ENVIRONMENT, SAFETY & HEALTH DIVISION

Chapter 11: Excavation Safety

Excavation Procedures

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1 Purpose

The purpose of these procedures is to ensure that *excavations* (including *ground disturbance* activities) are conducted in a safe manner and in compliance with applicable regulations. They cover planning, performing, and closing out excavations in which contact with soil is expected – such as trenching, drilling, removing, or penetrating soil – that meet any of these conditions at any time:

1. Depth is one foot or more
2. Power tools will be used
3. Utilities are identified
4. Soil will be disturbed as a result of asphalt and/or concrete removal
5. Any hazardous condition is likely to be encountered

The following activities are exempt:

- Sampling soil, concrete, and asphalt from bins, hoppers, or stockpiles using hand tools
- Replacing existing sign posts in and around SLAC roads, parking areas, and pathways, provided sleeves are used

These procedures apply workers, supervisors, competent persons, utility locators, project and field construction managers, the Facilities and Operations facilities engineer and division director, the excavation safety program manager, and subcontractors, Safety Services, Waste Management, Radiation Protection, and Environmental Protection.

2 Procedures

The following describes the procedures for planning, conducting, and closing out excavations. For an overview, see Figure 1.

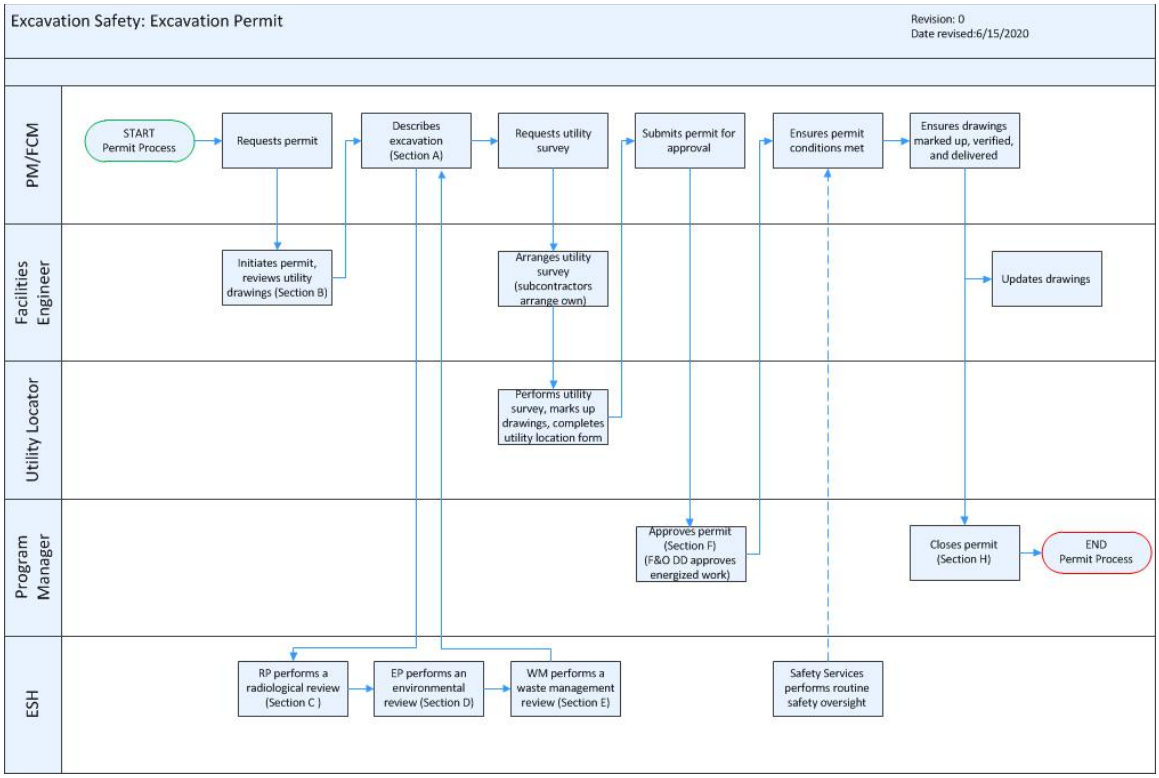

Figure 1 Excavation Process

2.1 External Permits

Specific requirements apply for certain types of excavations:

- A San Mateo County Environmental Health Services Division subsurface drilling permit is required under any of these conditions:
  - Soil borings are anticipated to encounter groundwater
  - Soil borings extend deeper than 10 feet
  - Groundwater monitoring wells, including geotechnical wells, will be installed or destroyed (installation or destruction must be in accordance with California well standards as established by the California Department of Water Resources)

2.2 Planning

The planning phase includes defining the project scope, a review by multiple departments of the Environment, Safety and Health Division, documenting utility location results, and obtaining approval for the excavation to proceed.

Note *Allow 10 working days for required reviews to be completed. If soil testing is required, allow up to two weeks of additional time from the sampling date.*

Step	Person	Action
Define excavation		
1.	Project manager (PM)/field construction manager (FCM)	Submits service request to the facilities engineer
2.	Facilities engineer	Initiates permit process ▪ Assigns a unique number to each permit request ▪ Pulls all as-builts pertaining to the proposed excavation area ▪ Completes top part of Section B, "Utility Drawing Review", of Excavation Safety: Excavation Permit Form ▪ Sends permit and as-builts to the PM/FCM
3.	PM/FCM	Completes Section A, "Description", of the permit and marks specific location, width, length, and depth of the proposed excavation on the as-builts Sends permit to the Radiation Protection (RP) Department
Review		
4.	RP	Reviews the permit for potential radiological concerns such as ▪ Location: any excavation located within an area posted as any type of controlled area, radiologically controlled area, contamination area, radiation, high radiation or radioactive material area or if within 25 lateral feet of beam housing (contact RP) to determine if a radiological work permit is required ▪ New wells or soil borings near accelerator housing: investigate to ensure that no radiological conditions will be encountered (such as tritium in groundwater) ▪ Radioactive sources that are to be brought on-site (such as soil density gauge, x-ray generator, thoriated weld rods, radiographic devices) to determine if a radiological device authorization is required ▪ Potential for generating radioactive waste Completes Section C, "Radiological Review", of permit Sends permit to the Environmental Protection (EP) Department
5.	EP	Collects samples as needed for classification of excavated material Completes Section D, "Environmental Review", of permit to ▪ Note excavated material handling and reuse requirements ▪ Provide data to inform waste disposal classification by Waste Management Sends permit to the Waste Management (WM) Group
6.	WM	Completes Section E, "Waste Management Review", of permit to note ▪ Special requirements ▪ Excavated material handling and disposition Sends permit to PM/FCM
7.	PM/FCM or subcontractor	For excavations performed by SLAC personnel, the PM/FCM submits a request for utility location to the facilities engineer

Step	Person	Action
		For excavations performed by a subcontractor, the subcontractor arranges for a utility survey (and ensures that the person conducting the excavation will be present during the survey)
8.	PM/FCM	Notifies building or area manager of work plans Notifies Safety Services of the utility survey date so that a representative can be present as needed
Survey Work Site		
9.	PM/FCM, facility engineer, excavator	Must be present during utility location *(PM/FCM should be familiar with the limitations of survey techniques)* Recommended: Safety Services representative presence during survey
10.	Utility locator	Surveys excavation area and three feet beyond and marks utilities following Excavation Safety: Utility Marking Requirements Every utility shown on the as-built drawings must be located, using all applicable methods. ▪ If an electrical line is difficult to locate, such as direct-bury Romex, methods and/or equipment that improve the chances of locating that line must be used, such as inducing a signal with the locator's equipment or causing current flow by energizing the circuit. ▪ If a known utility is not found using these methods, during excavation *potholing* (hand digging or vacuum excavation) of the entire excavation area is required to locate it. ▪ If the excavation is within three feet of a utility, during excavation the exact location (horizontal and vertical position and depth below surface) of the utility must be determined by potholing and recorded on the as-builts. If a utility is found that is not marked on the drawing, it must be drawn in. As-builts must comply with Excavation Safety: Drawing Requirements.
11.	Utility locator	Completes an Excavation Safety: Utility Location Results Form
12.	PM/FCM , facilities engineer, and Safety Services representative (if present)	Sign completed utility location results form if results are complete and accurate
13.	PM/FCM	Attaches completed utility location results form to permit Sends permit to excavation safety program manager for approval
Plan Work		
14.	PM/FCM	If indicated, coordinates with RP to obtain radiological work permit(s) and/or radiological device authorization(s)
15.	PM/FCM	Ensures hazard analysis and work planning and control (WPC) documents are complete as required per Chapter 2, "Work Planning and Control", and Chapter 42, "Subcontractor Safety"
16.	PM/FCM	Plans excavation to meet permit conditions and excavation requirements, including those in Excavation Safety: Physical Requirements, such as

Step	Person	Action
		▪ De-energizing/de-pressurizing and locking and tagging all utilities in the area before excavation activity begins unless an exception is approved by the Facility and Operations division director (see step 18) ▪ Only hand digging within an *exclusion zone* (comprised of the width of the utility plus 18 inches in all directions) around a known utility. Use of heavy machinery is not allowed. ▪ Ensuring adequate shoring, access/egress, and fall protection are in place ▪ Ensuring sediment/erosion control
17.	PM/FCM	Contacts Waste Management to arrange for disposal coordination or waste containers
Approve Permit		
18.	Excavation safety program manager	Reviews permit and approves as applicable (Section F) or ensures that missing sections are completed and any missing documentation is attached If work is to be done with utilities not de-energized/de-pressurized, sends permit to Facilities and Operations division director for approval (otherwise, go to step 20)
19.	Facilities and Operations division director	Reviews requests for energized work and approves if appropriate
20.	Excavation safety program manager	Delivers approved permit (original or copy) to PM/FCM Notifies RP, EP, WM, and facilities engineer that the permit is approved

2.3 Excavation

2.3.1 Emergency Excavation

There may be times when an excavation needs to begin before the permit is fully approved. The excavation safety program manager can authorize beginning an excavation while the permit is going through the approval process. Before the start of excavation, a review of utility location must be performed, including a review of drawings and a utility survey when possible. Once utilities have been identified, the excavation can begin in conjunction with the permit going through the approval process.

2.3.2 Multiple Excavations within the Same Work Site

Multiple excavations within the same work site require additional documentation and survey in instances where an excavation permit is completed for an initial large excavation and later additional smaller excavations may be needed in areas not covered by the existing excavation permit. Additional utility surveys will need to be conducted in locations that had not been surveyed previously or if a new utility had been installed since the original excavation permit was issued. For each additional excavation location needed on the site, Section A of the excavation permit form must be completed by the FCM and approved by a Safety Services representative.

2.3.3 Excavation Procedure

Step	Person	Action
1.	PM/FCM	Ensures permit is current (if permitted work is not initiated within three months of original submission, the permit must be resubmitted to confirm the in-field survey is still accurate)
2.	Safety Services	If the excavation involves a drilling rig: ▪ Completes the Excavation Safety: Mobile / Portable Drilling Rig Initial Inspection Form (or equivalent) ▪ Ensures the completed form is in the WPC package
3.	PM/FCM	Ensures the WPC work folder contains all required documents (excavation permit with hazard analysis, work planning documents, and any additional required permits) before excavation begins (see Chapter 2, "Work Planning and Control")
4.	PM/FCM	Ensures work practices are (and remain) in place to meet permit conditions and program requirements, including those in Excavation Safety: Physical Requirements, such as ▪ De-energizing/de-pressurizing and locking and tagging all utilities in the area before excavation begins unless an exception is approved by the Facility and Operations division director ▪ Only hand digging within an *exclusion zone* (comprised of the width of the utility plus 18 inches in all directions) around a known utility. Use of heavy machinery is not allowed ▪ Ensuring adequate shoring, access/egress, and fall protection are in place ▪ Ensuring sediment/erosion control
5.	PM/FCM	Meets at least daily with workers and supervisors to discuss the job safety analysis (JSA) for that day and is present at the site as necessary to ensure the work is being performed safely Ensures JSA and pre-work/tailgate briefings cover hazards and controls Verifies that competent person is present when required (see step 7)
6.	Supervisor and worker	Conduct work according to permit conditions and program requirements (including Excavation Safety: Physical Requirements)
7.	Competent person	Must be present during ▪ Active operations in which workers are expected to descend ▪ Placement of support systems and/or access/egress components such as ramps, ladders, or stairs ▪ Activities where powered or heavy machinery is to be used ▪ Activities that present a significant hazard to personnel or equipment ▪ Identify potential fall hazards and delineate excavations/trench as needed to prevent workers/pedestrian from approaching leading edge At least one person meeting the requirements for an excavation *competent person* must be present during active operations. If work is being conducted in a trench by more than one subcontractor, each must have its own competent person when worker exposure can reasonably be anticipated.

Step	Person	Action
8.	Competent person	Inspects excavations and takes steps to mitigate identified problems (such as removing workers until the excavation area is stabilized), and maintains record of inspections using the Excavation Safety: Daily Inspection Checklist or equivalent that demonstrates the adequacy of the inspection. Inspections are required ▪ Daily ▪ Before start of work and as needed throughout the shift (as determined by the competent person and/or PM/FCM) ▪ Whenever worker presence can reasonably be anticipated (check excavation(s), adjacent areas, and protective systems for signs of potential edge or wall collapse, cave-in, indication of protective system failure, hazardous atmospheres, or other hazardous conditions) ▪ After every rain event, exposure to vibrations or heavy loads, or other hazard increasing occurrences (to identify any changes that may affect safety) Inspection documentation must be available for review while the excavation is open.
9.	PM/FCM	Documents activities at the job site in daily log
10.	PM/FCM and/or competent person	Invokes stop work requirements for such conditions as ▪ Encountering an unknown/unidentified subsurface utility: the exact nature and condition of the utility must be determined before excavation can recommence ▪ Observation of discolored soil, an odor, or oily sheen: contacts excavation safety program manager before excavation recommences to ensure that the permit can be updated for proper waste disposition
11.	PM/FCM	Notifies excavation safety program manager of any scope changes (for example if any unexpected conditions are encountered or excavation size or extent increases)
12.	Excavation safety program manager	If scope changes, determines, in consultation with all permit reviewers as needed, if the permit should be revised and re-approved (Section G of permit)
13.	Excavation safety program manager / Safety Services	Visits site as part of routine construction safety oversight; checks for presence of a competent person and compliance with requirements. If problems are noted, meets with PM/FCM and/or competent person to resolve.
14.	WM	Coordinates disposition of excavated material with PM/FCM according to recommendations from EP and RP

2.3.4 Emergency Protocol

In the event of an emergency, anyone in an excavation who is physically able must exit immediately, providing assistance to others only when not endangering his or her own safety.

If the emergency is life-threatening, call 911 and provide accurate detail (see permit if needed). Any rescue action that can be performed safely from outside the excavation, such as hoisting a harnessed victim, may be undertaken while waiting for rescue personnel. Also call SLAC Site Security (ext. 5555) to report the incident.

Warning Do not attempt to enter an unprotected or failed trench to perform a rescue – call professional responders.

If the emergency is non-life-threatening, contact the supervisor and PM and SLAC Site Security (ext. 5555) to report the incident. (See Emergency Management: Emergency Notification, Response, and Reporting Procedures.)

2.4 Close Out

Step	Person	Action
15.	PM/FCM	Ensures drawings are marked up with as-built information, if required, and verifies in the field
16.	PM/FCM	Ensures completion of excavation
17.	PM/FCM	Meets with the excavation safety program manager Delivers marked-up drawings, if required, to the facilities engineer Signs Section H of permit
18.	Excavation safety program manager	Closes permit record by signing Section H of permit Notifies RP, EP, WM, and the facilities engineer that the permit has been closed
19.	Excavation safety program manager	Ensures that marked-up drawings, if required, are delivered to the facilities engineer
20.	Excavation safety program manager	Maintains the record copies of all closed permits
21.	Facilities engineer	Updates as-builts

3 Forms

The following forms and systems are required by this procedure:

- Excavation Safety: Excavation Permit Form (SLAC-I-730-0A23J-006). Form for documenting safety review and closing-out of an excavation
- Excavation Safety: Utility Location Results Form (SLAC-I-730-0A23J-004). Form for documenting results of required in-field utility survey
- Excavation Safety: Daily Inspection Checklist (SLAC-I-730-0A23J-003) (or equivalent). Form for documenting required daily inspection by a competent person
- Excavation Safety: Mobile / Portable Drilling Rig Initial Inspection Form (SLAC-I-730-0A23J-005) (or equivalent). Form for documenting required initial inspection of any drill rigs brought on-site

4 Recordkeeping

The following recordkeeping requirements apply:

- The excavation permit (with attached survey results form), daily inspection checklist, and mobile / portable drilling rig initial inspection (if applicable) must be kept at the work site during excavation with the WPC work package.
- The PM/FCM must maintain a daily log of operations.
- The excavation safety program manager maintains the record copies of all closed permits.
- The facilities engineer updates and maintains as-builts.

5 References

SLAC Environment, Safety, and Health Manual (SLAC-I-720-0A29Z-001)

- Chapter 11, "Excavation Safety"
  - Excavation Safety: Physical Requirements (SLAC-I-730-0A23S-007)
  - Excavation Safety: Utility Marking Requirements (SLAC-I-730-0A23S-009)
  - Excavation Safety: Drawing Requirements (SLAC-I-730-0A23S-005)
- Chapter 2, "Work Planning and Control"
- Chapter 37, "Emergency Management"
  - Emergency Management: Emergency Notification, Response, and Reporting Procedures (SLAC-I-730-0A14C-002)
- Chapter 42, "Subcontractor Safety"

Other SLAC Documents

- Radiological Work Permit
- Radiation Generating Devices Program Manual (SLAC-I-760-2A30C-015, FO 035)
- SLAC Utilities GIS
- SLAC Building and Road Outages GIS Dashboard

Other Documents

- San Mateo County Environmental Health Division. Subsurface Drilling Permit