

## Trenching and Shoring Program

Responsible Administrator: EHS Safety Specialist

Revised: January 2024

**Summary:** This section outlines the policy and procedures related to the Trenching and Shoring Program that is administered through the Environmental Health and Safety (EHS) Department.

|                                 |   |
|---------------------------------|---|
| 1. Program Description .....    | 1 |
| 2. Scope .....                  | 1 |
| 3. Definitions .....            | 2 |
| 4. Responsibilities .....       | 2 |
| 5. Program Components .....     | 3 |
| 6. Reporting Requirements ..... | 6 |
| 7. References .....             | 7 |

### 1. Program Description

This program sets forth procedures related to trenching and shoring activities at the University of California at Irvine (UC Irvine). Procedures on expectations for work in excavations are included in this program. This program also specifies responsibilities for different parties, training requirements for entrants and competent persons, code of safe practices, and types of personal protective equipment to use while performing trenching and shoring activities. For the trenching and shoring regulations and guidelines to be implemented, the digging activities and scope must go below 4 feet in depth.

### 2. Scope

The scope of this program applies to all facilities and grounds at UC Irvine and to all UC Irvine employees, while performing regularly scheduled or emergency trenching and shoring activities (any digging which is 4 feet or deeper) All departments at UC Irvine are required to assess their vendor and/or contractor programs for trenching and shoring issues (any digging which is 4 feet or deeper). Contractors hired by UC Irvine must have their own California OSHA (Cal/OSHA) compliant Trenching and Shoring Program and follow all specifications in the Campus Design Criteria.

The purpose of this Trenching and Excavations plan is:

- a. To supplement the UC Irvine standard safety policies by providing safety standards specifically designed to cover Excavation Safety on the job, and;
- b. To ensure that each employee is trained and made aware of the safety provisions which are to be implemented prior to the start of work.

This plan is designed to enable employers and employees to recognize the hazards on the job and to establish the procedures that are to be followed in order to prevent injury. Each employee will be trained in these procedures and will strictly adhere to them.

### 3. Definitions

**"Actual slope"** means the slope to which an excavation face is excavated.

**"Competent Person, trenching Competent Person"** means a person who is capable of identifying existing and predictable trenching hazards in the work environment, which are hazardous or dangerous, AND has the authority to stop work or take corrective actions to eliminate these conditions.

**"Competent Person on site"** means that a Competent Person must perform an inspection of the trench at the beginning of each shift, after a rain storm, or whenever conditions change at the job site.

**"Distress"** means that the soil is in a condition where a cave-in is imminent or is likely to occur. Distress is evidenced by such phenomena as the development of fissures in the face of or adjacent to an open excavation; the subsidence of the edge of an excavation; the slumping of material from the face or the bulging or heaving of material from the bottom of an excavation; the spilling of material from the face of an excavation; and raveling, i.e., small amounts of material such as pebbles or little clumps of material suddenly separating from the face of an excavation and trickling or rolling down into the excavation.

**"Maximum allowable slope"** means the steepest incline of an excavation face that is acceptable for the most favorable site conditions as protection against cave-ins and is expressed as the ratio of horizontal distance to vertical rise (H:V).

**"Short term exposure"** means a period of time less than or equal to 24 hours that an excavation is open.

**"Unconfined compressive strength"** means the load per unit area at which a soil will fail in compression. It can be determined by laboratory testing or estimated in the field using a pocket penetrometer, by thumb penetration tests, and other methods.

**"Wet soil"** means soil that contains significantly more moisture than moist soil, but in such a range of values that cohesive material will slump or begin to flow when vibrated. Granular material that would exhibit cohesive properties when moist will lose those cohesive properties when wet.

### 4. Responsibilities

#### 4.1 Facilities Management Supervisors

Supervisors are responsible for implementing the UC Irvine Trenching and Shoring Program.

Supervisors will implement the program through:

- Ensuring that work location health and safety practices related to trenching and shoring are communicated and understood through documented training;
- Establishing work unit specific procedures for equipment maintenance to comply with elements of this program;
- Enforcing health and safety procedures consistently through work unit specific training and following the Codes of Safe Practices ([Appendix A](#));
- Including compliance with health and safety procedures as part of the annual performance evaluation;
- Encouraging employees to report safety concerns without fear of reprisal; and Reporting accidents and injuries promptly to Human Resources.

Supervisors are also responsible for the following activities related to trenching and shoring activities:

- Creating a Standard Operating Procedure (SOP) ([Appendix B](#)) for all trenching and shoring activities;
- Ensuring that the designated “Competent Person” has reviewed and approved the SOP for trenching and shoring activities being performed;
- Ensuring that each job is analyzed for potential hazards and controls and hazard analyses are performed for all job classifications that perform trenching and shoring activities; and
- Ensuring that each job is reviewed by the designated “Competent Person” before the trenching and shoring work commences.

#### 4.2 Facilities Management Safety On site (SOS)

SOS Representatives (SR) [in partnership with EHS](#) are responsible for:

Completing Work Unit specific Hazard Assessments and Trench Entry and Authorization Form ([Appendix C](#)) before entering an excavation space and assuring that identified hazards are addressed;

Developing Standard Operating Procedure (SOP) ([Appendix B](#)) as necessary; Coordinating Work Unit specific training, as determined necessary for specific competencies related to job duties; and

Maintaining written records for work unit specific training.

#### 4.3 Employees

Employees are responsible for following the requirements of the Trenching and Shoring Program by:

- Asking questions of their supervisors when concerned about an unknown or hazardous situation or substance;
- Reporting all unsafe conditions, practices, or equipment either to their supervisor, or to [EHS](#) ;
- Keeping informed about conditions that may impact their health and safety; and participating in [training programs \(Appendix D\)](#) as required.

#### 4.4 Environmental Health and Safety (EHS) Responsibilities

The EHS Department is responsible to:

- Maintain and update the Trenching and Shoring Program on an annual basis or when conditions on campus grounds and facilities change.

### 5. Program Components

#### [Flowchart](#)

##### 5.1 Implementation of Plan

It is the responsibility of Facilities Management and designated [Competent Persons \(Appendix E\)](#) to implement this Excavations Plan. The designated Competent Person is responsible for continual observational safety checks of the work operations, and to enforce

the safety policies and procedures. The designated Competent Person is also responsible to correct any identified unsafe acts or conditions immediately upon their discovery. It is the responsibility of the employee to understand and adhere to the procedures of this plan, and to follow the instructions of the designated Competent Person . It is also the responsibility of the designated Competent Person to bring to management's attention any identified unsafe/hazardous conditions or acts that may cause injury to either themselves or to any other employee. Any changes to this Excavations Plan must be approved by the designated Competent Persons, Facilities Management, and EHS.

## 5.2 Site-Specific Standard Operating Procedures

Site-[Specific Standard Operating Procedures \(SOP\) \(Appendix B\)](#) will be developed by UC Irvine for all trenching and shoring activities and for activities involving or generating toxic or hazardous materials. SOPs may also be developed for high-hazard activities such as blasting, high- scaling, etc., or for additional personal protective and lifesaving equipment not identified by this program.

### 5.2.1 Hazard Assessment

UC Irvine has designated a group of Competent Persons to assess the inherent hazards associated with work areas, occupations, and tasks in excavations. The designated Competent Persons are responsible for eliminating or minimizing the hazards by means of engineering and administrative controls and by the use of personal protective equipment. Hazards include, but are not limited to airborne materials, impact noise, injurious light, heat and cold. Sources of these hazards include, but are not limited to chemical use, moving parts and equipment, rolling and pinching parts and equipment, elevated parts and equipment, sharp objects, electricity, and light sources such as welding operations.

The [Hazard Assessment Form/Trench Entry and Authorization Form \(Appendix C\)](#) for Trenching and Shoring activities consists of a checklist that must be completed before the commencement of each trenching and shoring project. Categories on the Hazard Assessment form include:

- Notification;
- Competent Person;
- Protective Systems;
- Hazards – Underground, Overhead, Surface;
- Access to Trenches and Excavations
- Confined Spaces and Hazardous Atmospheres;
- Hazardous Electrical Conditions requiring Lockout/Tagout procedures;
- Other Potential Physical Hazards;
- Personal Protective Equipment; and
- General Housekeeping.

### 5.2.2 Engineering and Administrative Controls

UC Irvine must use all feasible engineering and administrative controls to mitigate or minimize hazards.

Where hazards still exist after application of these controls, personal protection equipment must be utilized.

#### 5.2.3 Provision of Protective Equipment

UC Irvine must provide all necessary [personal protective equipment \(PPE\) \(Appendix F\)](#) unless other arrangements are agreed upon. UC Irvine must also provide for cleaning, laundering, or disposal of protective equipment as well as repair, maintenance or replacement of protective equipment as needed to maintain effectiveness of protection.

#### 5.2.4 Signs for Designated Personal-Protection-Required Areas

In areas where there are inherent hazards posed to all those who enter, that area must have signs warning entrants of the need for personal protection. Signs must be visible at all times when work is in progress and must be promptly removed or covered when the hazard no longer exists.

Signs must be in conformance with the latest edition of ANSI Z35.1 “Specifications for Accident Prevention Signs” and with OSHA 1910.145, “Specifications for Accident Prevention Signs and Tags”

“Danger” signs must be used only where there is imminent danger to the lives of employees or others.

“Caution” Signs must be used to warn against potential hazard and to caution against unsafe practices.

### 5.3 Requirements for Protective Systems

#### 5.3.1 Protection of employees in excavations

Each employee in an excavation must be protected from cave-ins by an adequate protective system designed in accordance with design criteria listed below for (1) sloping and benching systems or (2) support systems, shield systems and other protective systems except when:

- (a) Excavations are made entirely in stable rock; or
- (b) Excavations are less than 5 feet (1.52 m) in depth and examination of the ground by a competent person provides no indication of a potential cave-in.

[Protective systems \(Appendix G\)](#) must 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.

#### 5.4 Commencement of Excavation Work

UC Irvine must follow Specific Excavation Requirements ([Appendix H](#)) for the varying conditions that exist for different types of excavation work on campus grounds. All employees working in Excavations must follow the direction of the designated Competent Person in determining Soil Classification (Appendix I) before work commences, and refer to the [Soil Classification Definitions \(Appendix I\)](#) , if necessary. Additionally, a [Trench Inspection and Entry Authorization Form \(Appendix C\)](#) must be completed by a UC Irvine designated Competent Person before excavation work commences.

#### 5.5 Accident/Injury Procedures

When an injury or illness occurs that is serious enough to require immediate medical treatment, notify University Police (UCIPD) by calling 911 from a campus or external telephone. Completely describe the injury so that a determination can be made on the proper response. Serious occupational injuries, illnesses or exposures to hazardous substances must be investigated.

When calling 911, UCIPD will be notified of the emergency, and will then notify EHS of the situation. EHS will assist UCIPD in making decisions on the next step to take in the emergency situation.

##### 5.5.1 Reporting procedure:

If the injury is not serious or life-threatening but medical treatment is required, refer to the Workers Compensation form " [Obtaining Medical Care for Employees with Work-Related Injuries](#) ", and ensure that the employee is transported to the locations listed on the aforementioned form.

The online incident form must be completed on all injuries and work-related illnesses. These forms must be completed within 24 hours of the injury. For additional information, refer to the Supervisor's Responsibility instructions on the [Workers' Compensation web page](#) .

The supervisor will conduct an accident investigation as soon as possible and provide appropriate action to prevent reoccurrence of the accident. Should the accident involve the failure of any excavations-related device or equipment, the supervisor will immediately remove the damaged equipment from service and retain the equipment in the supervisor's possession until further evaluation of the equipment.

## 6. Reporting Requirements

### 6.1 Permit Requirements

UCI (as a State recognized entity) is not required to have an annual permit and is not required to inform Cal/OSHA of any digging event.

## [6.2 Reporting Requirements \(Appendix J\)](#)

UCI project managers must notify EHS about any scheduled trenching activities 48 hours before the event and of any emergency trenching as soon as it is scheduled.

The outside contractor is responsible for notifying Cal/OSHA about all trenching and shoring activities that are about to occur either via telephone or in writing ([Appendix K](#)). UCI is not responsible for the annual permit or event permit which the contractor shall have.

## 7. References

[California Code of Regulations, Title 8 \(8CCR\), Section 1541, General Requirements for Excavations;](#)

[California Code of Regulations, Title 8 \(8CCR\), Section 1541.1, Requirements for Protective Systems;](#)

## Appendices

- [A - Code of Safe Work Practices for Trenching and Shoring Activities](#)
- [B - SOP template for Trenching and Shoring Activities](#)
- [C - Hazard Assessment and Trench Entry and Authorization Form](#)
- [D - Training Components](#)
- [E - Designated Competent Persons at UC Irvine](#)
- [F - Personal Protection Requirements by Task](#)
- [G - Selection of Protective Systems](#)
- [H - Specific Excavation Requirements](#)
- [I - Soil Classification Definitions](#)
- [J – Reporting Requirements](#)
- [K – Cal/OSHA Activity Notification Form](#)
- [L - Competency Assessment Tool for Competent Persons at UC Irvine](#)
- [M – OSHA Daily Inspection Checklist for Trenching/Excavation Sites](#)

## **Appendix A**

### **Code of Safe Work Practices for Trenching and Shoring Activities**

1. Before excavation, underground utilities must be located and marked. Adjacent structures must be stabilized, as needed, using shoring, bracing, or underpinning techniques.
2. Appropriate barricades, fences, protected walkways, and signs must be provided to protect the public.
3. A competent person must be in charge of each excavation who is trained to identify hazardous conditions and who has the authority to take corrective action. The competent person must inspect excavations on a daily basis and after every rain.
4. Examine the trench or excavation before entry.
5. An access ladder or other safe access must be provided.
6. Install barricades, fences, protected walkways and/or signs to protect the public and other campus users from the excavation site.
7. Ensure all equipment and materials are in good, working condition.
8. Pre-plan the trenching, excavation operation to include safety work practices, hazard recognition procedures, and soil determination/analysis tasks.
9. Workers must be protected from cave-ins by either an adequate sloping system or an adequate support or protective system.
10. Stairs or ladders must be provided when workers enter excavations over 4 feet deep.
11. A means of exited the trench must be provided every 25 feet.
12. Workers must stay always from any equipment loading or unloading material.
13. Excavated or other material must be retained 2 feet or more from the edge of the excavation.



14. Workers must not enter or work in trenches with hazardous atmosphere without adequate controls. Test excavation and trench sites for oxygen deficiency or the presence of other hazardous atmosphere prior to entry.
15. Workers must wear all required personal protective equipment including hardhats, safety footwear, gloves, eye protection, hearing protection, and fall protection devices, as needed.
16. Additional shoring and bracing must be provided when excavations or trenches are located adjacent to previously backfilled excavations or where excavations are subjected to vibrations from railroad or highway traffic, the operation of machinery, or other sources.
17. Discourage surface crossing of trenches.
18. Protect employees from loads or objects falling from lifting or excavating equipment.
19. Keep rocks, soil, equipment, and other materials from falling into the trench.
20. Prevent water accumulation whenever possible.
21. Keep excavations and trenches open the minimum amount of time needed to complete work tasks.
22. Evaluate the excavation and trenching operation at the conclusion of the work activity.

## **Appendix B**

### **SOP template for regularly scheduled and emergency trenching and shoring activities**

UC Irvine will develop and implement a written Excavations SOP including each area of the workplace where the employees are assigned and where the hazard exists. The SOP should be written and implemented when a project possesses an exposure, or a non-routine task possesses a hazard.

| <b>Areas to assess in trenching and shoring activities</b>                               | <b>Check box to indicate if areas have been assessed</b> | <b>Hazards identified in trenching and shoring activities (e.g., physical hazards)</b> | <b>Check box to indicate if hazards are controlled</b> | <b>Indicate how hazards are controlled</b> | <b>Check box if work unit specific training is required</b> |
|--|--|--|--|--|---|
| Hazards in the work area   | <input type="checkbox"/>                                 |  | <input type="checkbox"/>                               |  | <input type="checkbox"/>                                    |
| Confined Space Entry In Hazardous Atmospheres  | <input type="checkbox"/>                                 |  | <input type="checkbox"/>                               |  | <input type="checkbox"/>                                    |
| Hazardous Electrical Work requiring Lockout/tagout procedures                            | <input type="checkbox"/>                                 |  | <input type="checkbox"/>                               |  | <input type="checkbox"/>                                    |
| Hot Work   | <input type="checkbox"/>                                 |  | <input type="checkbox"/>                               |  | <input type="checkbox"/>                                    |
| Fall Protection  | <input type="checkbox"/>                                 |  | <input type="checkbox"/>                               |  | <input type="checkbox"/>                                    |
| Chemical, Noise, or Heat Exposures   | <input type="checkbox"/>                                 |  | <input type="checkbox"/>                               |  | <input type="checkbox"/>                                    |
| Excavations equipment (e.g., backhoes)   | <input type="checkbox"/>                                 |  | <input type="checkbox"/>                               |  | <input type="checkbox"/>                                    |
| Correct procedures for the selection, fit, use, and maintenance of Excavations equipment | <input type="checkbox"/>                                 |  | <input type="checkbox"/>                               |  | <input type="checkbox"/>                                    |

|  |                          |  |                          |  |                          |
|--|--------------------------|--|--------------------------|--|--------------------------|
| Prompt and safe removal of injured employees                 | <input type="checkbox"/> |  | <input type="checkbox"/> |  | <input type="checkbox"/> |
| Jobsite inspection   | <input type="checkbox"/> |  | <input type="checkbox"/> |  | <input type="checkbox"/> |
| Employee training in using Excavations equipment             | <input type="checkbox"/> |  | <input type="checkbox"/> |  | <input type="checkbox"/> |
| Employee training in UC Irvine Trenching and Shoring Program | <input type="checkbox"/> |  | <input type="checkbox"/> |  | <input type="checkbox"/> |
| Inspection of Excavations equipment                          | <input type="checkbox"/> |  | <input type="checkbox"/> |  | <input type="checkbox"/> |
| Documentation of employee training                           | <input type="checkbox"/> |  | <input type="checkbox"/> |  | <input type="checkbox"/> |

**Appendix C Hazard Assessment and Trench Entry and Authorization Form**

**Appendix C**

**Hazard Assessment and Trench Entry and Authorization Form for regularly scheduled and emergency trenching activities**

Date Prepared: \_\_\_\_\_ Location: \_\_\_\_\_ Time: \_\_\_\_\_

Approximate Temperature (degrees F): \_\_\_\_\_ Weather Conditions: \_\_\_\_\_

Project Name: \_\_\_\_\_

Competent UC Irvine Employee: \_\_\_\_\_

Supervisor Name: \_\_\_\_\_

|                   |          |   |   |
|-------------------|----------|---|---|
| <b>Dimensions</b> | Depth =  |   |   |
|                   | Top =    | W | L |
|                   | Bottom = | W | L |

| <b>Soil Type</b>                                  | <b>Tested?</b>           |
|---|--------------------------|
| <input type="checkbox"/> Solid rock (most stable) | <input type="checkbox"/> |
| <input type="checkbox"/> Average soil             | <input type="checkbox"/> |
| <input type="checkbox"/> Fill material            | <input type="checkbox"/> |
| <input type="checkbox"/> Loose sand               | <input type="checkbox"/> |

| <b>Hazard Identification</b>  |                          |
|---|--------------------------|
| UC Irvine’s written Injury and Illness Prevention Program (IIPP) meets all Cal/OSHA requirements. Includes identification of trenching and excavation hazards on the site, regular inspections, accident investigation, and correction of hazardous conditions. | <input type="checkbox"/> |
| Before the job commences, consider the purpose of the job, the activities it involves, and the hazards it presents. What has to be done? Who has to perform the job and how will it be performed?   | <input type="checkbox"/> |
| Break down a specific job into a series of steps and identify all the potential hazards employees may encounter while performing the job.   | <input type="checkbox"/> |
|   |                          |

|  |                          |
|--|--------------------------|
| Decide what actions or procedures (develop revised task procedures, obtain personal protective equipment, provide safety guards or safety devices, provide job specific training, engineer the hazards out, etc...) are necessary to eliminate or minimize the hazards that could lead to an accident or injury. | <input type="checkbox"/> |
| <b>Notification</b>  |                          |
| The EH&S Department has been notified in a timely fashion, of any trenching or excavating job and whether any UC Irvine employees will enter the space. EH&S will subsequently notify Cal/OSHA of these trenching activities occurring on campus.  | <input type="checkbox"/> |
| Sloping or benching for excavations greater than 20 feet deep follow Cal/OSHA specifications or was designed by a professional engineer.   | <input type="checkbox"/> |
| <b>Competent Person</b>  |                          |
| A "Competent Person" is on site to identify hazards.   | <input type="checkbox"/> |
| Competent Person's Name:   |                          |
| If the Competent Person finds evidence of a hazard, employees are immediately removed from the dangerous area.   | <input type="checkbox"/> |
| No UC Irvine employee is allowed to enter a trench or excavation unless the Competent Person is on site.   | <input type="checkbox"/> |
| The Competent Person has knowledge of testing procedures for hazardous atmospheres.  | <input type="checkbox"/> |
| The Competent Person has knowledge of soil classification, has classified the soil, and has determined the appropriate type of cave-in protection and required slope.  | <input type="checkbox"/> |
| <b>Protective Systems</b>  |                          |
| Workers are protected from cave-ins in all excavations by an adequately designed protective system. (Not necessary if excavation made in stable rock, or if less than 5 feet deep and no potential for cave-in.)   | <input type="checkbox"/> |
| Work is done only in areas protected by sloping and benching, a support system, a shield system, etc.  | <input type="checkbox"/> |
| Installation of the support system is closely coordinated with excavation of the trench.   | <input type="checkbox"/> |

|  |                          |
|--|--------------------------|
| Material and equipment used for protective systems are the right size, in good condition, and free of defects.   | <input type="checkbox"/> |
| Members of support systems are securely connected together and are not subjected to loads beyond their capacity.   | <input type="checkbox"/> |
| Workers are protected from cave-ins, structural collapse, or accidentally being hit during installation and removal of the support system.   | <input type="checkbox"/> |
| Removal of shoring or other protective systems starts at the bottom of the excavation. Members are released slowly so structural failures will be noticed.   | <input type="checkbox"/> |
| Backfilling progresses with the removal of support systems from excavations.   | <input type="checkbox"/> |
| Employees are instructed not to climb on shoring or bracing.   | <input type="checkbox"/> |
| <b>Inspections</b>   |                          |
| The Competent Person inspects (a) every day before work, (b) after every rainstorm, and (c) as needed, for evidence of possible cave-ins, failure of systems, hazardous atmospheres, etc.  | <input type="checkbox"/> |
| There is no accumulated water in trenches or excavations where employees work, unless special precautions are taken. Water is removed safely and monitored by the Competent Person. The Competent Person is aware of the water table and natural drainage. | <input type="checkbox"/> |
| There are no tension cracks, sloughing (small cave-ins), or bulging in trench walls or in the ground near trenches or excavation.  | <input type="checkbox"/> |
| There is no bending, buckling, or shoring in the trench or excavation. (If there is any damage, call a registered professional engineer.)  | <input type="checkbox"/> |
| There has been no change in weather affecting soil moisture since the last inspection conducted by the Competent Person.   | <input type="checkbox"/> |
| A lookout person is standing by at all times while employees are physically in the trench.   | <input type="checkbox"/> |
| <b>Hazards – Underground, Overhead, Surface</b>  |                          |
| Underground utility installations in the area (such as electrical, phone, gas, sewage, water, and fuel lines) have been identified.  | <input type="checkbox"/> |

|  |                          |
|--|--------------------------|
| Utility owners have been notified at least two working days prior to the commencement of digging.  | <input type="checkbox"/> |
| While an excavation is open, underground utility lines are protected, supported, or removed, as necessary.   | <input type="checkbox"/> |
| Employees are not permitted underneath a load handled by lifting or digging equipment.   | <input type="checkbox"/> |
| No employees are permitted above others on sloped/benched faces, unless those below are protected from falling material.   | <input type="checkbox"/> |
| There is adequate protection from loose rock on the face of a trench or excavation. (Protection may include scaling to remove loose material or erection of a barricade.)  | <input type="checkbox"/> |
| Hazards from vehicle or equipment vibration have been inspected and corrected.   | <input type="checkbox"/> |
| Support systems have been installed wherever the stability of adjoining buildings, walls, or other structures is endangered by excavation operations.  | <input type="checkbox"/> |
| No excavation is done below the level of the base or footing of any foundation or retaining wall, unless the structure is supported.   | <input type="checkbox"/> |
| Sidewalks and roads are supported, if undermined.  | <input type="checkbox"/> |
| Spoil, tool, material, and equipment are kept at least two feet from the edge. If not, they are kept in place by retaining devices.  | <input type="checkbox"/> |
| Protection is provided from mobile equipment, which approaches the edge of an excavation. (Protection may include barricades, hand or mechanical signals, or stop logs) Wherever possible, the vehicle path grade should slope away from the excavation. | <input type="checkbox"/> |
| <b>Access to Trenches and Excavations</b>  |                          |
| Ladders, stairs, ramps, or other means of access are no more than 25 feet from any employee in a trench 4 feet or more deep.   | <input type="checkbox"/> |
| Structural ramps, that are used solely by employees, must be designed by a Competent Person; ramps for equipment are designed by a Competent Person qualified in structural design.  | <input type="checkbox"/> |
| Walkways or bridges with standard guardrails are provided where employees or equipment cross over excavations, which are deeper than 6 feet and wider than 30  | <input type="checkbox"/> |



|  |                          |
|--|--------------------------|
| inches.  |                          |
| There are adequate barriers (warning signs, barricades, covers) to prevent unauthorized entry into a trench or excavation.   | <input type="checkbox"/> |
| Temporary wells, pits, shafts, etc. are backfilled as soon as exploration or similar operations are completed.   | <input type="checkbox"/> |
| <b>Confined Spaces and Hazardous Atmospheres</b>   |                          |
| Excavations may be classified as confined spaces if dangerous air contamination or oxygen deficiency exists, and it is difficult for workers to exit the space. If such a space exists, the <u>UC Irvine Confined Space Entry Program</u> must be followed before the space may be entered.                            | <input type="checkbox"/> |
| List specific space information here:  |                          |
| <b>Hazardous Electrical Conditions Requiring the Use of Lockout/Tagout Procedures</b>  |                          |
| Excavations may contain equipment that requires the use of lockout/tagout procedures to de-energize the energy source. If such equipment exists, follow the <u>UC Irvine Hazardous Energy Control and Lockout/Tagout Program</u> before the excavation space may be entered.   | <input type="checkbox"/> |
| List specific space information here:  |                          |
| <b>Fall Protection</b>   |                          |
| Excavations may possess conditions where fall protection is required to be used in these spaces. If employees must access shoring equipment that is located at least six feet from the bottom of the excavation or trench, follow the <u>UC Irvine Fall Protection Program</u> before working in the excavation space. | <input type="checkbox"/> |
| List specific space information here:  |                          |
| <b>Hot Work</b>  |                          |
| Excavations may possess conditions where hot work is required to be performed to fix a problem. If employees must perform hot work in an excavation space, follow the <u>UC Irvine Hot Work Program</u> before commencing hot work in an excavation space.   | <input type="checkbox"/> |
| List specific space information here:  |                          |
| <b>Potential for Other Physical Hazards (Chemical, Noise, and Heat)</b>  |                          |

|  |                          |
|--|--------------------------|
| Excavations may possess other physical hazards that include chemical exposure, noise exposure, and excessive heat exposure to employees while working in the excavation space. Before commencing work in an excavation space, evaluate the potential for the aforementioned exposures.   | <input type="checkbox"/> |
| Determine if any chemicals are being used in the area where the excavation work is occurring and if present, evaluate how to control employee exposure, and the proper PPE to be used.   | <input type="checkbox"/> |
| Determine if any significant noise sources exist where the excavation work is occurring and if present, evaluate how to control employee exposure, and the proper PPE to be used.  | <input type="checkbox"/> |
| Determine if any significant sources of heat exist where the excavation work is occurring and if present, evaluate how to control employee exposure, and the proper PPE to be used.  | <input type="checkbox"/> |
| List specific space information here:  |                          |
| <b>Personal Protective Equipment</b>   |                          |
| Hard hats, protective boots or shoes, goggles, protective clothing, and protective gloves are available and used as required by UC Irvine employees entering trenches, excavations, and confined spaces. Protective equipment is appropriate for the work being performed and provides adequate protection.  | <input type="checkbox"/> |
| Evaluate the excavation space to determine if it is necessary to wear respiratory protection while working in the space. If it is determined that respirators are to be used, confirm that all excavation employee entrants are included in <u>UC Irvine's Respiratory Protection Program</u> and if their medical examination and annual fit tests are current. | <input type="checkbox"/> |
| Workers exposed to vehicle traffic must wear bright orange warning garments. In rainy weather, they must wear orange or yellow raingear.   | <input type="checkbox"/> |
| <b>Housekeeping</b>  |                          |
| Adequate lighting exists when employees are working at night.  | <input type="checkbox"/> |
| All work areas are free of tripping hazards.   | <input type="checkbox"/> |
| Means of access and egress are kept clear at all times.  | <input type="checkbox"/> |

## **Appendix D**

### **Training Components**

UC Irvine will coordinate all trenching and shoring training and provide a training program that will teach employees who might be exposed to Trenching and Shoring hazards, how to recognize such hazards, and how to minimize them. Employees will be trained in the following areas:

- (a) the nature of Trenching and Shoring hazards in the work area;
- (b) the correct procedures for erecting, maintaining, disassembling, and inspecting Trenching and Shoring protection systems;
- (c) the use and operation of Trenching and Shoring equipment
- (d) the role of each employee in the Trenching and Shoring safety monitoring system when the system is in use;
- (e) the limitations of safety equipment during the performance of work;
- (f) the correct procedures for equipment and materials handling and storage;
- (g) employees' roles in the UC Irvine Trenching and Shoring Program; and
- (h) the details in this plan.

Additional Trenching and Shoring training details:

- (a) The company or contractor hired by UC Irvine will conduct all Trenching and Shoring training.
- (b) New employees will be oriented to the UC Irvine Trenching and Shoring Program as part of the new employee orientation program.
- (c) All Facilities Maintenance employees will be trained in General Awareness Level Trenching and Shoring training every three years.

- (d) All designated Competent Persons will sign off on all safety training related to Trenching and Shoring.
  
- (e) Any employee who has not received appropriate training in the UC Irvine Trenching and Shoring Program will not be allowed to work with Excavations until the employee has been trained and understands the program.
  
- (f) The Trenching and Shoring Program is based on published standards and these standards are considered to be a minimum program. The UC Irvine Excavations Plan has been designed to exceed the minimum requirements.

**Trainer:** The trainer must prepare a written certification that identifies the employee trained and the date of the training. The trainer must sign the training certification record for each employee. This certification record and training documentation are evidence of employees receiving Trenching and Shoring training. Completion of this training equals competency in Trenching and Shoring activities.

## **Appendix E**

### **Designated Competent Persons at UC Irvine**

UC Irvine has identified the following employees as “Competent Persons” to evaluate a trenching or shoring project and to ensure all program requirements are met and to immediately correct an unsafe condition that may pose a hazard to UC Irvine employees and their contractors.

## **List of Trained Trench & Shoring Competent Persons**

| <b>Employee</b> | <b>Department (Area)</b> | <b>Date Trained</b> |
|-----------------|--------------------------|---------------------|
| Danny Hirschag  | FM (Grounds)             | Jan. 27, 2017       |
| Eric Alton      | FM (Grounds)             | Jan. 27, 2017       |
| Fred Bockmiller | FM (Engineering)         | Jan. 27, 2017       |
| Greg Feazel     | FM (Estimator)           | Jan. 27, 2017       |
| Joel Villanueva | FM (Grounds)             | Jan. 27, 2017       |
| Mike Widgery    | FM (Buildings)           | Jan. 27, 2017       |
| Rick Ternet     | FM (Grounds)             | Jan. 27, 2017       |

A competent person is one who is capable of identifying existing and predictable hazards in the surrounding, or working conditions that are unsanitary, hazardous, or dangerous to employees, and who has authorization to take prompt corrective measure to eliminate them. All competent persons must complete a trenching and shoring class, successfully pass the exam, and be certified for successful completion of the class. A competent person should have and be able to demonstrate the following:

Training, experience, and knowledge of:

- Soil analysis;
- Use of protective systems; and
- Requirements of the trenching standard and permit conditions (Title 8 California Code of Regulations (CCR) Chapter 3.2 Article 2, Section 341).

Ability to detect:

- Conditions that could result in cave-ins;
- Failures in protective systems;
- Hazardous atmospheres; and
- Other hazards including those associated with confined spaces.

The competent person must also have the authority to take prompt corrective measures to eliminate existing and predictable hazards and to stop work when required.

The competent person must conduct inspections:

- Daily and before the start of each shift;
- As dictated by the work being performed in the trench;
- After every rain storm;
- After other events that could increase hazards, such as snowstorms, windstorms, ground thaw, earthquake, dramatic change in weather, etc.;
- When fissures, tension cracks, sloughing, undercutting, water seepage, bulging at the bottom, or other similar conditions occur;
- When there is a change in the size, location, or placement of the spoil pile;
- When there is an indication of change or movement in adjacent structures.

For excavations four feet or greater in depth, a Trench Inspection and Entry Authorization Form ([Appendix M](#)) must be completed for each inspection. The Trench Inspection and Entry Authorization Form should be used before each trenching and shoring activity commences.

## **Appendix F**

### **Personal Protection Requirements by Task**

When a specific task to be performed has inherent hazards, those personnel performing the task must be warned of the hazards and must be advised of the protective measures available to them. In conjunction with the EHS Department, Facilities Management will determine the specific type of PPE that will be required while performing specific tasks. The PPE determination will be based upon the nature of the task, the hazards involved, and if any engineering and/or administrative controls have been implemented to mitigate the hazards involved.

### **Personal Protection Equipment Use Training**

All UC Irvine personnel (Facilities Maintenance or contractors) required to wear personal protective equipment must be trained in the proper selection, fit, and use of the equipment and in the limitations of the equipment. With the assistance of EHS, Facilities Management will train all personnel in how to properly select, fit, use, and store PPE.

### **Design Standards**

Personal protective equipment must conform to NIOSH (National Institutes of Occupational Safety and Health) and MSHA (Mine Safety and Health Administration) standards, and, where applicable, those in referenced American National Standards Institute (ANSI) publications. All personal protective equipment must be of safe design and construction for the work to be performed.

### **Maintenance**

Personal protective equipment in use must be inspected daily and maintained in serviceable condition. Items of personal issue must be cleaned, sanitized as appropriate, and repaired prior to being reissued to another employee.

Tools and equipment must be maintained in safe operating condition. Defective equipment must be taken out of service until repaired or replaced.

## **Appendix G**

### **Selection of Protective Systems**

#### ***Design of sloping and benching systems***

The slopes and configurations of sloping and benching systems shall be selected and constructed by the employer or his designee and shall be in accordance with the requirements of 8CCR Section 1541.1(b)(1), Section 1541.1(b)(2), Section 1451.1(b)(3), or Section 1541.1(b)(4) as follows:

#### (1) Option One: Allowable configurations and slopes

Excavations shall be sloped at an angle not steeper than one and one-half horizontal to one vertical (34 degrees measured from the horizontal), unless the employer uses one of the other options listed below.

Slopes specified in Section 1541.1(b)(1)(A) shall be excavated to form configurations that are in accordance with the slopes shown for Type C.

#### (2) Option Two: Determination of slopes and configurations

Maximum allowable slopes, and allowable configurations for sloping and benching systems, shall be determined in accordance with the conditions and requirements set forth in Appendices A and B in 8CCR1541.1

#### (3) Option Three: Designs using other tabulated data

Designs of sloping or benching systems shall be selected from and be in accordance with tabulated data, such as tables and charts.

The tabulated data shall be in written form and shall include all of the following:

- Identification of the parameters that affect the selection of a sloping or benching system drawn from such data;
- Identification of the limits of use of the data, to include the magnitude and configuration of slopes determined to be safe;
- Explanatory information as may be necessary to aid the user in making a correct selection of a protective system from the data.
- At least one copy of the tabulated data, which identifies the registered professional engineer who approved the data, shall be maintained at the jobsite during construction of the protective system. After that time, the data may be stored off the jobsite, but a copy of the data shall be made available to the Division upon request.

#### (4) Option Four: Design by a registered professional engineer

Sloping and benching systems not utilizing Option (1) or Option (2) or Option (3) under Section 1541.1(b) shall be stamped and signed by a registered professional engineer.

Designs shall be in written form and shall include at least the following:



- The magnitude of the slopes that were determined to be safe for the particular project;
- The configurations that were determined to be safe for the particular project;
- The identity of the registered professional engineer approving the design.

At least one copy of the design shall be maintained at the jobsite while the slope is being constructed. After that time, the design need not be at the jobsite, but a copy shall be made available to the Cal/OSHA upon request.

## **Sloping and benching**

Scope and application: This section contains specifications for sloping and benching when used as methods of protecting employees working in excavations from cave-ins. The requirements of this appendix apply when the design of sloping and benching protective systems is to be performed in accordance with the requirements set forth in 8 CCR 1541.1(b)

### **Actual slope**

The actual slope must not be steeper than the maximum allowable slope.

The actual slope must be less steep than the maximum allowable slope when there are signs of distress. If that situation occurs, the slope must be cut back to an actual slope which is at least 1/2 horizontal to one vertical (1/2H:1V) less steep than the maximum allowable slope.

When surcharge loads from stored material or equipment, operating equipment, or traffic are present, a competent person must determine the degree to which the actual slope must be reduced below the maximum allowable slope and must assure that such reduction is achieved. Surcharge loads from adjacent structures must be evaluated in accordance with criteria related to **Stability of Adjacent Structures** above.

### **Materials and equipment**

Materials and equipment used for protective systems must be free from damage or defects that might impair their proper function.

Manufactured materials and equipment used for protective systems must be used and maintained in a manner that is consistent with the recommendations of the manufacturer, and in a manner that will prevent employee exposure to hazards.

When material or equipment that is used for protective systems is damaged, a competent person must examine the material or equipment and evaluate its suitability for continued use. If the competent person cannot assure the material

or equipment is able to support the intended loads or is otherwise suitable for safe use, then such material or equipment must be removed from service and must be evaluated and approved by a registered professional engineer before being returned to service.

### ***Installation and removal of support***

Members of support systems must be securely connected together to prevent sliding, falling, kickouts, or other predictable failure.

Support systems must be installed and removed in a manner that protects employees from cave-ins, structural collapses, or from being struck by members of the support system.

Individual members of support systems must not be subjected to loads exceeding those which members were designed to withstand.

Before temporary removal of individual members begins, additional precautions must be taken to ensure the safety of employees, such as installing other structural members to carry the loads imposed on the support system.

Removal must begin at, and progress from, the bottom of the excavation. Members must be released slowly so as to note any indication of possible failure of the remaining members of the structure or possible cave-in of the sides of the excavation.

Backfilling must progress together with the removal of support systems from excavations.

### ***Additional requirements for support systems for trench excavations***

Excavation of material to a level no greater than 2 feet (.61 m) below the bottom of the members of a support system must be permitted, but only if the system is designed to resist the forces calculated for the full depth of the trench, and there are no indications while the trench is open of a possible loss of soil from behind or below the bottom of the support system.

Installation of a support system must be closely coordinated with the excavation of trenches.

### ***Sloping and benching systems***

Employees must not be permitted to work on the faces of sloped or benched excavations at levels above other employees except when employees at the lower levels are adequately protected from the hazard of falling, rolling, or sliding material or equipment.

***Shield systems*** - Shield systems must not be subjected to loads exceeding those which the system was designed to withstand. Shields must be installed in a manner to restrict lateral or other hazardous movement of the shield in the event of the application of sudden lateral loads.

Employees must be protected from the hazard of cave-ins when entering or exiting the areas protected by shields.

Employees must not be allowed in shields when shields are being installed, removed, or moved vertically.

***Additional requirement for shield systems used in trench excavations***

Excavations of earth material to a level not greater than 2 feet (0.61 m) below the bottom of a shield must be permitted, but only if the shield is designed to resist the forces calculated for the full depth of the trench, and there are no indications while the trench is open of a possible loss of soil from behind or below the bottom of the shield.

## **Appendix H**

### **Specific Excavation Requirements**

This section applies to all open excavations made in the earth's surface. **Excavations** are defined to include trenches.

#### ***Surface encumbrances***

All surface encumbrances that are located so as to create a hazard to employees must be removed or supported, as necessary, to safeguard employees.

#### ***Underground installations***

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, must be determined prior to opening an excavation.

In addition to notifying EHS, Facilities Management must contact utility companies or owners, within established or customary local response times, advise them of the proposed work, and ask them to establish the location of the utility underground installations prior to the start of actual excavation. When utility companies or owners cannot respond to a request to locate underground utility installations within 24 hours (unless a longer period is required by state or local law), or cannot establish the exact location of these installations, UC Irvine may proceed with caution and provide detection equipment or other acceptable means to locate utility installations.

When excavation operations approach the estimated location of underground installations, the exact location of the installations must be determined by safe and acceptable means. While the excavation is open, underground installations must be protected, supported, or removed as necessary to safeguard all employees.

#### ***Access and egress***

Structural ramps that are used solely by UC Irvine employees, as a means of access or egress from excavations, must be designed by a UC Irvine designated Competent Person. Structural ramps used for access or egress of equipment must be designed by a Competent Person qualified in structural design and must be constructed in accordance with the design.

Ramps and runways constructed of two or more structural members must have the structural members connected together to prevent displacement.

Structural members used for ramps and runways must be of uniform thickness.

Cleats or other appropriate means used to connect runway structural members must be attached to the bottom of the runway or must be attached in a manner to prevent tripping.

Structural ramps used in lieu of steps must be provided with cleats or other surface treatments of the top surface to prevent slipping.

A means of egress from trench excavations must be provided. A stairway, ladder, ramp, or other safe means of egress must be located in trench excavations that are 4 feet (1.22 m) or more in depth so as to require no more than 25 feet (7.62 m) of lateral travel for employees.

### ***Exposure to vehicular traffic***

Employees exposed to public vehicular traffic must be provided with, and must wear, warning vests or other suitable garments marked with or made of reflectorized or high-visibility material.

### ***Exposure to falling loads***

No employee must be permitted underneath loads handled by lifting or digging equipment. Employees must be required to stand away from any vehicle being loaded or unloaded to avoid being struck by any spillage or falling materials. Operators may remain in the cabs of vehicles being loaded or unloaded when the vehicles are equipped, in accordance with 8 CCR 1591(e), to provide adequate protection for the operator during loading and unloading operations.

### ***Warning system for mobile equipment***

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 must be utilized such as barricades, hand, or mechanical signals, or stop logs. If possible, the grade should be away from the excavation.

### ***Hazardous atmospheres***

#### **Testing and controls**

In addition to the requirements set forth in the Construction Safety Orders, relating to any construction activities on campus, and General Industry Safety Orders to prevent exposure to harmful levels of atmospheric contaminants and to assure acceptable atmospheric conditions, the following requirements also apply:

- Where oxygen deficiency (atmospheres containing less than 19.5 percent oxygen) 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 atmospheres in the excavation

must be tested before employees enter excavations greater than 4 feet (1.22 m) in depth.

- Adequate precautions must be taken to prevent employee exposure to atmospheres containing less than 19.5 percent oxygen and other hazardous atmospheres. These precautions include providing proper respiratory protection or ventilation.
- Adequate precaution must 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 must be conducted as often as necessary to ensure that the atmosphere remains safe.

### **Emergency rescue equipment**

Emergency rescue equipment, such as breathing apparatus, a safety harness and line, or a basket stretcher, must be provided by Facilities Management and be readily available where hazardous atmospheric conditions exist or may reasonably be expected to develop during work in an excavation. This equipment must be attended when in use.

Employees entering bell-bottom pier holes, or other similar deep and confined footing excavations, must wear a harness with a lifeline securely attached to it. The lifeline must be separate from any line used to handle materials and must be individually attended at all times while the employee wearing the lifeline is in the excavation.

### ***Protection from hazards associated with water accumulation***

UC Irvine employees must not work in excavations in which there is accumulated water, or in excavations 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. The designated Competent Persons have the authority to ensure that UC Irvine employees do not work in excavations in which there is accumulated water.

If water is controlled or prevented from accumulating by the use of water removal equipment, the water removal equipment and operations must 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 must 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 and compliance with the above two paragraphs.

### ***Stability of adjacent structures***

Where the stability of adjoining buildings, walls, or other structures is endangered by excavation operations, support systems such as shoring, bracing, or underpinning must be provided to ensure the stability of such structures for the protection of employees.

Excavation below the level of the base or footing of any foundation or retaining wall that could be reasonably expected to pose a hazard to employees must not be permitted except when:

- (a) A support system, such as underpinning, is provided to ensure the safety of employees and the stability of the structure; or
- (b) The excavation is in stable rock; or
- (c) A registered professional engineer has approved the determination that such excavation work will not pose a hazard to employees.

Sidewalks, pavements, and appurtenant structure must not be undermined unless a support system or another method of protection is provided to protect employees from the possible collapse of such structures.

### ***Protection of employees from loose rock or soil***

Adequate protection must 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 must 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 must be protected from excavated or other materials or equipment that could pose a hazard by falling or rolling into excavations. Protection must be provided by placing and keeping such materials or equipment at least 2 feet (.61 m) 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.

### ***Inspections***

Daily inspections of excavations, the adjacent areas, and protective systems must 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 must be conducted by the competent person prior to the start of work and as needed throughout the shift. Inspections must also be made after every rainstorm 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 must be removed from the hazardous area until the necessary precautions have been taken to ensure their safety.

### ***Fall protection***

Walkways or bridges must be provided with standard guardrails where employees or equipment are required or permitted to cross over excavations over 6 feet and wider than 30 inches.

Adequate barrier physical protection must be provided at all remotely located excavations. All wells, pits, shafts, etc., must be barricaded or covered. Upon completion of exploration and other similar operations, temporary wells, pits, shafts, etc., must be backfilled.



## Appendix I

### **Soil Classification Definitions**

The definitions and examples given below are based on, in whole or in part, the following; American Society for Testing Materials (ASTM) Standards D653-85 and D2488; The Unified Soils Classification System; The U.S. Department of Agriculture (USDA) Textural Classification Scheme; and The National Bureau of Standards Report BSS-121.

**"Cemented soil"** means a soil in which the particles are held together by a chemical agent, such as calcium carbonate, such that a hand-size sample cannot be crushed into powder or individual soil particles by finger pressure.

**"Cohesive soil"** means clay (fine grained soil), or soil with a high clay content, which has cohesive strength. Cohesive soil does not crumble, can be excavated with vertical side slopes, and is plastic when moist. Cohesive soil is hard to break up when dry and exhibits significant cohesion when submerged. Cohesive soils include clayey silt, sandy clay, silty clay, clay, and organic clay.

**"Dry soil"** means soil that does not exhibit visible signs of moisture content.

**"Fissured"** means a soil material that has a tendency to break along definite planes of fracture with little resistance, or a material that exhibits open cracks, such as tension cracks, in an exposed surface.

**"Granular soil"** means gravel, sand, or silt (coarse grained soil) with little or no clay content. Granular soil has no cohesive strength. Some moist granular soils exhibit apparent cohesion. Granular soil cannot be molded when moist and crumbles easily when dry.

**"Layered system"** means two or more distinctly different soil or rock types arranged in layers. Micaceous seams or weakened planes in rock or shale are considered layered.

**"Moist soil"** means a condition in which a soil looks and feels damp. Moist cohesive soil can easily be shaped into a ball and rolled into small diameter threads before crumbling. Moist granular soil that contains some cohesive material will exhibit signs of cohesion between particles.

**"Plastic"** means a property of a soil, which allows the soil to be deformed or molded without cracking, or appreciable volume change.

**"Saturated soil"** means a soil in which the voids are filled with water. Saturation does not require flow. Saturation, or near saturation, is necessary for the proper use of instruments such as a pocket penetrometer or shear vane.

**"Soil classification system"** means, for the purpose of this subpart, a method of categorizing soil and rock deposits in a hierarchy of Stable Rock, Type A,

Type B, and Type C, in decreasing order of stability. The categories are determined based on an analysis of the properties and performance characteristics of the deposits and the characteristics of the deposits and the environmental conditions of exposure.

**"Stable rock"** means natural solid mineral matter that can be excavated with vertical sides and remain intact while exposed.

**"Submerged soil"** means soil which is underwater or is free seeping.

**"Type A"** means cohesive soils with an unconfined, compressive strength of 1.5 ton per square foot (tsf) (144 kPa) 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:

- (a) The soil is fissured; or
- (b) The soil is subject to vibration from heavy traffic, pile driving, or similar effects; or
- (c) The soil has been previously disturbed; or
- (d) 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
- (e) The material is subject to other factors that would require it to be classified as a less stable material.

**"Type B"** means:

- (a) Cohesive soil with an unconfined compressive strength greater than 0.5 tsf (48 kPa) but less than 1.5 tsf (144 kPa); or
- (b) Granular cohesion-less soils including angular gravel (similar to crushed rock), silt, silt loam, sandy loam and, in some cases, silty clay loam and sandy clay loam.
- (c) Previously disturbed soils except those which would otherwise be classed as Type C soil.
- (d) Soil that meets the unconfined compressive strength or cementation requirements for Type A, but is fissured or subject to vibration; or
- (e) Dry rock that is not stable; or
- (f) 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"** means:

- (a) Cohesive soil with an unconfined compressive strength of 0.5 tsf (48 kPa) or less; or
- (b) Granular soils including gravel, sand, and loamy sand; or
- (c) Submerged soil or soil from which water is freely seeping; or
- (d) Submerged rock that is not stable, or

(e) 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**

This section describes a method of classifying soil and rock deposits based on site and environmental conditions, and on the structure and composition of the earth deposits. This section also contains definitions, sets forth requirements, and describes acceptable visual and manual tests for use in classifying soils.

This section applies when a sloping or benching system is designed in accordance with the requirements set forth in 8 CCR1541.1(b)(2) as a method of protection for employees from cave-ins. This section also applies when timber shoring for excavations is designed as a method of protection from cave-ins.

### **Classification of soil and rock deposits.**

Each soil and rock deposit must be classified by a competent person as Stable Rock, Type A, Type B, or Type C in accordance with the definitions set forth above.

### **Basis of classification**

The classification of the deposits must be made based on the results of at least one visual and at least one manual analysis. Such analyses must be conducted by a competent person using tests described in paragraph (d) below, or in other recognized methods of soil classification and testing such as those adopted by the American Society for Testing Materials, or the U.S. Department of Agriculture textural classification system.

### **Visual and manual analyses**

The visual and manual analyses, such as those noted as being acceptable in this section, must be designed and conducted to provide sufficient quantitative and qualitative information as may be necessary to identify properly the properties, factors, and conditions affecting the classification of the deposits.

## **Layered systems**

In a layered system, the system must be classified in accordance with its weakest layer. However, each layer may be classified individually where a more stable layer lies under a less stable layer.

## **Reclassification**

If, after classifying a deposit, the properties, factors, or conditions affecting its classification change in any way, the changes must be evaluated by a Competent Person. The deposit must be reclassified as necessary to reflect the changed circumstances.

## ***Acceptable visual and manual tests***

All soil must be tested by using either the visual test and pocket penetrometer or the manual test and pocket penetrometer. The pocket penetrometer is required to be used by UC Irvine employees in all cases when testing soil characteristics, and all readings should be taken at least three times and recorded.

### **Visual tests**

Visual analysis is conducted to determine qualitative information regarding the excavation site in general, the soil adjacent to the excavation, the soil forming the sides of the open excavation, and the soil taken as samples from excavated material.

- (a) Observe samples of soil that are excavated and soil in the sides of the excavation. Estimate the range of particle sizes and the relative amounts of the particle sizes. Soil that is primarily composed of fine-grained material is cohesive material. Soil composed primarily of coarse-grained sand or gravel is granular material.
- (b) Observe soil as it is excavated. Soil that remains in clumps when excavated is cohesive. Soil that breaks up easily and does not stay in clumps is granular.
- (c) Observe the side of the opened excavation and the surface area adjacent to the excavation. Crack-like openings such as tension cracks could indicate fissured material. If chunks of soil spall off a vertical side, the soil could be fissured. Small spalls are evidence of moving ground and are indications of potentially hazardous situations.
- (d) Observe the area adjacent to the excavation and the excavation itself for evidence of existing utility and other underground structures, and to identify previously disturbed soil.
- (e) Observed the opened side of the excavation to identify layered systems. Examine layered systems to identify if the layers slope toward the excavation. Estimate the degree of slope of the layers.

- (f) Observe the area adjacent to the excavation and the sides of the opened excavation for evidence of surface water, water seeping from the sides of the excavation, or the location of the level of the water table.
- (g) Observe the area adjacent to the excavation and the area within the excavation for sources of vibration that may affect the stability of the excavation face.

### **Manual tests**

Manual analysis of soil samples is conducted to determine quantitative as well as qualitative properties of soil and to provide more information in order to classify soil properly.

- (a) Plasticity. Mold a moist or wet sample of soil into a ball and attempt to roll it into threads as thin as 1/8-inch in diameter. Cohesive material can be successfully rolled into threads without crumbling. For example, if at least a two-inch (50 mm) length of 1/8-inch thread can be held on one end without tearing, the soil is cohesive.
- (b) Dry strength. If the soil is dry and crumbles on its own or with moderate pressure into individual grains or fine powder, it is granular (any combination of gravel, sand, or silt). If the soil is dry and falls into clumps, which break up into smaller clumps, but the smaller clumps can only be broken up with difficulty, it may be clay in any combination with gravel, sand, or silt. If the dry soil breaks into clumps which do not break up into small clumps and which can only be broken with difficulty, and there is no visual indication the soil is fissured, the soil may be considered unfissured.
- (c) Thumb penetration. The thumb penetration test can be used to estimate the unconfined compressive strength of cohesive soils. (This test is based on the thumb penetration test described in American Society for Testing and Materials (ASTM) Standard designation D2488 - "Standard Recommended Practice for Description of Soils (Visual - Manual Procedure).") Type A soils with an unconfined compressive strength of 1.5 tsf can be readily indented by the thumb; however, they can be penetrated by the thumb only with very great effort. Type C soils with an unconfined compressive strength of 0.5 tsf can be easily penetrated several inches by the thumb and can be molded by light finger pressure. This test should be conducted on an undisturbed soil sample, such as a large clump of spoil, as soon as practicable after excavation to keep to a minimum the effects of exposure to drying influences. If the excavation is later exposed to wetting influences (rain, flooding), the classification of the soil must be changed accordingly.
- (d) Other strength tests. Estimates of unconfined compressive strength of soils can also be obtained by use of a pocket penetrometer or by using a hand-operated shearvane. All tests performed using a pocket

penetrometer must be performed at least three times and all readings must be recorded.

- (e) Drying test. The basic purpose of the drying test is to differentiate between cohesive material with fissures, unfissured cohesive material, and granular material. The procedure for the drying test involves drying a sample of soil that is approximately one inch thick (2.54 cm) and six inches (15.24 cm) in diameter until it is thoroughly dry:
- (i) If the sample develops cracks as it dries, significant fissures are indicated.
  - (ii) Samples that dry without cracking are to be broken by hand. If considerable force is necessary to break a sample, the soil has significant cohesive material content. The soil can be classified as an unfissured cohesive material, and the unconfined compressive strength should be determined.
  - (iii) If a sample breaks easily by hand, it is either a fissured cohesive material or a granular material. To distinguish between the two, pulverize the dried clumps of the sample by hand or by stepping on them. If the clumps do not pulverize easily, the material is cohesive with fissures. If they pulverize easily into very small fragments, the material is granular.

## **Appendix J**

### **Reporting Requirements**

Whenever any trenching and shoring activity is about take place, Facilities Management must notify EHS as soon as possible, or at least 48 hours before the work has been scheduled. All emergency trenching work must also be reported to EHS as soon as it has been determined that the activity will take place. The following people have been designated as the EHS Department contacts:

Primary contact:

Eric Allton

(949) 824 – 6024 – office

(949) 246 – 3699 – cell phone

Secondary contact:

Jennie Wung

(949) 880-4270 – cell phone

Tertiary contact:

John Sterritt

(949) 824-6889 – office

(949) 390-0430 – cell phone

If none of the above contact is available, please call the EHS main office at (949) 824 – 6200 to leave a message.

The following information must be provided to the EHS Department when notifying them about trenching and shoring activities:

1. Has the Hazard Assessment and Trench Entry and Authorization Form ([Appendix C](#)) been completed?
2. Who is the Competent Person on site?
3. What is the depth of the trench?
4. What is the length of the trench?
5. What method of trench protection is being used?
6. What are the results of the soil analysis?

**Appendix K Cal OSHA Activity Notification Form**



## ACTIVITY NOTIFICATION FORM FOR HOLDERS OF ANNUAL PERMITS Scaffolding Falsework Trenches/Excavations

8 CCR 341.1 (f) REQUIRES HOLDERS OF ANNUAL PERMITS TO PROVIDE NOTIFICATION TO THE DOSH OFFICE NEAREST THE PROJECT PRIOR TO COMMENCEMENT OF ANY WORK. THIS FORM IS PROVIDED FOR YOUR CONVENIENCE TO USE FOR SUCH NOTIFICATION.

THIS FORM MAY BE FAXED TO THE NEAREST DOSH OFFICE TO COMPLY WITH THE ABOVE. PLEASE DO NOT MAIL DUPLICATE NOTIFICATION TO FOLLOW-UP FAX NOTIFICATION.

**FAX DATA:** FAXED TO \_\_\_\_\_ DOSH DISTRICT OFFICE ON \_\_\_\_\_  
DOSH FAX NO. ( \_\_\_\_\_ ) BY \_\_\_\_\_

Company Name: \_\_\_\_\_ Field Phone: \_\_\_\_\_  
Annual Permit Number: \_\_\_\_\_ Office Phone: \_\_\_\_\_  
Issuing Region: \_\_\_\_\_ Issuing District: \_\_\_\_\_  
Specific Activity Location: \_\_\_\_\_ Number of Employees: \_\_\_\_\_  
Nearest Major Cross Street: \_\_\_\_\_ Starting Date: \_\_\_\_\_  
City: \_\_\_\_\_ Anticipated Completion Date: \_\_\_\_\_  
County: \_\_\_\_\_ High Voltage Lines in Proximity? No \_\_\_\_\_ Yes \_\_\_\_\_

**INSTRUCTIONS:** The appropriate item(s) must be completed and signed by a person knowledgeable about the project for each activity covered by a permit. Please fill in or check off the blanks where appropriate.

**Scaffolding:** Height \_\_\_\_\_ Metal \_\_\_\_\_ Wood \_\_\_\_\_ Wood over 60 Feet \_\_\_\_\_ Metal over 125 Feet \_\_\_\_\_

Metal > 125 Feet or Wood > 60 Feet requires design by California Registered Civil Engineer & Plans at Site. (See 8 CCR 1644(c)(7))

Description: \_\_\_\_\_  
\_\_\_\_\_

**Falsework/Vertical Shoring:** Maximum Height \_\_\_\_\_ Maximum Span \_\_\_\_\_ Material \_\_\_\_\_

Description: \_\_\_\_\_  
\_\_\_\_\_  
(See 8 CCR 1717)

**Trenches/Excavations:** Depth Range (Min/Max) \_\_\_\_\_ Width Range (Min/Max) \_\_\_\_\_ Total Length \_\_\_\_\_

Ground Protection Method: Shoring \_\_\_\_\_ Sloping \_\_\_\_\_ Trench Shield \_\_\_\_\_ Professional Engineer \_\_\_\_\_

Underground Services Alert (USA) Number \_\_\_\_\_ (NORTH 1-800-642-2444/SOUTH 1-800-422-4133)

Soil Analysis to be done? Yes \_\_\_\_\_ No \_\_\_\_\_ If No, You **Must** Slope 1.5 to 1.

**Competent Person:** The holder of an Annual Permit who is notifying the District of the commencement of a Trench and/or Excavation project shall designate a **competent person** in accordance with the requirements of 8 CCR Section 1504, 1541, and 1541.1.

Description: \_\_\_\_\_  
\_\_\_\_\_

- Ground protection methods for excavations deeper than 20 feet must be designed by a Registered Professional Engineer. See 8 CCR 1541.1, Appendix F.

I hereby certify that to the best of my knowledge the above information and assertions are true and correct and that I/the applicant have knowledge of and will comply with the foregoing.

Signature: \_\_\_\_\_

Title: \_\_\_\_\_ Date: \_\_\_\_\_

## **Appendix L**

### **Competency Assessment Tool for Competent Persons at UC Irvine**

This form is used in determining the competency of UC Irvine employees on the topic of Trenching and Shoring. All employees being considered as a Competent Person should be able to show and demonstrate knowledge of all items listed on this assessment form.

#### **UC IRVINE EMPLOYEE BEING CONSIDERED AS A COMPETENT PERSON:**

---

#### **CONFINED SPACE**

Can the employee identify if a trench or excavation meets the definition of confined space? \_\_\_\_

If yes, is the employee trained to evaluate confined space hazards?

\_\_\_\_\_

Is the employee capable of specifying necessary safety control measures to assure employee safety? \_\_\_\_\_

#### **INSPECTIONS**

When performing inspections of the excavation, is the employee able to thoroughly conduct inspections of the excavation? \_\_\_\_\_

Of adjacent structures? \_\_\_\_\_

Of protective systems? \_\_\_\_\_

Is the employee able to identify when to conduct inspections (prior to the start of work, as needed throughout the shift, after rainstorm or hazard-increasing occurrence)?  
\_\_\_\_\_

Can the employee exercise the authority to remove employees from a hazardous area until proper precautions are taken? \_\_\_\_\_

### **PROTECTIVE SYSTEMS**

Is the employee able to recognize that a protective system is needed for any excavation less than 5 feet in depth? \_\_\_\_\_

Is the employee able to examine the ground for indications of potential cave-in?  
\_\_\_\_\_

Is the employee able to examine any damaged equipment or materials used, and evaluate its suitability for continued use? \_\_\_\_\_

Is the employee able to distinguish between Option 1 (Select and construct a protective system) and Option 2 (Design a sloping and shoring system) and which one is appropriate to be used at a job site?  
\_\_\_\_\_

Is the employee able to properly classify soil using either a manual test and pocket penetrometer OR a visual test and a pocket penetrometer? \_\_\_\_\_

What type of soil was identified in the excavation?  
\_\_\_\_\_

What visual tests were used? \_\_\_\_\_

What manual tests were performed?  
\_\_\_\_\_

How was the proper sloping or benching configuration chosen?  
\_\_\_\_\_

### **WATER CONDITIONS**

If using dewatering equipment on site, is the employee able to monitor the equipment and its proper operation? \_\_\_\_\_

Is the employee able to identify if the excavation been subjected to heavy rainfall?  
\_\_\_\_\_

Is the employee able to inspect the excavation and ensure that it complies with the precautions set forth in the Excavations Standard, part (h)(1) and (h)(2)? \_\_\_\_\_

**RAMPS**

Is the employee able to evaluate the use of a structural ramp for trenching activities?

\_\_\_\_\_

If the ramp is used for employees, is the employee able to evaluate it for safe access and egress?

\_\_\_\_\_

If the ramp is used for access and egress of equipment, is the employee able to identify that the ramp must be qualified in structural design? \_\_\_\_\_

List qualifications of equipment ramp:

\_\_\_\_\_

\_\_\_\_\_

Was the employee able to determine if the ramp meets design qualifications?

\_\_\_\_\_

**CONCLUSION**

List all qualifications of UC Irvine employee being evaluated as a Competent Person:

\_\_\_\_\_

\_\_\_\_\_

Has the competent person performed all tasks required by the Excavations standard?

\_\_\_\_\_

Is the person capable of identifying existing and predictable hazards in the surrounding or working conditions, which are unsanitary, hazardous, or dangerous to employees?

\_\_\_\_\_

Is the competent person authorized to take prompt corrective measures to eliminate such hazards or conditions?

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_ (UC Irvine employee's name) is hereby designated as a Competent Person in Trenching and Excavations activities conducted on the grounds and facilities at UC Irvine and has met the requirements for such designation. The Competent Person understands and is able to demonstrate the responsibilities of this title and the Excavations Standard under Cal/OSHA.

Supervisor's Signature \_\_\_\_\_ Date

\_\_\_\_\_

EHS Signature \_\_\_\_\_ Date

\_\_\_\_\_

Competent Person's Signature \_\_\_\_\_ Date

\_\_\_\_\_

**Appendix M Daily Trenching Inspection Checklist**

## Daily Inspection Checklist for Trenching/Excavation Sites

**Competent Person:**

**Project:**

**Trench Location/Station and Dimensions:**

### Utilities

✓ N/A

- 1. Utility locates contacted at least 2 working days prior to start of digging, and appropriately marked and identified
- 2. Underground installations have been protected, supported, or removed when the excavation is open
- 3. Surface encumbrances such as utilities, utility poles, foundations, transformer vaults or other structures are supported or removed
- 4. Equipment operator(s) is aware of energized overhead uninsulated powerlines and required approach distances (10' minimum for lines <50kV; 20' minimum unknown Voltage; with a dedicated spotter)

### Excavation / Trench

✓ N/A

- 1. Soil classified using 1 visual and 1 manual method, or default Type C
- 2. Employees are protected from loose rock or soil
- 3. All employees are wearing proper PPE
- 4. Spoils, materials, and equipment are set back at least 2' from the edge of excavation

**Excavation / Trench**✓ **N/A**

- 1. Soil classified using 1 visual and 1 manual method, or default Type C
- 2. Employees are protected from loose rock or soil
- 3. All employees are wearing proper PPE
- 4. Spoils, materials, and equipment are set back at least 2' from the edge of excavation
- 5. The work area has been identified using barricades, fencing, or some other physical barrier
- 6. Traffic control plan has been completed and implemented
- 7. High visible clothing is worn by all employees exposed to vehicular traffic
- 8. Excavations 6' or deeper with walkways or bridges are equipped with guardrails
- 9. Employees are prohibited from working or walking under suspended loads
- 10. Employees are prohibited from working on faces of sloped / benched excavations above other employees
- 11. A warning system has been established and used when mobile equipment is operating near the edge of the excavation
- 12. A means of egress (e.g. ladders, steps, ramps) has been provided so that no employee must travel further than 25'
- 13. If ladders are used for egress, they are secured and extend at least 3' above the top of the excavation
- 14. If wood ramps are used for egress, they are constructed of uniform material thickness and cleated together at the bottom
- 15. All employees entering the trench have documented training on requirements for excavation / trenching and protective measures

**Wet Conditions**



**Wet Conditions**

✓ **N/A**

- 1. Precautions have been taken to protect employees from hazards posed by water accumulation
- 2. When water removal equipment is in operation, it is being monitored by the Competent Person
- 3. Surface water is being collected or diverted
- 4. An inspection of the excavation, adjacent areas, and protective system is performed and documented after each rainstorm

**Hazardous Atmosphere**

✓ **N/A**

- 1. Where a hazardous atmosphere could reasonably exist, the atmosphere is being tested for low or high oxygen, hazardous vapors, and toxic gasses before employees enter the excavation
- 2. Emergency response equipment is readily available where a hazardous atmosphere could exist (e.g. retrieval unit)

**Comments**