

Trenching and Excavations	S.O.P. 3K		Page 1 of 6
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STANDARD OPERATING PROCEDURE		Approved by:	

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I. SCOPE AND PURPOSE

- A. To define a Standard Operating Procedure for operations involving trenching and excavation operations and any operations that potentially expose company employees to trenching and/or excavation related hazard.

II. RELATED PROCEDURES AND RESOURCES

- A. Company Health, Safety and Regulatory Compliance Policy Statement
- B. S.O.P. 3H, Permit Required Confined Space
- C. S.O.P. 3O, Fall Hazard Management
- D. Federal Register 29 CFR 1926.650-652 & Appendix A-F

III. DEFINITIONS

- A. **Aluminum Hydraulic Shoring** - A pre-engineered shoring system designed specifically to support the sidewalls of an excavation and prevent cave-ins.
- B. **Benching** - A method of protecting employees from cave-ins by excavating the sides of an excavation to form one or a series of horizontal levels or steps, usually with vertical or near-vertical surfaces between levels.
- C. **Cave-in** - The separation of a mass of soil or rock material from the side of an excavation, or the loss of soil from under a trench shield or support system, and its sudden movement into the excavation, either by falling or sliding, in sufficient quantity so that it could entrap, bury, or otherwise injure and immobilized a person.
- D. **Competent Person** - One who is knowledgeable and capable of identifying existing and predictable excavation hazards in the surrounding, or working

- conditions which are unsanitary, hazardous, or dangerous to employees, and who has the company's authorization to take prompt corrective measures to eliminate them.
- E. **Excavation** - Any man-made cut, cavity, trench, or depression in an earth surface, formed by the earth removal.
 - F. **Faces Or Sides** - The vertical or inclined earth surfaces formed as a result of excavation work.
 - G. **Failure** - The breakage, displacement, or permanent deformation of a structural member or connection as to reduce its structural integrity and its supportive capabilities.
 - H. **Hazardous Atmosphere** - An atmosphere which by reason of being explosive, flammable, poisonous, corrosive, oxidizing, irritating, oxygen deficient, toxic, or otherwise harmful, may cause death, illness, or injury.
 - I. **Protective System** - A method of protecting employees from cave-ins, from material that could fall or roll from an excavation face into an excavation, or from the collapse of adjacent structures. Protective systems includes support systems, sloping and benching systems, shields systems, and other systems that provide the necessary protection.
 - J. **Registered Professional Engineer** - A person who is registered as a Professional Engineer in the state where the work is being performed.
 - K. **Shield (Shield System)** - A structure that is able to withstand the forces imposed on it by a cave-in and thereby protect employee within the structure.
 - 1. Shields can be permanent structures or can be designed to be portable and moved along as work progresses.
 - 2. Shields used in trenches are usually referred to as "trench boxes" or "trench shields".
 - L. **Shoring (Shoring System)** - A structure such as a metal hydraulic, mechanical or timber shoring system that supports the sides of an excavation and which is designed to prevent cave-ins.
 - M. **Sloping (Sloping System)** - A method of protecting employees from cave-ins by excavating to form sides of an excavation that are inclined away from the excavation so as to prevent cave-ins.
 - 1. The angle of incline required to prevent a cave-in varies with differences in such factors as the soil type, environmental conditions of exposure, and application of surcharge loads.
 - N. **Support System** - A structure such as underpinning, bracing, or shoring, which provides support to an adjacent structure, underground installation, or the sides of an excavation.
 - O. **Tabulated Data** - Tables and charts approved by a registered Professional Engineer and used to design and construct a protective system.
 - P. **Trench** - A narrow excavation (in relation to its length) made below the surface of the ground. In general, the depth is greater than the width.

IV. PROCEDURES

- A. For excavations five feet (5 ft.) or greater in depth, not to exceed twenty feet (20 Ft.)
 - 1. Prior to starting any excavation work, a “Work Authorization Permit” or an “Application for Excavation” form must be completed by a Competent Person.
 - i. The “Application for Excavation” is completed once per job, with daily inspections being recorded on the form for as long as the excavation is open.
 - 2. Prior to excavating, the “Application for Excavation” form must be approved by the Facility Owner or a designated representative.
- B. Soil type inside the most Refineries has been designated as Class “C” type soil.
 - 1. The slopes and configurations of sloping and benching systems shall be determined and selected from and be in accordance with tabulated data for class “C” soil.
 - 2. Designs of support systems, shielded system, and other protective systems shall be selected and constructed for Class “C” soil unless designated otherwise by a Professional Engineer.
- C. Excavations less than 5 feet (5 ft.) in depth must be sloped, shored or shielded if the examination by a Competent Person determines a potential for cave-in.
- D. Excavations exceeding twenty feet (20 ft) in depth shall have protective systems designed by a registered Professional Engineer in accordance with OSHA 1926.650 requirements.
- E. For excavations five feet (5 ft.) or greater in depth:
 - 1. An inspection shall be conducted:
 - i. Prior to the start of work.
 - ii. After every rain storm.
 - iii. As needed throughout the shift for as long as the excavation is open.
 - 2. Inspections will be recorded on the original “Application For Excavation” form.
 - 3. Daily inspections of the excavation, the adjacent areas, and protective systems shall be made by a Competent Person for:
 - i. Evidence of a situation that could result in a cave-in.
 - ii. Indication of failure of protective systems.
 - iii. Any other hazardous conditions.
- F. Excavation less than five feet (5 ft.) in depth, in which a Competent Person had indicated a potential for cave-in, shall also be inspected as outlined above.
- G. Prior to excavating:
 - 1. The estimated location of utility installations, such as sewer, telephone, fuel, electric, water lines, or any other underground installation that may be encountered during excavation work, shall be determined and marked.
 - i. Surface objects (buildings, walls, vessels, tanks, or other above ground structures) shall be made secure from undermining.
- H. All excavated material (spoil pile) shall be stored no closer than two feet (2 ft.) from the edge of an excavation.
 - 1. Unless shielding protective systems are used to keep the material from falling into the excavation.
 - 2. This assumes employees will be working inside the excavation.
- I. Ground and/or surface water shall not be allowed to accumulate in an excavation.
- J. Hot work inside an excavation will follow all “Work Authorization Permit” procedure stipulations.

- K. Excavations four (4) feet or greater in depth require a “Work Authorization Permit” prior to entry.
- L. A means of egress (ladders, steps, or similar forms of exit) shall be provided in excavations five (5) feet or greater in depth and positioned so that no more than twenty-five (25 ft.) feet of travel to any exit point, is required.
- M. All excavations must be marked or posted when left overnight.
 - 1. Flagging, barricading, and safety lights shall be used to identify the excavation hazard.

V. GENERAL REQUIREMENTS

- A. The “Application for Excavation” serves as a check and balance system between the excavation and other work groups who will be working in any excavation five feet (5 ft.) to greater in depth, not to exceed twenty feet (20 ft.).
 - 1. The “Application for Excavation” will help the Competent Person establish an excavation pre-plan prior starting a job.
- B. The “Application for Excavation” form:
 - 1. Shall be completed by a competent contract representative planning the excavation.
 - 2. Must be approved by the company supervisor prior to starting the job.
 - 3. Will be kept on file by the excavating company for as long as the excavation is open.
- C. The following is a list of information needed to complete the “Application for Excavation” form.
 - 1. The name of the company who will perform the excavation.
 - 2. The name of the person who will excavate.
 - 3. The Unit, e.g., Combination, Condensate, or Coker and Area, e.g., the FCC, Merox, Cryogenic, where the excavation will occur.
 - 4. The exact location of where the excavation will occur e.g., North of 80 tank and South of dike wall ten feet (10 ft.), North of discharge piping.
 - i. The date the excavation is planned and the estimated duration it will be open.
 - ii. The purpose of the excavation, e.g., exploratory hole, new pipe support, and/or foundation.
 - iii. Verification that all suspected underground utilities and process equipment has been identified.
 - iv. Indication of the depth of the excavation.
 - v. Indication that the form of protecting will meet the requirements for Class “C” soil.
 - vi. Indication that the Competent Person completing the application understands both OSHA and the Facility’s excavation safety laws and procedures.

VI. DAILY INSPECTIONS

- A. Daily inspections are required only when it is anticipated employees will be working

in the excavation.

- B. Daily inspections of excavations, the adjacent areas, and protective systems, shall be made:
 - 1. An inspection shall be conducted:
 - i. Prior to the start of work.
 - ii. After every rainstorm.
 - iii. As needed throughout the shift for as long as the excavation is open.
 - 2. Inspections will be recorded on the "Application for Excavation" form.
 - 3. A Competent Person shall make inspections of the excavation, the adjacent areas, and protective systems for the following:
 - i. Evidence of a situation that could result in a cave-in.
 - ii. Indication of failure of protective systems.
 - iii. Any other hazardous conditions.
- C. The daily inspection will include the following information:
 - 1. The name of the Competent Person performing the inspection.
 - 2. The date and time of the inspection.
 - 3. Shoring, sloping, or shielding checks (check those that apply).
 - 4. Warning of the excavation hazard - barricades, flagging, and lights.
 - 5. Spoil pile placement - no less than two feet (2 ft) from the edge of the excavation.
 - 6. Traffic control - provide suitable warning to those driving near the excavation.
 - 7. Ladders - verify adequate egress established.

VII. SELECTION OF PROTECTIVE SYSTEMS

- A. Protective systems serve to protect employees from potential cave-ins while working in an excavation. Protective systems include, but are not limited to:
 - 1. Sloping
 - 2. Shoring
 - 3. Shielding
- B. Protective systems must have the capacity to resist, without failure, all loads that are or could, reasonably be expected, to be applied or transmitted to the system.
- C. Each employee in an excavation shall be protected from cave-ins by an adequate protective system designed in accordance with the requirement for Class "C" soil.
- D. Excavations less than five feet (5ft.) in depth are exempted from these requirements.
- E. Material and equipment used for protective systems shall be free of damage or defects that might impair their proper function.
- F. When materials or equipment used for protective systems are damaged:
 - 1. A Competent Person shall examine the material and evaluate its suitability for continued use.
 - 2. Damaged equipment shall be removed from service.

VIII. SLOPING SYSTEMS

- A. The slopes and configuration of sloping systems shall be selected and constructed by the excavator and shall be in accordance with the requirements for type "C" soil.
- B. Excavations made in type "C" soil, twenty feet (20 ft.) or less in depth shall have a maximum allowable slope of one and one-half horizontal to one vertical (34 degrees

measured from the horizontal).

IX. SHORING SYSTEMS

- A. Excavations that do not exceed twenty feet (20 It) in depth:
 - 1. Timber, Aluminum Hydraulic Shores, Pneumatic Hydraulic Shores, Screw Jacks, and Sheet Pile shoring systems can be used to protect employees from potential cave-ins.
- B. Shoring system's design shall be selected from and be in accordance with tabulated data for Class "C" soil (such as manufacturers' or professional engineer's table and charts).
- C. Manufacturer specifications, recommendations, limitations, and approvals to deviate from the tabulated data, shall be in written form, at the job site during construction of the protective systems.
- D. All protective-shoring systems shall be in accordance with:
 - 1. Federal Register 29 CFR 1926.650, App. C & D
 - 2. The manufacturer's tabulated data.
 - 3. Or a registered professional engineer's designated plan.

X. SHIELDING SYSTEMS

NOTE: Shielding construction is not covered by the OSHA standard. Users must rely on manufacturers or professional engineering data to certify that the shield is appropriate for the situation.

- A. Shield systems shall not be subjected to loads exceeding those for which the system was designed.
- B. In the event of a cave-in, shields shall be installed in a manner to restrict movement of the shield.
- C. Employees shall be protected from cave-in hazards when entering or exiting the areas protected by the shield. Employees shall use a ladder within the shield or a properly sloped ramp at one end.
- D. Employees shall not be allowed in shields when the shields is being moved, removed, or installed.
- E. If the excavation is deeper that the shield is tall:
 - 1. Stacking shields of the correct specification may be used, or
 - 2. The excavation may be sloped back 34 degrees from a point 18 inches below the top of the trench box.
- F. If the open end of the trench box or shield is exposed to a wall of the excavation, the wall should be sloped, shored, or shielded to prevent a cave-in.
- G. The manufacturer or a registered Professional Engineer shall approve any modification to a shield.