



# **TRENCHING AND EXCAVATION GUIDELINES**

## Table of Contents

<i>Trenching and Excavation</i> .....	3
<i>A trained competent person shall:</i> .....	3
<i>General Precautions</i> .....	3
<i>Prior to Digging</i> .....	3
<i>While Digging</i> .....	4
<i>Open Trenches and Excavations</i> .....	4
<i>Barricades</i> .....	5
<i>Placement</i> .....	6
<i>Excavation Checklist</i> .....	7
<i>Soils Analysis Checklist</i> .....	9
<i>Daily Trenching and Excavation Checklist Over 4' in Depth or More</i> .....	11

## **Trenching and Excavation**

Our construction activities occasionally require our employees to work in trenches and excavations. The following precautions are mandatory when our employees work in trenches or excavations that are 5 feet deep or greater. They are also required in trenches less than 5 feet deep if the soil appears unstable. These precautions apply even if we did not dig the trench.

### **A trained competent person shall:**

- ♦ Supervise all excavation operations.
- ♦ Ensure that all employees are working in safe conditions.
- ♦ Have thorough knowledge of this data.
- ♦ Have the authority to stop work when it is unsafe for workers to enter a trench/excavation.
- ♦ All employees shall be trained in correcting excavation procedures, proper use of the protective system and safety precautions.
- ♦ Excavation and protective systems shall be inspected a minimum of once each working day and whenever there is a change of soil, water or other job site conditions that would affect the excavation.
- ♦ All lifting and pulling equipment, including cables, clings, chains, shackles and safety hooks shall be evaluated for suitability and capacity, and shall be inspected for damage or defects prior to use.
- ♦ All installation and removal of shoring and shielding shall be from above ground only.
- ♦ Employees are not allowed to enter an excavation that is not properly shored, shielded or sloped.
- ♦ All employees shall always work within the shoring and shielding and not stand on the edge of an un-shored excavation.
- ♦ All employees shall enter and exit excavations only within shielded or shored areas.

### **General Precautions**

- ♦ All trenching and excavation activities will be conducted in accordance with Cal/OSHA regulations.
- ♦ All trenching and excavation work or entry will be supervised by a competent person with the skills, training, and experience to recognize hazards and implement corrective action.
- ♦ All trenches and excavations 5 feet deep or greater will be protected from cave-ins by sloping, shoring, benching or shields.
- ♦ No employee is permitted to work in any trench or excavation that is not safe. Work will stop until the hazard is corrected.
- ♦ All trenches and excavations will be inspected prior to the start of work and at least daily by the competent person.
- ♦ Suitable access and egress will be maintained at all times
- ♦ Employees exposed to vehicular/equipment traffic shall be provided with and shall wear high visibility vests.
- ♦ No person shall be permitted under loads handled by power shovels, derricks, cranes, or hoists. No employee shall remain in or near a vehicle being loaded by the above.

### **Prior to Digging**

- ♦ A trenching and excavation permit will be obtained from Cal/OSHA.
- ♦ The estimated location of utility installations, such as sewer, telephone, fuel, electric, water lines, or any other underground installations that reasonably may be expected to be encountered during excavation work, shall be determined prior to opening an excavation.

- ♦ All Regional Notification Centers in the area involved and all known owners of underground facilities in the area who are not members of a Notification Center shall be advised of the proposed work at least 2 working days prior to the start of any digging or excavation work. Call 811. EXCEPTION: Emergency repair work to underground facilities.
- ♦ Make sure shoring drawings are on site and drawings must be stamped by Registered Civil Engineer if required (20' or over).

### **While Digging**

- ♦ When excavation operations approach the estimated location of underground installations, the exact location of the installations shall be determined by safe and acceptable means.
- ♦ Contact with live electrical lines and gas mains can cause death or serious injury. Extra care is to be taken in these areas. If you are unsure, ask your superintendent.
- ♦ While the excavation is open, underground installations shall be protected, supported, or removed as necessary to safeguard employees.
- ♦ All surface encumbrances that are located and create a hazard to employees shall be removed or supported, as necessary, to safeguard employees.
- ♦ Where the stability of adjoining buildings, walls, or other structures is endangered by excavation operations, support systems such as shoring, bracing, or underpinning shall be provided to ensure the stability of such structures for the protection of employees.
- ♦ Sidewalks, pavements and appurtenant structures shall not be undermined unless a support system or another method of protection is provided to protect employees from the possible collapse of such structures.
- ♦ No employee shall be permitted underneath loads handled by lifting or digging equipment. Employees shall be required to stand away from any vehicle being loaded or unloaded to avoid being struck by any spillage or falling materials.
- ♦ Adequate barriers or physical protection shall be provided at all remotely located excavations. All wells, pits, shafts, etc., shall be barricaded or covered. Upon completion of exploration and other similar operations, temporary wells, pits, shafts, etc., shall be back filled.

### **Open Trenches and Excavations**

- ♦ Daily inspections of excavations, the adjacent areas, and protective systems shall be made by a competent person for evidence of a situation that could result in possible cave-ins, indications of failure of protective systems, hazardous atmospheres, or other hazardous conditions. An inspection shall be conducted by the competent person prior to the start of work and as needed throughout the shift. Inspections shall also be made after every rain storm or other hazard increasing occurrence. These inspections are only required when employee exposure can be reasonably anticipated.
- ♦ Where the competent person finds evidence of a situation that could result in a possible cave-in, indications of failure of protective systems, hazardous atmospheres, or other hazardous conditions, exposed employees shall be removed from the hazardous area until the necessary precautions have been taken to ensure their safety.
- ♦ A stairway, ladder, ramp or other safe means of egress shall be located in trench excavations that are 4 feet or more in depth so as to require no more than 25 feet of lateral travel for employees.
- ♦ Where employees or equipment are required or permitted to cross over excavations over 6 feet and wider than 30 inches, walkways or bridges with standard guardrails shall be provided.
- ♦ When mobile equipment is operated adjacent to an excavation, or when such equipment is required to approach the edge of an excavation, and the operator does not have a clear and direct

- view of the edge of the excavation, a warning system shall be utilized such as barricades, hand or mechanical signals, or stop logs. If possible, the grade should be away from the excavation.
- ♦ Adequate protection shall be provided to protect employees from loose rock or soil that could pose a hazard by falling or rolling from an excavation face. Such protection shall consist of scaling to remove loose material; installation of protective barricades at intervals as necessary on the face to stop and contain falling material; or other means that provide equivalent protection.
  - ♦ Employees shall be protected from excavated or other materials or equipment that could pose a hazard by falling or rolling into excavations. Protection shall be provided by placing and keeping such materials or equipment at least 2 feet from the edge of excavations, or by the use of retaining devices that are sufficient to prevent materials or equipment from falling or rolling into excavations, or by a combination of both if necessary.
  - ♦ Where oxygen deficiency/enrichment or a hazardous atmosphere exists or could reasonably be expected to exist, such as in excavations in landfill areas or excavations in areas where hazardous substances are stored nearby, the atmosphere in the excavation shall be tested before employees enter excavations.
  - ♦ Adequate precautions shall be taken to prevent employee exposure to atmospheres, these precautions include providing proper respiratory protection or ventilation if engineering methods do not work.
  - ♦ Adequate precautions shall be taken, such as providing ventilation, to prevent employee exposure to an atmosphere containing a concentration of a flammable gas in excess of 20 percent of the lower flammable limit of the gas.
  - ♦ When controls are used that are intended to reduce the level of atmospheric contaminants to acceptable levels, testing shall be conducted as often as necessary to ensure that the atmosphere remains safe.
  - ♦ Emergency rescue equipment, such as breathing apparatus, a safety harness and line, or a basket stretcher, shall be readily available where hazardous atmospheric conditions exist or may reasonably be expected to develop during work in an excavation. This equipment shall be attended when in use.
  - ♦ Employees shall not work in excavations in which there is accumulated water, or in excavations in which water is accumulating, unless adequate precautions have been taken to protect employees against the hazards posed by water accumulation. The precautions necessary to protect employees adequately vary with each situation, but could include special support or shield systems to protect from cave-ins, water removal to control the level of accumulating water, or use of a safety harness and lifeline.
  - ♦ If water is controlled or prevented from accumulating by the use of water removal equipment, the water removal equipment and operations shall be monitored by a competent person to ensure proper operation.
  - ♦ If excavation work interrupts the natural drainage of surface water (such as streams), diversion ditches, dikes, or other suitable means shall be used to prevent surface water from entering the excavation and to provide adequate drainage of the area adjacent to the excavation. Excavations subject to runoff from heavy rains will require an inspection by a competent person.

## **Barricades**

### **Types**

*Warning* – these call attention to the hazard but offer no physical protection, therefore should be at least 5' from the edge and generally erected with multi-colored flagging.

*Protective* – provide physical protection, generally made from solid rails on posts set in ground.

If rebar stakes are used in or around any excavation (concrete reinforcement or barricades), rebar caps or troughs must be attached to protect employees from impalement hazards.

### **Placement**

- ♦ Shall be erected prior to excavation or immediately thereafter to avoid leaving an unprotected hazard.
- ♦ Shall be marked with lights at night if they are in walkways or roadways.
- ♦ Protective, physical barricades should be used for all excavations anticipated to be left open.

### Excavation Checklist

Site Location:		
Date:	Time:	Competent Person:
Soil Type: (see analysis checklist)		
Soil Classification:	Excavation Depth:	Excavation Width:
Type of Protection System Used:		

(Indicate For Each Item: Yes, No or N/A = Not Applicable)	Yes	No	N/A
<b>1. General Inspection of Job Site:</b>			
A. Excavations, adjacent areas and protective systems inspected by a competent person.			
B. Competent person has the authority to remove employees immediately.			
C. Surface encumbrances removed or supported.			
D. Employees protected from loose rock or soil that could pose a hazard by falling or rolling.			
E. Hard hats worn by all employees.			
F. Spoils, materials and equipment set back at least two feet from edge of excavation.			
G. Barriers provided at all remotely located excavations, wells, shafts, pits, etc.			
H. Walkways and bridges over excavations 4 feet or more in depth and equipped with standard guardrails and toe boards.			
I. Warning vest or other highly visible clothing provided and worn by all employees exposed to public vehicular traffic.			
J. Employees required to stand away from vehicles being loaded or unloaded.			
K. Warning system established and utilized when mobile equipment is operating near the edge of the excavation.			
L. Employees prohibited from going under suspended loads.			
M. Employees prohibited from working on the faces of sloped or benched excavations above other employees.			
<b>2. Utilities:</b>			
A. Utility companies contacted and/or utilities located.			
B. Exact location of utilities marked.			
C. Underground installations protected, supported, or removed when excavation is open.			
<b>3. Means of access and egress:</b>			
A. Lateral travel to means of egress no greater than 25 feet in excavation 4 feet or more in depth.			
B. Ladders used in excavations secured and extended 3 feet above the edge of the trench.			
C. Structural ramps used by employees designed by a competent person.			
D. Structural ramps used for equipment designed by a registered professional engineer (RPE).			
E. Ramps constructed of materials of uniform thickness, cleated together on the bottom, equipped with no slip surface.			
F. Employees protected from cave ins when entering or exiting the excavation.			
<b>4. Wet conditions:</b>			
A. Precautions taken to protect employees from the accumulation of water.			
B. Water removal equipment monitored by a competent person.			
C. Surface water or runoff diverted or controlled to prevent accumulation of water.			

<b>(Indicate For Each Item: Yes, No or N/A = Not Applicable)</b>	<b>Yes</b>	<b>No</b>	<b>N/A</b>
<b>5. Hazardous Atmosphere:</b>			
A. Atmosphere within the excavation tested where there is a reasonable possibility of an oxygen deficiency/enrichment, combustible, or other harmful contaminants exposing employees to a hazard.			
B. Adequate precautions taken to protect employees from exposure to an atmosphere containing less than 19.5% oxygen or more than 23.4% and/or to other hazardous atmospheres .			
C. Ventilation provided to prevent employees exposure to an atmosphere containing flammable gas in excess of 10% of the lower flammable limit of the gas.			
D. Testing conducted often to ensure that the atmosphere remains safe.			
E. Emergency equipment, such as breathing apparatus, safety harness and lifeline, and/or basket stretcher readily available where hazardous atmosphere could or do exist.			
F. Employees trained to use personal protective equipment and other rescue equipment.			
G. Safety harnesses and lifeline used and individually attended when entering bell bottom or other deep confined excavations.			
<b>6. Support Systems:</b>			
A. Materials and/or equipment for support systems selected based on soil analysis, trench depth, and expected loads.			
B. Materials and equipment used for protective systems inspected and in good condition.			
C. Materials and equipment not in good condition have been removed from service.			
D. Damaged materials and equipment used for protective systems inspected by a registered professional engineer (RPE) after repairs and before being placed back in service.			
E. Protective systems installed without exposing employees to the hazards of cave-ins, collapses, or threat of being struck by materials or equipment.			
F. Members of support system securely fastened to prevent failure.			
G. Support systems provided to insure stability of the adjacent structures, buildings, roadways, sidewalks, walls, etc.			
H. Excavations below the level of the base or footing supported, approved by an RPE.			
I. Removal of support systems processes from the bottom and released slowly as to note any indication of possible failure.			
J. Backfilling progresses with removal of support system.			
K. Excavation of material to a level no greater than 2ft. below the bottom of the support system and only if the system is designed to support the loads calculated for the full depth.			
L. Shield system placed to prevent lateral movement.			
M. Employees are prohibited from remaining in shield system during vertical movement.			
<b>Corrective action and remarks:</b>			



## Soils Analysis Checklist

This checklist must be completed when soil analysis is made to determine the soil type (s) present in the excavation. A separate analysis must be performed on the excavation (trench) is stretched over a distance where soil type changes.

Site Location: \_\_\_\_\_

Date: \_\_\_\_\_ Time: \_\_\_\_\_ Competent Person: \_\_\_\_\_

Where Was The Sample Taken From: \_\_\_\_\_

Excavation Depth: \_\_\_\_\_ Excavation Width: \_\_\_\_\_ Excavation Length: \_\_\_\_\_

### Visual Test

Particle type:      Fine grained (cohesive)      Granular (sand / gravel)  
 Water conditions:    Wet       Dry       Seeping water  
                           Surface water present       Submerged

Previously disturbed soils:       Yes       No

Underground utilities:       Yes       No

If yes, what type? \_\_\_\_\_

Layered soils? Note: the less stable layer controls soil type.       Yes       No

Layered soils dipping into excavation:       Yes       No       Unknown

Excavation exposed to vibrations:       Yes       No

If yes, from what? \_\_\_\_\_

Crack like openings or spalling observed:       Yes       No

Conditions that may create a hazardous atmosphere:       Yes       No

If yes, identify condition and source: \_\_\_\_\_

Surface encumbrances:       Yes       No

If yes, what type? \_\_\_\_\_

Work to be performed near public vehicular traffic:       Yes       No

Possible confined space exposure:       Yes       No

### Manual Test

Plasticity:       Cohesive       Non-Cohesive

Dry Strength:       Granular (crumbles easily)       Cohesive (broken with difficulty)

Wet shake:       Water comes to surface (granular material)       Surface remains dry (clay material)

**Note:** The following unconfined compressive strength tests should be performed on undisturbed soils.

**Thumb Test used to estimate unconfined compressive strength of cohesive soil.**

Test performed:  Yes  No

Type A - soil indented by thumb with very great effort.

Type B - soil indented by thumb with some effort.

Type C - soil easily penetrated several inches by thumb with little or no effort. If soil is submerged, seeking water, subjected to surface water, runoff, exposed to wedding.

**Penatrometer or Shearvane used to estimate on confined compresses strength of the cohesive soils:**

Test performed:  Yes  No Device Used: \_\_\_\_\_

**Type A soil:** Cohesive soils with an unconfined, compressive strength of 1.5 ton per square foot (tsf) or greater. Examples of cohesive soils are: clay, silty clay, sandy clay, clay loam and, in some cases, silty clay loam and sandy clay loam. Cemented soils such as caliche and hardpan are also considered Type A.

However, no soil is Type A if: (1) The soil is fissured; or (2) The soil is subject to vibration from heavy traffic, pile driving, or similar effects; or (3) The soil has been previously disturbed; or (4) The soil is part of a sloped, layered system where the layers dip into the excavation on a slope of four horizontal to one vertical (4H:1V) or greater; or (5) The material is subject to other factors that would require it to be classified as a less stable material.

**Type B soil:** (1) Cohesive soil with an unconfined compressive strength greater than 0.5 tsf but less than 1.5 tsf; or (2) Granular cohesionless soils including: angular gravel (similar to crushed rock), silt, silt loam, sandy loam and, in some cases, silty clay loam and sandy clay loam. (3) Previously disturbed soils except those which would otherwise be classed as Type C soil. (4) Soil that meets the unconfined compressive strength or cementation requirements for Type A, but is fissured or subject to vibration; or (5) Dry rock that is not stable; or (6) Material that is part of a sloped, layered system where the layers dip into the excavation on a slope less steep than four horizontal to one vertical (4H:1V), but only if the material would otherwise be classified as Type B.

**Type C soil:** (1) Cohesive soil with an unconfined compressive strength of 0.5 tsf or less; or (2) Granular soils including gravel, sand, and loamy sand; or (3) Submerged soil or soil from which water is freely seeping; or (4) Submerged rock that is not stable, or (5) Material in a sloped, layered system where the layers dip into the excavation or a slope of four horizontal to one vertical (4H:1V) or steeper.

**Soil Classification**

Stable Rock  Type A  Type B  Type C

**Selection of Protective System**

Protective System: Sloping Specify angle \_\_\_\_\_  
Timber Shoring  
Aluminum hydraulic shoring  
Trench shield maximum depth in this soil

### Daily Trenching and Excavation Checklist Over 4’ in Depth or More

		Sun	Mon	Tues	Wed	Thurs	Fri	Sat		
Date:		/ /	/ /	/ /	/ /	/ /	/ /	/ /		
Job #:	Name & Initial of Competent Person:	Yes	No	Yes	No	Yes	No	Yes	No	Yes
	Current trenching & excavation permit on site	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
	US ALERT called and known utilities marked 811	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
	Remove trees, poles, boulders and similar objects that may be hazardous to workers and excavation	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
	Competent person must supervise the trench or excavation at all times	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
	Workers shall be protected by sloping, shoring, benching casing or equivalent alternative methods	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
	Protective devices/materials that are utilized shall conform with the type of soil present on the site	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
	Shoring and sloping complies with CAL OSHA Regulations. If required are shoring drawings on site. Are drawings stamped by Registered Civil Engineer if required (20’ or over)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
	The competent person will assess the job site from possible moving ground, after rainstorm, earthquake or other events as necessary	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
	Spoil/dirt must be kept a minimum of two feet from the edge of the trench/ excavation	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
	Check edge of trench/excavation for cracked or sloughing soil/dirt	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
	Ladders are a minimum of 25 feet from one another. Ladders used must be three feet above trench and properly secured/tied off	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
	No workers are allowed on top of or in trench/excavation until checklist is complete	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
	When crossing is placed above the trench/excavation, a standard guardrail will be installed when the depth of the trench/excavation is 6 feet or more	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
	Protective barriers, barricades or caution signs will be used at the site so that workers, residents or public will not fall into trench/excavation	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
	Do not excavate beneath the base of an adjacent foundation, retaining wall or other structure so as to undermine such structure. Support undermined sidewalk and adjoining structures if the conditions exist	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
	Do not use existing wall or structure, as a retaining wall until it will safely support the expected load. The competent person on the job site must determine this	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
	Backfill temporary wells, pits or shafts immediately upon completion of operation	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
	Does trench/excavation have hazardous atmosphere - air testing may be required at 4’ or deeper	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
	Site personnel understand and are following our safety procedures for trenching and excavation	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>