	☐
Are slopes cut at design angle of repose?	☐	☐	Underground utilities (piping, electric, etc.) located, verified and marked?	☐	☐

NOTE: Excavations deeper than 20 feet must have protective systems designed by a Registered Professional Engineer

Observations:

I hereby attest that the above conditions existed and that the items were checked or reviewed during this inspection:

Competent Person Signature: **Name of Competent Person**

excavation form – bottom section

- Bottom of the Excavation form includes areas for Gas Test results and LOTO energy isolation, if LOTO is required a EIC must also be completed.
- New box on form for the Company name of the Permit Issuer.

GAS TEST RESULTS

☐ Check if Gas Test is required ☐ Check if continuous Gas Testing is required throughout Job ☐ Additional gas test results form attached

Date:	Time	% LEL/LFL	% O2	H2S - PPM	Other	Results	Other	Results	Gas Testing Instrument	Authorized Gas Tester - Initials

HAZARDOUS ENERGY LOCK-OUT TAG-OUT (LOTO)—API 1848 Section 12

Has Chevron Equipment Isolation Checklist (EIC) been completed?	YES ☐	N/A ☐

Person in Charge (Authorized Permit Issuer): (signature required)

I ensure this form has been filled out completely and in conjunction with all applicable OSHA / WorkSafe BC requirements to provide a safe workplace for all workers and myself. I will take action to eliminate hazardous conditions or acts identified on this job site.

Company Name: **Contractor Company Name**

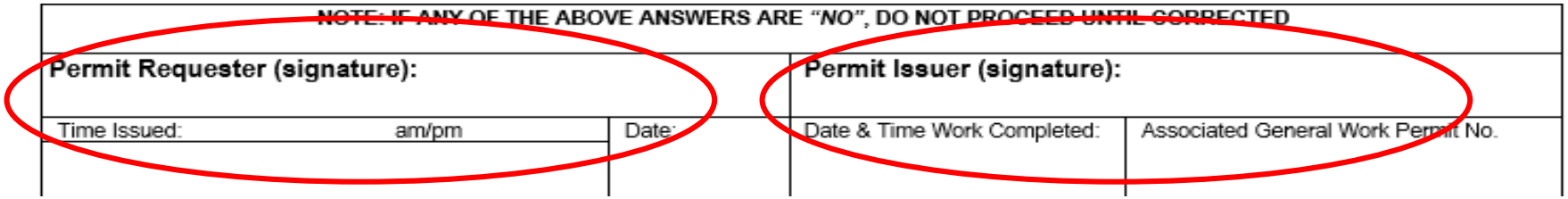
Time Issued:	am/pm	Date:	Date & Time Work Completed:	Location:	Associated General Work Permit No. **General Work Permit number**
Time expires:	am/pm (16 hrs max.)				

permit requirements

- If the excavations will be a depth of **(4 feet)** or greater a Confined Space Entry Pre-Entry checklist is required in addition to the General Work Permit.
- Barricading and installation of signs to prevent personnel from falling in is required.

permit requirements (cont)

- Only **approved** Permit Writers that have had additional competency training per OSHA / Worksafe BC guidelines, API and contractor assessments completed can sign in the Permit Requestor or Permit Issuer boxes on the Permit forms.
- The workers name must also be on your companies remote permit writer list that are submitted to Chevron, this includes any work which requires permits such as the GWP and EIC / LOTO form.



NOTE: IF ANY OF THE ABOVE ANSWERS ARE *"NO"*, DO NOT PROCEED UNTIL CORRECTED			
Permit Requester (signature):		**Permit Issuer (signature):**	
Time Issued: am/pm	Date:	Date & Time Work Completed:	Associated General Work Permit No.

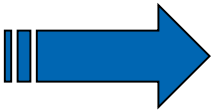
- See Remote Permit Power Point for additional General Contractor guidelines and requirements for certifying Sub Contractors to Remote Permit.

barricades

- Vehicles and personnel not working in 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
- 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

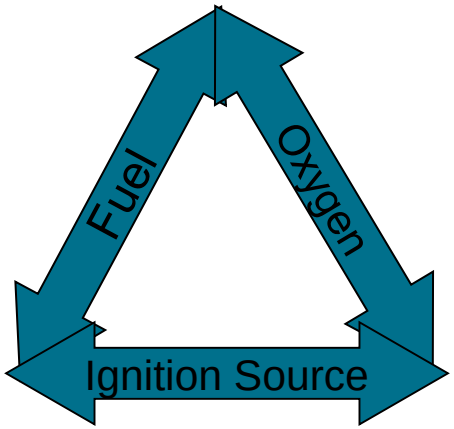
excavation dangers

- Cave in of an excavation is a major concern and must be adequately addressed.
  - Cave in during excavations has resulted in several deaths due to engulfment of personnel.



excavation dangers (cont)

- Contaminated soil is a potential danger.
- Gas testing should be undertaken prior to and during the excavation to check for soil contamination.
- If contamination is found measures must be taken to address the potential hazards.



excavation dangers (cont)

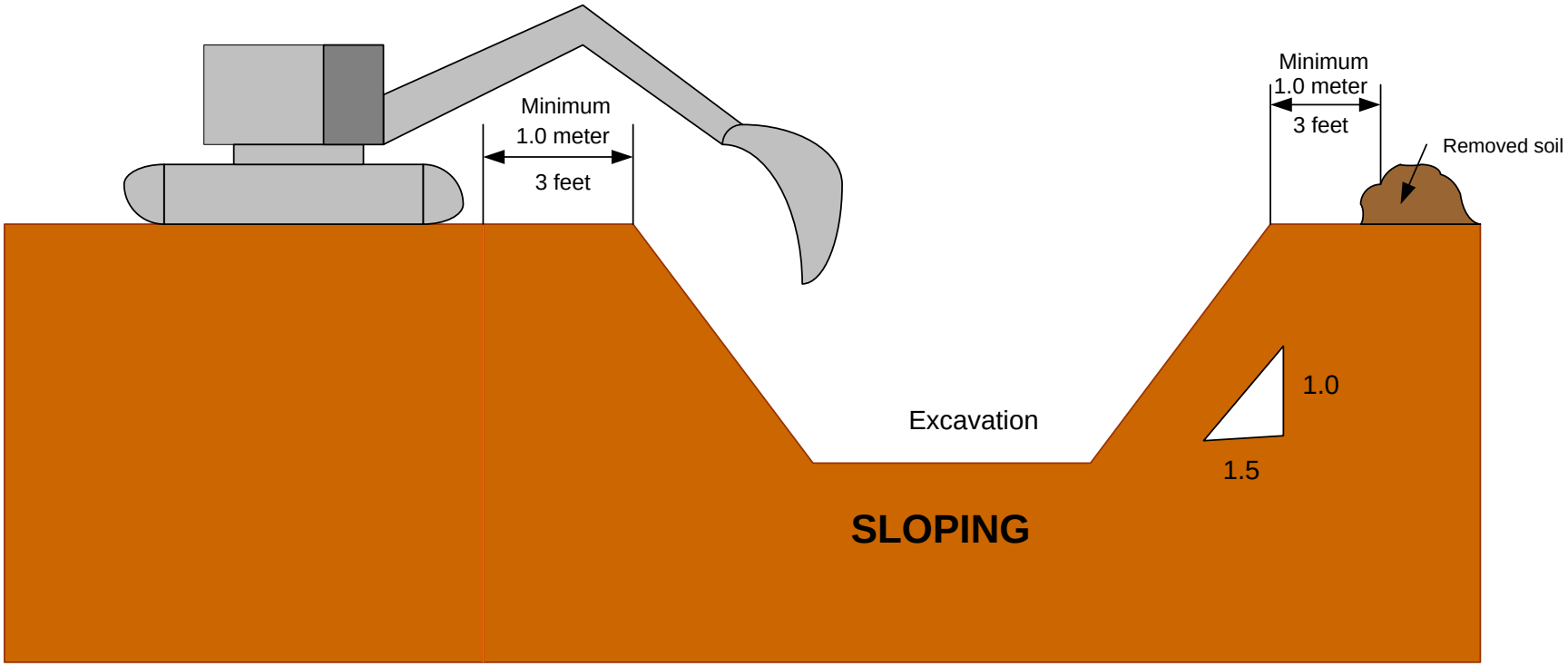
- Personnel must not enter into an excavation if standing water is present.
- Water must be pumped out if it is contaminated or there is free product, the pump used must be either explosion proof or air driven.
- If water is contaminated it must be properly contained and treated.

excavation dangers (cont)

- There are potential for various flammable or toxic gases to be present in an excavation, such as:
  - Methane
  - LPG
  - Gasoline vapor
  - Carbon Monoxide (CO)
  - Hydrogen Sulfide (H2S)
  - Sulfur dioxide (SO2)
  - Carbon Dioxide (CO2)
- When flammable or toxic vapors are present special precautions should be taken to ensure the atmosphere is safe to enter.
- Use of a blower or an eductor to purge the excavations atmosphere and ensure it is safe to enter may be required.
  - Motorized Blowers must be of an explosion proof type.

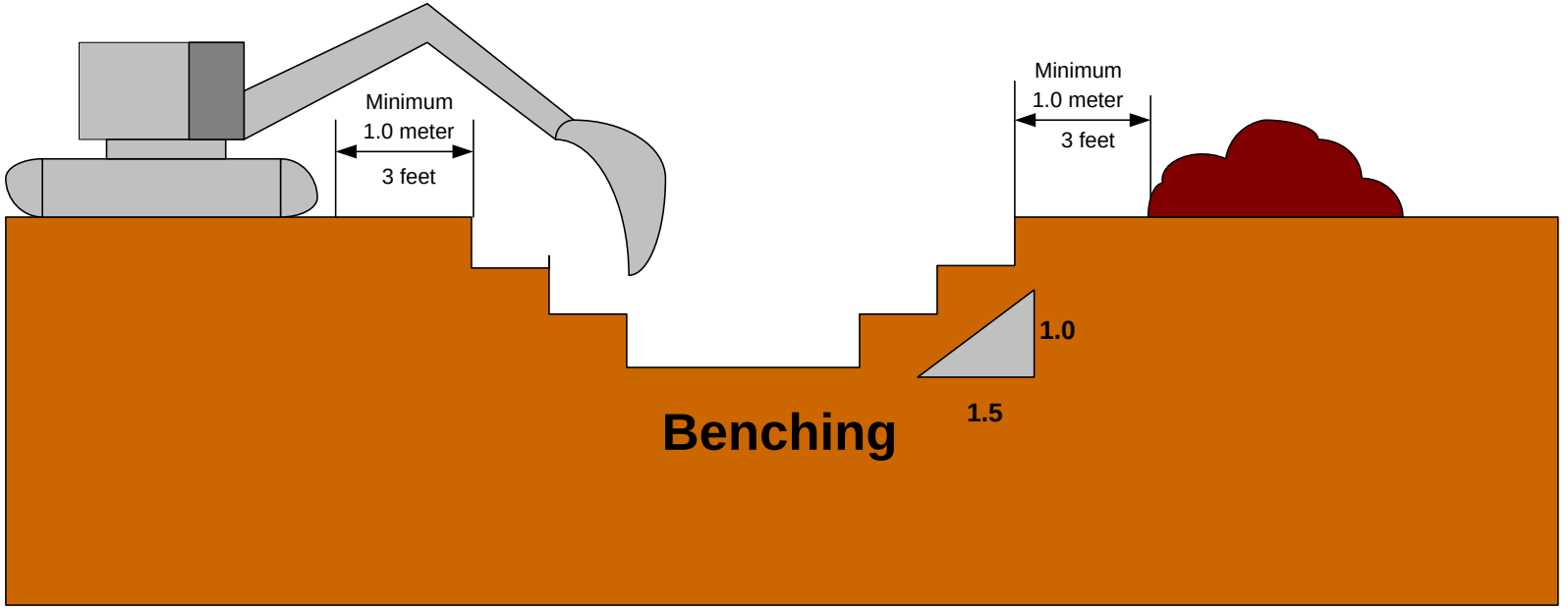
Preventing Cave-in

- Sloping of the excavation's sides



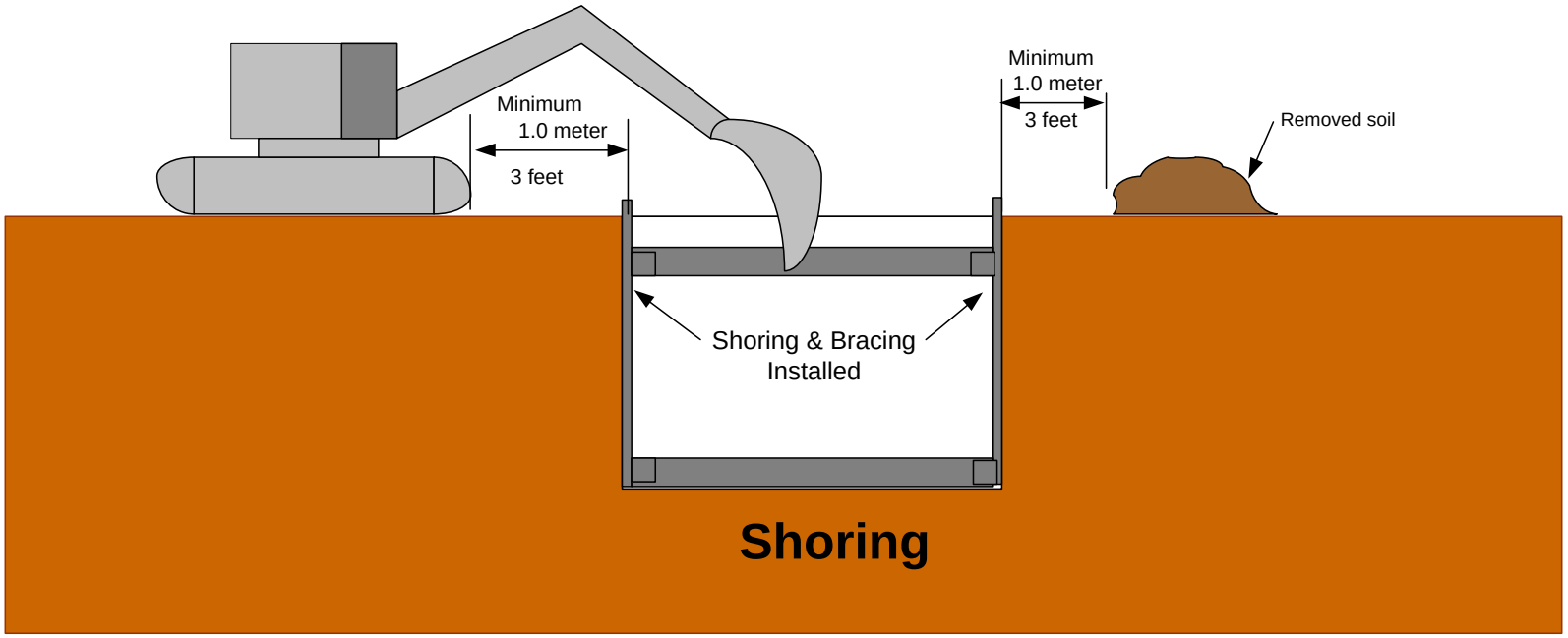
preventing cave-in

- Benching of an excavation is another method that can be used to help ensure a cave-in doesn't occur.



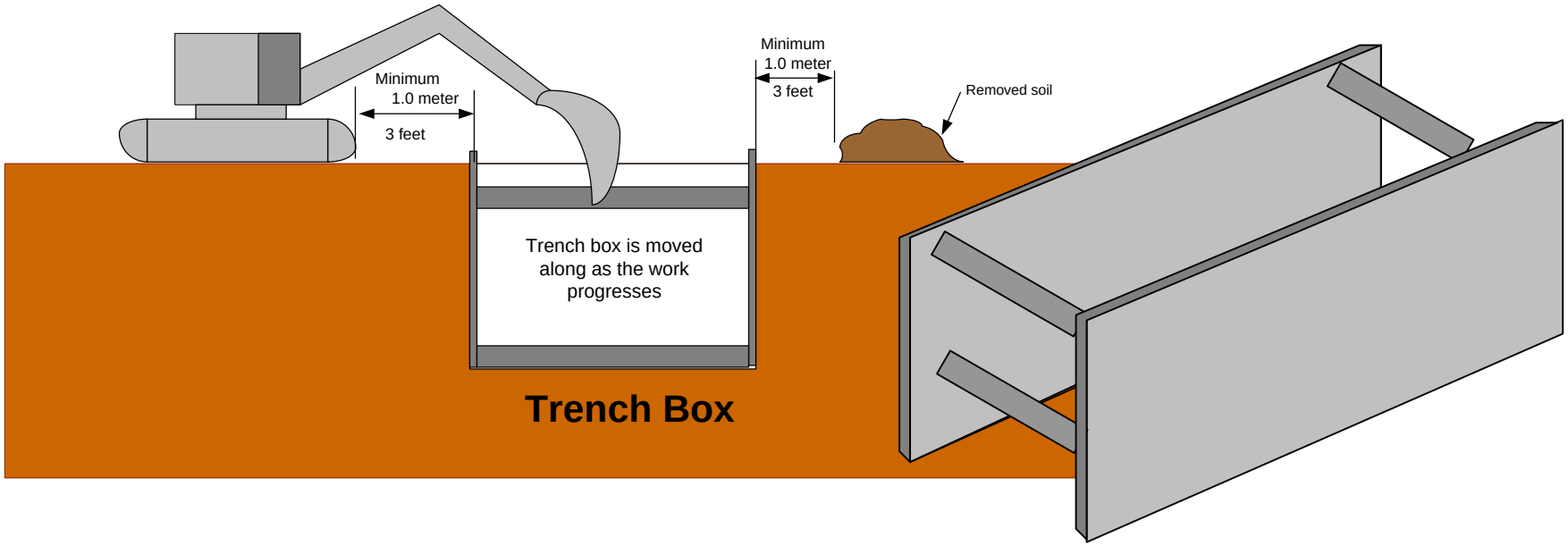
preventing cave-in

- Installation of Shoring to prevent cave-in



preventing cave-in of trenches

- Using a trench box for when working in trenches



Typical design of a metal trench box

gas testing at excavation site

Outside of the excavation (aboveground), the following is required based on gas detector readings:

- If gas test indicates LEL concentration is 0% LFL/LEL, then no action is required an the excavation work can continue
- If gas test indicates any LEL, no work allowed unless the workers are wearing suitable respirators with organic vapor (OV) cartridge equipped with dust/particulate filters [or Supplied-Air breathing apparatus is used].
- If gas test indicates 5% LFL/LEL or higher, evacuate the excavation site, determine the source and address appropriately.

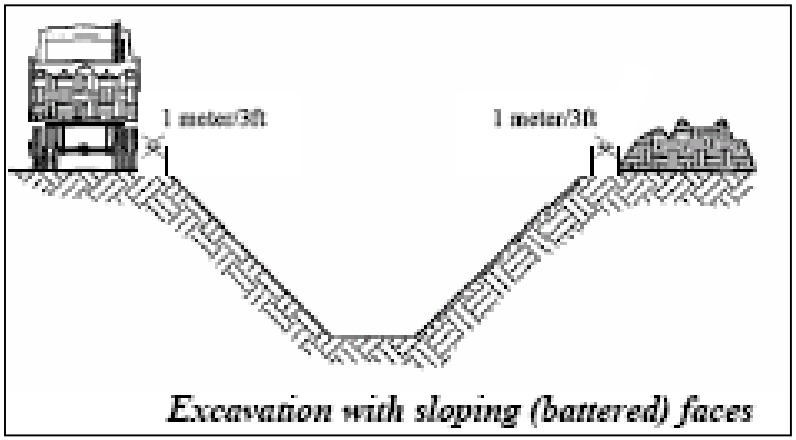
gas testing in an excavation

Inside the excavation (below ground), the following is required based on gas detector readings:

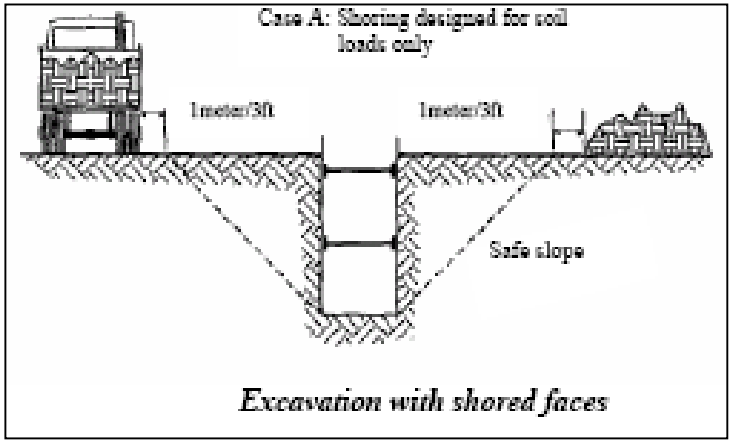
- If LEL reading is above 0% LFL/LEL, but lower than 5%, workers test for Benzene/Total Hydrocarbon and wear appropriate Organic Vapor Cartridge Respirator with dust or particulate filter.
- If LEL reading is 5% LFL/LEL or higher, evacuate
- Caution, if there is high flash point flammable product in the excavation it will normally not register LEL present, but such free product is still flammable and a significant hazard that should be addressed.
- **Note:** In cases where there is a presence of LEL, consider ventilating the excavation to reduce the concentration of flammable vapors.

loads above excavations

- Excavated or other loose material, tools or equipment must not be retained closer than 1 meter (3 feet) from the edge of the trench.
- API standard allows soil piles within 2 feet, however Chevron standard is 3 feet, follow the Chevron standard.
- WorkSafe BC requires excavated material to be placed at a minimum 1.2 meters (4 feet) from excavations other than trenches. In Canada follow WorkSafe BC requirement.



Excavation with sloping (battered) faces



Excavation with shored faces

access and egress from excavation

- Ladders shall be installed in excavation to provide a means of access and egress.
- Ladders shall be a maximum of 7.5 meters (25 feet) apart
- Ladders should extend 1 meter (3 feet) or 3 rungs above the top of the excavation or trench and should be adequately secured.
- 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.

excavation & trenching – additional information

For additional details on Excavation & Trenches requirements refer to:

- Your company's operating procedures
- Your Company's Safety Department
- API
- OSHA
- WorkSafe BC