

SOUTHERN CALIFORNIA SAFETY MANUAL ACCIDENT PREVENTION RULES FOR CIVIL UNDERGROUND OPERATIONS

Western Line Constructors Chapter, Inc., N.E.C.A., Inc.



And



Local Union No. 47 of International Brotherhood of
Electrical Workers AFL-CIO

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General Statement

The safety policies and procedures set forth herein are to be followed when working under the Southern California Underground Construction Agreement [Agreement]. Any signatory Contractor working under the Agreement or Customer may require safety standards and procedures that are more stringent than those set forth herein.

Section 1: General Rules

1.1 Scope

These accident prevention rules shall be complied with by every employee of the Company under every circumstance where they are applicable. Acceptance of employment by an employee constitutes acceptance of these rules.

1.2 Education

In addition to any current: safety, accident prevention, and educational or training program, each Civil supervisor or foreman shall make certain all employees under their jurisdiction are instructed and advised concerning the applicable rules and their application.

1.3 Knowledge

Each employee of the Civil Employer shall be required to know, understand and comply with the rules which apply to the work each employee is performing.

1.4 Enforcement

(A) Civil Employees acting in a supervisory capacity either regularly or temporarily shall require all employees working under their jurisdiction to comply with all applicable safety instructions, safe practices, and safety rules.

(B) Any safety device, tool or equipment is found unsafe or defective shall be removed from service by the employee and reported to their Civil Supervisor.

1.5 Emergencies

In the event of an emergency which may result in a serious personal injury, a Civil supervisor, foreman or employee in charge may temporarily modify or suspend any of these rules as they may consider necessary to permit proper handling of the emergency. In any such case, the Civil employee so acting shall be fully accountable for their actions.

1.6 Amendments

Revisions or amendments to any Civil safety rule, policy or procedure may only be made in the manner in which they were originally issued and shall be effective on the date of their issuance.

1.7 Interpretation

The Civil rules contained in this manual shall be strictly interpreted to bring about maximum compliance and safe conduct and shall take precedence over any conflicting rules regulations, instructions, procedures, or policies which are less stringent.

1.8 Supplementary Information

Additional instructions and information such as the APPENDIX's found in this manual relating to safe performance of work as issued through the medium of letters, operating instructions, bulletins, etc., shall be used to supplement these fundamental accident prevention rules as necessary and shall be made available to all Civil employees.

1.9 Governmental Safety Standards

In addition to its own Civil accident prevention rules, policies and safe practices, the Civil Employer and its employees in the performance of their work are subject to the safety regulations of various governmental agencies including federal, state, county and local. Civil employees in charge shall make certain all applicable provisions of governmental regulations which are more stringent than those contained in this manual are complied with on their jobs.

1.10 Care in Performance of Duties

- (A) Each Civil employee shall use reasonable care in the performance of their duties and act in such a manner as to ensure at all times maximum safety to themselves, their fellow employees and the public.
- (B) Civil employees shall not engage in practical jokes, scuffling, "horse play", or the urging of Civil employees in the performance of their duties to take unnecessary chances.

1.11 Qualifications for Duty

- (A) No Civil employee shall attempt work for which they are not mentally and physically fit.
- (B) Any Civil employee in charge having reasonable grounds to suspect an employee under their supervision is either mentally or physically unfit for duty, shall prohibit such employee from working until satisfactory medical, or other evidence indicating fitness for duty is obtained.

1.12 Clothing

- (A) Each employee shall wear the appropriate shirt, long pants and work boots at all times to minimize danger when exposed to, moving machinery, hot or injurious substances and rough or sharp surfaces.
- (B) Employees exposed to the hazards of flames or electrical arcs shall wear approved CAL rated flame resistance (FR) long sleeve shirts, pants or other FR clothing as required. Synthetic clothing (For example: acetate, nylon, polyester and rayon) other than FR designated clothing, will not be used under any circumstances. All undergarments worn will be made of natural fibers.

- (C) Civil employees working in areas where there is a possible danger of head injury from impact, falling or flying objects, electrical shock and burns, or where specifically posted, shall be protected by the appropriate class hard hat ANSI Z89.1.

1.13 Intoxicants

Any Civil employee under the influence of intoxicants or illegal drugs when reporting for duty or during working hours is prohibited, and any violation will be sufficient cause for dismissal.

1.14 Smoking

- (A) Civil employees shall not smoke in proximity to flammable liquids, explosives or gases, or where "No Smoking" signs are displayed.
- (B) Matches, cigars, cigarettes, tobacco or other substances must not be discarded while still burning except when placed in a proper receptacle or otherwise disposed of safely.
- (C) All matches or other sources of ignition shall be removed from any Civil employee before he/she enters an explosive or combustible area.
- (D) Smoking shall not be permitted in areas indicated as danger zones or areas closed by federal, state, county or city representatives.

1.15 First Aid

- (A) Civil employees shall familiarize themselves with, and become reasonably proficient in, the treatment of injuries as outlined in Section 4 of these rules.
- (B) Every injured or ill Civil employee shall be given first aid as soon as possible.
- (C) Properly equipped and approved first aid kits shall be maintained on trucks, in attended plants or stations, and such other locations as may be considered advisable.
- (D) A list of names, addresses and telephone numbers of ambulance services, physicians, and hospitals to be called in emergencies shall be provided to Civil employees in charge.

1.16 What to Do When an Accident or Incident Occurs

The following rules covering the reporting and preliminary investigation of all accidents shall be strictly observed:

- (A) Injury to Civil employees.
 - (1) When possible, at least one Company employee should stay with the injured employee to render first aid such as; controlling bleeding, applying

artificial respiration and treating for shock, until medical attention is available.

- (2) When a serious injury to, or death of, a Civil employee occurs while on duty, the first Company employee having knowledge shall seek help by the fastest means of communications available. It shall be made clear in the initial call whom is to summon the doctor and/or ambulance.
- (3) Sufficient and accurate information must be given so the doctor, ambulance or others responding to the call will be informed of the exact location and necessary directions for reaching the scene of the accident.
- (4) All injuries to, or death of, any Civil employees while on duty shall be reported in writing in accordance with the Civil employer's instructions.

(B) **Accident Investigation.**

No equipment, machinery, tools or evidence of the accident, shall be removed from the accident site, unless a hazard or dangerous situation exists, until the Civil employer can secure accurate measurements, photographs and/or other vital information regarding the accident. It is the Civil employer's responsibility to promptly notify the union of all fatalities or serious accidents.

(C) **Pertinent and accurate information shall be provided and submitted to the Civil Employer and Union Safety Committees.**

(D) **Automobile Accidents.**

In all accidents involving the operation of a Civil employer vehicle, the Civil employee (driver) shall follow all federal, state and local laws, as well as Civil employer's safety rules, policies and procedures

1.17 Sight Protection

Approved ANSI Z 87.1 eye-protective devices are provided on jobs requiring eye protection. Such devices should fit properly, be kept clean at all times, and shall be worn when a Civil employee is engaged in, or in the vicinity of work involving jobs where there is danger of eye injury.

1.18 Protection from Dusts, Fumes, Vapors or Gases

Where it is impracticable to eliminate harmful quantities of dusts, fumes, vapors or gases, every Civil employee in the zone of contamination must be protected in a manner that will insure a supply of clean air. Otherwise, only approved respiratory equipment used by Civil employees who have been properly trained and fit tested shall be used.

1.19 Poisons

- (A) Before handling poisonous, infectious, or corrosive substances, such as acids, solvents, leads, etc., Civil employees shall be trained and be thoroughly familiar with Safety Data Sheets and with the hazards involved and utilize all necessary precautions, protective devices and/or equipment. Care shall be exercised by Civil employees with open sores.

- (B) Civil employees shall not handle food, tobacco, etc. with such poisonous substances on their hands.

1.20 Explosives

Only trained, authorized and experienced Civil employees shall handle explosives, and then only in accordance with approved and lawful methods.

1.21 Lights

- (A) No artificial light, except a Civil employer issued light or an approved explosion-proof fixture, shall be used near escaping gas, gasoline, or other flammable vapors, or when entering a room or enclosure suspected of containing an explosive atmosphere.
- (B) Dark places, such as basements, cellars, etc., shall not be entered without proper light; the use of matches or other open flames is strictly forbidden.
- (C) When workers are working at night, adequate lighting shall be provided by the Civil employer.

1.22 Gasoline

- (A) Gasoline shall be stored, handled and transported only in approved containers, and extreme care must be used at all times to prevent ignition. In addition, employees shall familiarize themselves with and observe local ordinances relative to such storage.
- (B) When pouring or pumping gasoline from one container to another, contact shall be maintained between the pouring and receiving containers.

1.23 Fire Protection

- (A) Civil employees shall be familiar with instructions relating to fire prevention and suppression, and with the location and use of all fire-fighting equipment in the location where they are regularly employed.
- (B) All fire apparatus shall be maintained in serviceable condition and accessible at all times.
- (C) Carbon tetrachloride fire extinguisher shall not be used.

1.24 Welding, Metalizing, Soldering and Use of Open Flames

- (A) Open flames shall not be brought near to, nor welding processes, brazing, flame cutting or soldering done on any empty container, tank, or other vessel which has, or may have, previously contained a flammable or explosive substance.

- (B) Welding processes, flame cutting, brazing, metalizing, soldering and the use of open flames on vessels subject to possible ignition of contents, shall be done in accordance with approved procedures by fully trained and qualified Civil employees who shall observe the following additional precautions:
 - (1) Keep away from vessel openings as far as possible.
 - (2) Provide suitable fire protection equipment adjacent to the work.
 - (3) Hazardous areas shall be designated by signs and protected by approved barricades as required.
- (C) It shall be the responsibility of the welder to see that, where practical, screens are properly placed to prevent eye injury to fellow workers and on-lookers. Helpers shall wear suitable eye protection when assisting in welding.
- (D) Whenever lead, cadmium, galvanized or other toxic fume producing material is welded, burned or otherwise heated to such a degree that fumes from the metal or its fluxes are generated, the work shall be ventilated so that the workers performing the operation are not exposed to hazardous concentrations of fumes, or the Civil employees who have been trained shall be protected by approved respiratory equipment. If respiratory equipment is required to protect qualified Civil employees performing the operation, the following additional precautions shall be observed:
 - (1) Sufficient ventilation shall be provided for the protection of others to prevent accumulations of harmful quantities of fumes in the work area;
or
 - (2) The operation shall be isolated; or
 - (3) The work shall be performed outdoors, in such a location that fumes will not enter any building in harmful quantities.
- (E) The use of open flames in battery rooms is prohibited except under the direct supervision of qualified and experienced Civil personnel, and then only after the room has been well ventilated.

1.25 Compressed Gases

- (A) Oil or grease shall not be allowed to come in contact with valves, regulators, or any other parts of oxygen cylinders or apparatus. (Oxygen contacting oil or grease may cause an explosion.)
- (B) Portable gas cylinders or containers shall be handled with extreme care and shall be stored in a suitable, well ventilated location, properly secured in a vertical position with valve cap in place, except one-ton chlorine cylinders which shall be stored horizontally.
- (C) Portable gas cylinders or containers shall not be exposed to excessive heat. Sparks and flames shall always be kept away from such cylinders or containers.

- (D) Oxygen cylinders shall not be stored near cylinders containing flammable gases (hydrogen, butane, propane, acetylene, etc.) or with oils, greases or flammable liquid.
- (E) All connections to piping, regulators, and other appliances shall be kept tight to prevent leakage. Should leaks develop, never test with an open flame. When cylinders or containers are not in use, always keep valves tightly closed.
- (F) Compressed gases shall not be used from a cylinder or cylinder manifold or other container unless an acceptable pressure-regulating device is installed on the cylinder, valve or manifold. Regulators shall not be required with fuel gases used from cylinders through torches or other devices, which are equipped with shut-off valves.
- (G) When shipping cylinders of compressed gases, the valves shall be protected by:
 - (1) Securely attached metal caps;
 - (2) Boxing or crating the cylinders so as to give proper protection to the valves, or,
 - (3) By loading the cylinders compactly in an upright position and securely bracing them.
- (H) Compressed gas or welding fuel-gas cylinders in portable service shall be securely fastened to suitable trucks in an upright position with valves tightly closed before moving.

1.26 Warning Signs, Guards, Barricades, Barriers, Etc.

- (A) As applicable, approved warning signs, barriers, barricades, guards, cones and flags shall be placed and properly maintained wherever hazards exist due to moving or stationary machinery or vehicles, exposed energized parts, open excavations, construction operation, open underground structures or hand holes, and similar exposures. In addition, lights and/or other illuminating devices shall be used at night, as required.
- (B) Warning signs, barricades and Qualified and trained flaggers shall be in compliance with the governing agency having jurisdiction over the jobsite location.
- (C) Where pedestrian or vehicular traffic is involved, and conditions require it, properly trained and equipped flaggers must be stationed to warn or direct traffic; however, the flagger should exercise extreme care in the performance of their duties, and avoid unnecessary direction of traffic. Where conditions warrant, a Civil employee shall be stationed at the surface to guard open structures, pits, vaults or unattended excavations.

1.27 Use of Safety Devices

All safety devices furnished by the Civil employer shall be properly used by all Civil

employees as required. These devices will be regularly tested as required and kept in good repair by the Civil employer, but this will not relieve the Civil employee of the responsibility of using only those in good condition.

1.28 Removing Safeguards

- (A) Safeguards shall not be removed except on approval of the Civil employee in charge.
- (B) Where regular safeguards are removed, they shall be replaced or suitable temporary guards provided before returning to normal operation.

1.29 Safety Belts, Life Lines, Railings, Etc.

- (A) Civil employees shall only use approved safety belts and straps, lifelines or other adequate protection as required when working in elevated positions.
- (B) It shall be the duty of each Civil employee to inspect each safety device prior to use, whether furnished by the Civil employer or Civil employee and they shall only use those in good condition.

1.30 Safe Supports

- (A) No Civil employee, material or equipment shall be supported on any portion of a tree, pole structure, scaffold, ladder, walkway, or other elevated structure, crane or derrick, etc., without it first being determined that such support is adequately strong and properly secured.
- (B) Scaffolding shall be of sufficient strength and rigidity to support four times the weight of Civil employees and material to which it will be subjected; that is, it shall have a safety factor of at least four.
- (C) Construction details of all scaffolding shall comply with applicable federal, state or local governmental safety regulations.

1.31 Ladders

- (A) When working from a portable ladder, the ladder shall be securely placed, held, tied, or otherwise made secure to prevent slipping or falling.
- (B) Care shall be used in placing ladders. Where possible, the horizontal distance from the top support to the foot of the ladder shall be one-quarter of the working length of the ladder (the length along the ladder between the foot and the top support) 4:1 Ratio.
- (C) Ladders shall not be placed in front of doors opening toward the ladder unless the door is secured open, locked or guarded.
- (D) The Civil employee using the ladder shall face the ladder and shall use both hands when ascending and descending.
- (E) When standing on a ladder, the Civil employee shall not lean to one side while working unless the ladder is adequately secured.

- (F) An employee shall not stand on the top platform of stepladders or the step immediately below the top platform.
- (G) Ladders with weakened, broken or missing steps, broken side rails, or otherwise defective, shall be removed from service and tagged.
- (H) All portable ladders, except special purpose ladders, such as tower ladders and metal manhole ladders, shall be equipped with non-slip bases and care shall be exercised in placing them. Blocking or lashing or having the ladder held by someone may be required, especially upon oily, metal, or concrete surfaces.
- (I) Wire truss portable ladders shall not be used.
- (J) Portable metal ladders shall not be used in the vicinity of electric circuits. Any such ladders used for authorized purposes shall be legibly marked "Caution- Do Not Use Around Electrical Equipment."
- (K) Benches, boxes, tables or other makeshift substitutes shall not be used as ladders.
- (L) Wooden ladders shall be finished with clear shellac, varnish or other clear finish only. Paint shall not be used which might obscure a defect in the wood.
- (M) A ladder used to enter or exit excavations four feet or more in depth shall extend a minimum of three feet from the top of the excavation and require no more than 25 feet of lateral travel when exiting.

1.32 Tools

- (A) Civil employees shall use proper tools suitable for the job in progress and only those in good repair. Defective tools shall be removed from service and tagged.
- (B) Proper handles shall be fitted to tools where required.
- (C) Tools and other materials shall not be left lying in elevated positions, unless protected from falling.
- (D) Cutting tools shall be kept properly sharpened and cutting edges guarded with scabbards or other safe storage provided when not in use.
- (E) Metallic tapes or metallic rules shall not be used near exposed energized electrical equipment. Cloth tapes with metal reinforcing shall not be used under any circumstances.

1.33 Housekeeping

- (A) Combustible materials, such as oil-soaked and paint-covered rags, waste, shavings, packing and rubbish shall not be allowed to accumulate on benches, bins, floors, yards, or vehicles, except in suitable containers in areas provided therefore.
- (B) Floors, stairways and platforms shall be reasonably free of dangerous projections or obstructions and shall be maintained in good repair, and reasonably free from oil, grease, or water. Where the type of operation necessitates working on slippery floor areas, such surfaces shall be protected against slipping by the use of mats, grates, cleats or other methods employed to provide equivalent protection. Floors, stairways and platforms shall be constructed and maintained to safely support the loads to which they are subjected.
- (C) Stairways, aisles, exits, roadways and walkways in material storage areas shall be kept reasonably clear and free from obstructions, depressions and debris.
- (D) Material and supplies shall be stored in an orderly manner to prevent their falling or spreading and to eliminate tripping and stumbling hazards.
- (E) Compressed air shall not be used for cleaning purposes, unless an approved pneumatic blowgun is used, limiting pressure to 30 psi.
- (F) Compressed air shall not be used to clean the clothing or hair, or be turned against any person for any reason.

1.34 Lifting Material or Equipment

- (A) When lifting, take a firm grip; secure good footing; place the feet a comfortable distance apart; bend the knees; keep the back straight; and lift with the leg muscles.
- (B) Never carry a load that obstructs the vision.
- (C) Use gloves or hand pads as required when handling materials.
- (D) Secure help when needed. Use cranes or hoists for lifting heavy loads. Keep out from under suspended loads.

1.35 Packing, Unpacking, Storage, Loading and Unloading of Materials

- (A) Nail points, ends of wires or bands shall not be left exposed when packing or unpacking boxes, crates, barrels, or other containers.
- (B) Nails shall be removed from loose lumber, the points bent down, or the lumber shall be disposed of so that it will not become a hazard.

- (C) Sharp or pointed articles shall be so stored as to prevent persons from coming in contact with the sharp edges and points.
- (D) Care shall be exercised when packing or unpacking glassware, porcelain and other fragile objects which may have sharp edges.
- (E) Loads shall not be handled from the street side of a vehicle if it can be avoided.
- (F) Special regulations and instructions governing the loading and unloading of poles, pipes, etc., shall be strictly observed in every case.

1.36 Transportation

- (A) Civil employees shall not ride on fenders, running boards, side rails, truck bed or on top of vehicles.
- (B) Civil employees shall ride in the space provided in employer vehicles and shall not ride with their legs hanging out of the rear or side of any vehicle.
- (C) All sharp tools, such as saws, chisels, axes, knives, etc., carried on vehicles shall be so stored or guarded to prevent injury to Civil employees.
- (D) Before proceeding, drivers shall make certain all loads are properly secured, and riders are properly located to prevent falling from the vehicle and are not exposed to hazards from shifting loads.
- (E) Civil employees shall not get on or off vehicles in motion.
- (F) Civil drivers shall not permit more Civil employees to ride on the seat than the number for which the seat was constructed.
- (G) Where provided, Civil employees shall use automotive seat belts, properly fastened, at all times while driving or riding in the following Civil Employer vehicles:
 - (1) All passenger vehicles and trucks.
 - (2) Construction equipment, when the equipment is being "roaded."
 - (3) Construction equipment, (such as tractors, loaders, trenchers and tampers) when provided with both seat belts and a canopy, roll bars, or similar roll over protection. (Exception: Seat belts need not be worn by Civil employees using this type of equipment when it is necessary for the Civil employee to operate the equipment from a position other than sitting in the normal seat provided.)

1.37 Cranes, Hoists and Derricks

- (A) Cranes, hoists, and derricks shall be operated only by trained, qualified and authorized Civil employees.
- (B) When mobile hoists, cranes, booms, or other similar lifting devices are used near energized equipment, all Civil employees shall remain in the clear until the equipment is in a safe position. The Civil employee in charge shall check and determine all Civil employees remain in the clear while the vehicle is being moved or the boom is being repositioned.
- (C) Civil employees shall not ride on loads suspended from cranes, hoists, and derricks.
- (D) A sign shall be posted in the cab of all outdoor portable cranes, hoists, and derricks reading essentially as follows: "Unlawful to operate this equipment within 10 feet of high voltage lines of 50,000 volts or less. The above clearances do not apply to authorized work by qualified electrical workers on or near exposed energized high-voltage conductors or apparatus."
- (E) Operators shall not move loads over the heads of workers or others unless authorized by the employee in charge. Operators shall not leave cranes or derricks unattended while load is suspended unless suspended over a barricaded area, blocked or otherwise supported from below during repair or emergency.
- (F) No crane, hoist, or derrick shall be loaded in excess of its rated capacity.
- (G) Crane, hoist, or derrick operators shall take signals only from the person designated by the Civil employee in charge.
- (H) Uniform hand signals shall be used to signal overhead travelling cranes, and uniform signals for derrick and crane operators shall be used. The appropriate chart shall be conspicuously posted in the vicinity of hoisting operations (cage or cab is so equipped) depicting and explaining the system of signals to be used.
- (I) Portable cranes, hoists and derricks shall be positioned, equipped, protected, and/or operated so that no part comes closer to exposed energized power lines than indicated in the below table:

Nominal Voltage KV Phase to Phase			Minimum Required Clearance (Ft)
.6	-	50	10 ft.
50	-	75	11 ft.
75	-	125	13 ft.
125	-	175	15 ft.
175	-	250	17 ft.
250	-	370	21 ft.
370	-	550	27 ft.
550	-	1,000	42 ft.

NOTE: These clearances do not apply to such equipment when used for authorized work on overhead and underground conductors, structures, or appurtenances by qualified persons.

1.38 Tailboard Briefing

Tailboard briefing means “tailboard conference”, “job procedure discussion” or talking the job over before starting to work, so all Civil supervisors and members of each Civil crew involved thoroughly understand the job to be done and the method of accomplishing the task.

Before starting each job after breaks and when the scope changes, the Civil employee in charge shall call the crew together for a few minutes and outline the proper work procedure to be followed in such a manner that the following will be accomplished by each Civil crew member who will understand:

- (A) The purpose of the job. In other words, what they are going to accomplish.
- (B) What they are to do.
- (C) What the other members of the crew are to do.
- (D) The manner in which the Civil employee in charge intends to carry out the job.
- (E) The hazards or trouble spots involved and will know how the Civil employee in charge is proposing to overcome such problems.

Each Civil employee will be aware of the physical location of the job and the closest Emergency Medical Center, to relay the information to emergency responders in the event of an accident.

Section 2: Entering and Working in Underground Structures

2.1 Qualified Electrical Workers (QEW)

- (A) Qualified Electrical Worker is a qualified person who by reason of a minimum of two years of training and experience with high-voltage circuits and equipment

and who has demonstrated by performance familiarity with the work to be performed and the hazards involved.

- (B) Qualified Electrical Workers (QEW's) shall be assigned to monitor and observe work being performed by Civil employees performing tasks such as Chipping around encasements containing high Voltage conductors. Note: See Chipping policies Section 2.5
- (C) A Qualified Electrical Worker shall be present whenever Civil employees are performing certain work functions as prescribed by the Host Employer.

2.2 Entering and Exiting

A ladder shall always be used in entering or leaving a manhole or vault. Climbing into or out of manholes or vaults by stepping on cables or hangers is forbidden.

2.3 Safeguards

- (A) When covers are removed from enclosed spaces, the opening shall be promptly guarded by a railing, temporary cover, or other barrier to prevent a fall through the opening and to protect Company employees, pedestrians, and those working in the space from objects entering the space.
- (B) Whenever a Civil employee enters a vault, manhole or similar below ground enclosure, there shall be another Company employee available in the immediate vicinity to render emergency assistance as required.

2.4 Precautions Before Commencing work in an Enclosed Space

- (A) Before a Civil employee enter an enclosed space, the internal atmosphere shall be tested through the pick hole in the access cover if available for oxygen deficiency and for flammable gases and hazardous vapors with a direct reading meter or similar instrument capable of immediate analysis of data samples without the need for off-site evaluation.
- (B) Forced Air ventilation is required at all times and tests shall be conducted with sufficient frequency to ensure the development of dangerous air contamination, oxygen enrichment and/or oxygen deficiency does not occur during the performance of any operation.
- (C) The Civil employee in charge of the work shall determine the instrument being used to test for Oxygen deficiency or Flammable or hazardous gases is in proper working order. A written record of such testing results shall be made and kept at the worksite for the duration of the work. If it is not feasible to ensure the removal of dangerous air contamination, oxygen enrichment and/or oxygen deficiency, "Do Not Enter This Space" and contact the company Safety Personnel or other Qualified Persons designated by the Company for assistance.

- (D) Whenever any Civil employee enters a manhole, vault, or similar structure, they shall conduct an inspection, including heat scan, to determine if a hazardous condition exists. Appropriate safeguards shall be applied by QEW as required prior to the performance of any work.

2.5 Removal of Concrete encasement surrounding conduits containing Energized Conductors, (Chipping) Procedures.

- (A) This policy is to describe the minimum guidelines for the removal of concrete encasement surrounding conduits containing energized conductors (CHIPPING) while working on So-Cal Edison or other customer's properties that allow qualified workers (non-QEW's) to perform this scope of work. These are the current guidelines and may be subject to change due to the possibility of regulatory changes and also due to ongoing joint efforts with SCE, IBEW, and the other signatory contractors to identify the most effective "best practices" and tooling to perform this work in the safest manner possible.

(B) Required PPE

- Full Outer Layer FR Clothing
- Hard Hat
- Appropriate Foot Protection
- Appropriate Eye Protection
- FR Balaclava
- Leather Work Gloves
- Dust Mask

- (C) All reasonable efforts will be made prior to the start of the chipping to have every possible circuit de-energized and the remaining circuits will have No-Test Orders being held by the on-site QEW.

- (D) Civil Crew (that has been trained and demonstrated understanding of the training) and a QEW on site. The QEW is required to be on site and be actively watching to ensure proper safety procedures are being followed while the chipping is taking place. Chipping is to be done with the "rivet buster", the "chipping gun" or similar sized tools only, utilizing a chisel tip gad or a waffle head tool (use of a pointed gad tool is prohibited). The rivet buster can only be used on the large concrete over pour sections of the encasement to get past the over burden and then must be replaced with the smaller chipping gun once getting down closer to the duct package. All chipping is to always be done with the tools in a parallel orientation to the duct package as to ensure that the ducts are not contacted if a large chunk of encasement suddenly breaks away. Once the ducts become partially visible, the chipping can continue in a linear fashion down the trench to the required length of removal. At no time should the tools ever be placed directly against the duct package or attempt be made to remove any encasement material from in between or down through the middle of the duct package. Only the outer perimeter of the encasement will be removed

while the duct package contains any energized cables with a goal of leaving approximately ½” of concrete material surrounding the duct package if it doesn’t fall or break off on its own.

- (E) At no time during any of the chipping procedures while there are energized cables in any ducts within the package can there be any breaching of ring cutting of, and or windowing of any ducts containing energized cables.
- (F) Furthermore, at no time is it permissible or acceptable for a civil employee to touch, move, connect, disconnect, or cut any cable, conductor, ground component or utility electrical equipment (energized or de-energized). There are NO exceptions to these important safety rules.
- (G) Electrical Line Crew Outage: Once all cables within the duct package have been de- energized, tested, and a clearance taken on them by the Electrical Line Crew the Civil crew can then begin to complete the chipping to facilitate the scope of the work at hand. This will include removing the final encasement material from around, in between, and down through the middle of the duct package to fully expose all ducts. At this time any ducts that needs to be ring cut, split and/or removed it is safe to do so following the proper identification and safety protocol for those steps.

2.6 **Chipping on Encasement Surrounding Asbestos Containing Material [ACM]**

(A) Required PPE

- Full Outer Layer FR Clothing
- Hard Hat
- Appropriate Foot Protection
- Appropriate Eye Protection
- FR Balaclava
- Leather work gloves
- Dust Masks

- (B) The Civil Crew requirements, QEW requirements circuit status requirements, tool requirements, and overall process for ACM ducts starts identical as the first section of this policy up to the point of how much encasement can be removed while the cable is still energized. The encasement directly surrounding the ACM duct cannot be removed to the point that the duct is exposed while the cable is energized inside the duct due to the fragile (non-protective barrier to the Civil employee) nature of the ACM duct itself. For example, if there is an encased duct bank containing 6 ducts and the bottom two are identified as ACM, the chipping can start from the top of the encasement following the above guidelines for chipping on PVC encasement. The chipping can continue until the perimeter of the encasement has been removed from the top four ducts, but cannot continue beyond the point where the material being removed would expose the ACM ducts, until the cable within the ACM have been de-energized. In a case where every duct within

the duct package is ACM then no chipping can be performed until the cables are de-energized. Once the cable is de-energized following the above procedure with the Electrical Line Crews, the chipping can proceed being as cautious as possible to not break/breach the ACM duct as it then is considered hazardous. Once the duct is broken or breached and the ACM is made airborne, it then has to be made safe, contained, handled, bagged labeled and removed by a certified ACM abatement contractor. Since the ACM ducts are pre-identified prior to doing the work, we should have already contacted the Host Employer's Environmental Representative and they will have their approved vendor on site when the work begins. If at any time during the chipping process it required the vendor to step in and contain and remove the broken and now airborne ACM, it doesn't mean chipping cannot continue in that location. But, prior to its continuation, the vendor has to remove the hazard, clean the area, wet down and paint the exposed edges to contain the fibers, and once they deem the site again hazard free, the chipping process can once again resume. Once all the encasement is chipped off of the duct bank, at that time the Host Employer's approved vendor will then complete the removal of all the exposed remaining ACM duct covering the cable and any other hazardous debris. They will at the same time, make the final square cut on the end where the ACM to PVC transition coupler will be installed to facilitate the current scope of the work at hand.

Section 3: Underground Installations

- 3.1 The estimated location of underground utility installations, such as sewer, telephone, fuel, electric, water lines, or any other underground installations that reasonably may be expected to be encountered during excavation work, shall be determined as best as possible prior to opening an excavation. Through the use of the Underground Service Alert member in the area, after obtaining a valid Ticket number and waiting the prescribed hours for ALL Utilities to mark their facilities
- 3.2 Utility companies or owners shall be contacted within established or customary local response times, advised of the proposed work, and asked to establish the location of the utility underground installations prior to the start of the actual excavation. When utility companies or owners cannot respond to a request to locate underground utility installations, the Company may proceed to excavate with caution and provided detection equipment or other acceptable means to locate utility installations are used.

Note: Check State and Local “one call” regulations prior to any excavation activities.
- 3.3 When excavation operations approach the estimated location of underground installations, the exact location of the installations shall be determined by safe and acceptable means (i.e., hand dig, vacuum extraction).



3.4 While the excavation is open, underground installations shall be protected, supported or removed as necessary to safeguard employees.

Note: Check State and Local “one call” regulations prior to any excavation activities.

3.5 Protection from Hazards Associated with Water Accumulation

3.6 Employees shall not work in excavations in which there is accumulated water, unless adequate precautions have been taken to protect employees against the hazards posed by the 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.

3.7 If water is controlled or prevented from accumulating by the use of water removal equipment, the water removal equipment and operations shall be monitored by a competent person.

3.8 If excavation work interrupts the natural drainage of surface water (such as streams), diversion ditches, dikes, or other suitable means shall provide adequate drainage of the area adjacent to the excavation. Excavations subject to runoff from heavy rains will require more frequent inspections by a competent person.

3.9 **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 shall be provided to ensure the stability of such structures for the protection of employees.

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

(A) A registered professional engineer has approved the determination that the structure is sufficiently removed from the excavation so as to be unaffected by the excavation activity; or

(B) A support system, such as underpinning, is provided to ensure the safety of employees and the stability of the structure; or

(C) The excavation is in stable rock; or

(D) A registered professional engineer has approved the determination that such excavation work will not pose a hazard to employees.

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

3.12 Protection of Employees from Loose Rock or Soil

3.13 Adequate protection shall be provided to protect employees from loose rock or soil that could pose a hazard by falling or rolling into the excavation. Such protection shall consist of scaling to remove loose material; installation of protective barricades at intervals as necessary on the face to stop and contain falling material; or other means that provide equivalent protection.

3.14 Employees shall be protected from excavated or other materials or equipment that could pose a hazard by falling or rolling into excavations. Protection shall be provided by placing and keeping such materials or equipment at least 2 feet from the edge of the 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.

3.15 Inspections

- (A) Daily inspections of excavations, the adjacent areas, and protective systems shall be made by a competent person for evidence of a situation that could result in possible cave-ins, indications of failure of protective systems, hazardous atmospheres, or other hazardous conditions. An inspection shall be conducted by the competent person prior to the start of work and as needed throughout the shift. Inspections shall also be made after every rainstorm or other occurrence that may increase the hazard (e.g., heavy vibration). These inspections are only required when employee exposure can be reasonably anticipated.
- (B) Where the competent person finds evidence of a situation that could result in a possible cave-in, indications of failure of protective systems, hazardous atmospheres, or other hazardous conditions, exposed employees shall be removed from the hazardous area immediately until the necessary precautions have been taken to ensure their safety.
- (C) All inspections are to be documented on the appropriate Trenching and Excavation Inspection forms. Copies of these forms shall be sent to the Safety Department.

3.16 Fall Protection

- (A) Where employees or equipment are required or permitted to cross over excavations over 6-feet in depth and wider than 30 inches, walkways or bridges with standard guardrails shall be provided.
- (B) Adequate barrier physical protection shall be provided at all unattended remotely located excavations. All unattended wells, pits, shafts, etc., shall be barricaded or covered. Upon completion of exploration and other similar operations, temporary wells, pits, shafts, etc., shall be backfilled.

Section 4: Entering and Exiting

- 4.1 Structural ramps that are used solely by employees as a means of access or egress from excavations shall be designed by a competent person. Structural ramps used for access and egress of equipment shall be designed by a competent person qualified in structural design, and shall be constructed in accordance with the design. Design plans must be available for review.
- 4.2 Ramps and runways constructed of two or more structural members shall have the structural members connected together to prevent displacement.
- 4.3 Structural members used for ramps and runways shall be of uniform thickness.
- 4.4 Cleats and other appropriate means used to connect runway structural members shall be attached to the bottom of the runway or shall be attached in a manner to prevent tripping.
- 4.5 Structural ramps used in lieu of steps shall be provided with cleats or other surface treatments on the top surface to prevent slipping.
- 4.6 A stairway, ladder, ramp or other safe means of exit shall be located in trench excavations that are **4 feet** or more in depth so as to require no more than **25 feet** of lateral travel for employees. Ladders must extend **3 feet** beyond the surface to be accessed.
- 4.7 Ramps that are used solely by employees as a means of entry and exit from excavations shall be designed by a competent person.

Section 5: Exposure to Vehicular Traffic

- 5.1 Employees exposed to public vehicular traffic shall be provided with, and shall wear, warning vests or other suitable garments marked with or made of reflectorized or high-visibility material.
Note: Check State and Local regulations regarding any specific type or color of garment to be worn by employees.

Section 6: Exposure to Falling Loads

- 6.1 No employee shall be permitted underneath loads handled by lifting or digging equipment. Employees shall be required to stand away from any vehicle being loaded or unloaded to avoid being struck by any spillage or falling materials. Operators may remain in the cabs of vehicles being loaded or unloaded when the vehicles are equipped with a cab shield and/or canopy adequate to protect the operator from shifting or falling materials.

Section 7: Warning Systems for Mobile Equipment

- 7.1 When mobile equipment is operated adjacent to an excavation, or when such equipment is required to approach the edge of an excavation, and the operator does not have a clear and direct view of the edge of the excavation, a warning system shall be utilized such as barricades, hand or mechanical signals, or stop logs. If possible, the grade should be away from the excavation.

Section 8: Hazardous Atmospheres

8.1 Testing and Controls

- (A) When it can be reasonably expected that a hazardous atmosphere or environment could exist, such as in excavations in landfill areas or excavations in areas where hazardous substances are stored nearby, adequate precautions shall be taken to ensure the health and safety of personnel.
- (B) A hazardous atmosphere can exist due to an oxygen deficiency or enrichment, dangerous air contamination due to flammable and/or explosive substances, or dangerous air contamination due to a combustible particulate.
1. Oxygen Deficiency Is Defined As:
An atmosphere containing less than 19.5% by volume
 2. Oxygen Enrichment Is Defined As:
An atmosphere containing more than 23.5% by volume
 3. Dangerous Air Contamination Due to the Presence of Flammable Gas or Vapor Is Defined As:
Containing a concentration greater than 20% of it's lower explosive limit (LEL)
- (C) Before personnel are allowed to enter areas where a hazardous atmosphere or environment could exist, the air shall be tested with an appropriate/approved device or method to determine whether dangerous air contamination, oxygen enrichment and/or an oxygen deficiency exists.

A written record of such testing results shall be made and kept at the work site for the duration of the work.

- (D) Where the existence of dangerous air contamination, oxygen enrichment and/or oxygen deficiency is demonstrated by tests performed, forced ventilation shall be used until the area is safe to enter. Additional monitoring shall be conducted before personnel are allowed to enter the area.

During the time the space is occupied, atmospheric monitoring shall be continuous. If normal ventilation is not adequate to provide a safe atmosphere, suitable temporary ventilation to ensure worker safety shall be provided.

8.2 Emergency Rescue Equipment

- (A) Emergency rescue equipment, such as breathing apparatus, a safety harness and line, or basket stretcher, shall be readily available where hazardous atmospheric conditions exist or may reasonably be expected to develop during work in an excavation.
- (B) Employees entering bell-bottom pier holes, or other similar deep and confined footing excavations, shall wear a harness with a lifeline securely attached to it. The lifeline shall be separate from any line used to handle materials, and shall be individually attended at all times while the employee wearing the lifeline is in the excavation.

Section 9: Requirements for Protective Systems

9.1 Protection of Employees in Excavations Without Shoring:

- (A) Each employee in an excavation more than 5 feet in depth, shall be protected from cave-ins by an adequate protective system, either sloped or shielded, except when:
- (B) Excavations are made entirely in stable rock (refer to definition of stable rock); or
- (C) Excavations that are less than 5 feet in depth and have had an examination of the ground by a competent person provides no indication of a potential cave-in;
Note: Some excavations 5 feet or less may require shoring, sloping, or other methods of employee protection.
- (D) Protective systems shall 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.

9.2 Design of Sloping and Benching Systems:

- (A) **Option 1: Allowable configurations and slopes**
 1. If soil classification as outlined in Section 13 Soil Classification is not performed and the use of sloping as the form of protection is used, then excavations shall be sloped at an angle not steeper than one and one-half horizontal to one vertical (34 degrees measured from the horizontal).
 2. Slopes specified above P shall be excavated to form configurations that are in accordance with the slopes shown for Type C soil.

	<p>Simple Slope – General All simple slope excavations 20 feet or less in depth shall have a maximum allowable slope of 1- 1/2 to 1.</p>
	<p>Vertical Sided Lower Portion All excavations 20 feet or less in depth which have vertically sided lower portions shall be shielded or supported at a height at least 18 inches above the top of the vertical side. All such excavations shall have a maximum allowable slope of 1- 1/2 to 1.</p>

(B) Option 2: Determination of Slopes and Configurations using Soil Classification

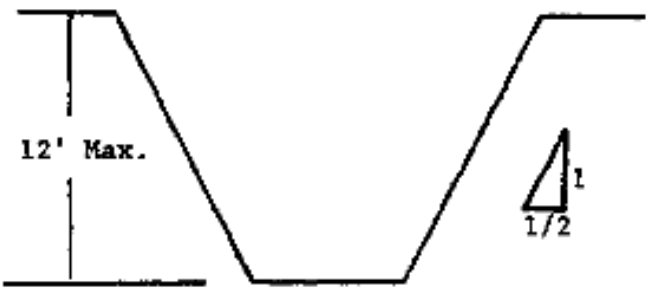
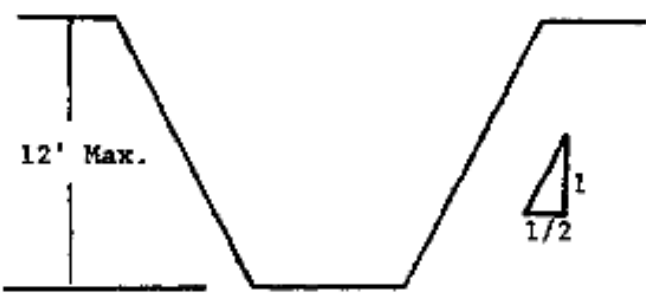
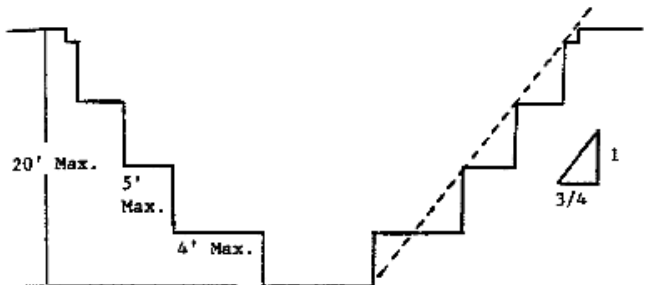
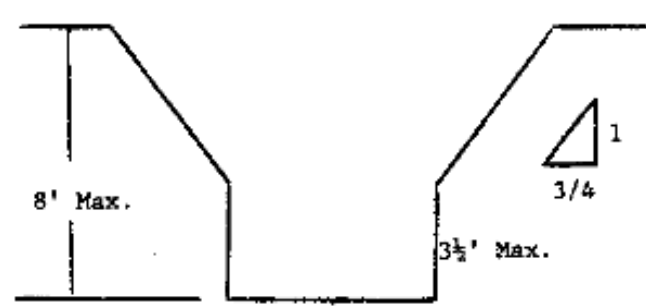
- (1) Maximum allowable slopes, and allowable configurations for sloping and benching systems, shall be determined in accordance with the conditions and requirements set forth in Section 13 Soil Classification. Below are the configurations for Type B and Type B soils.

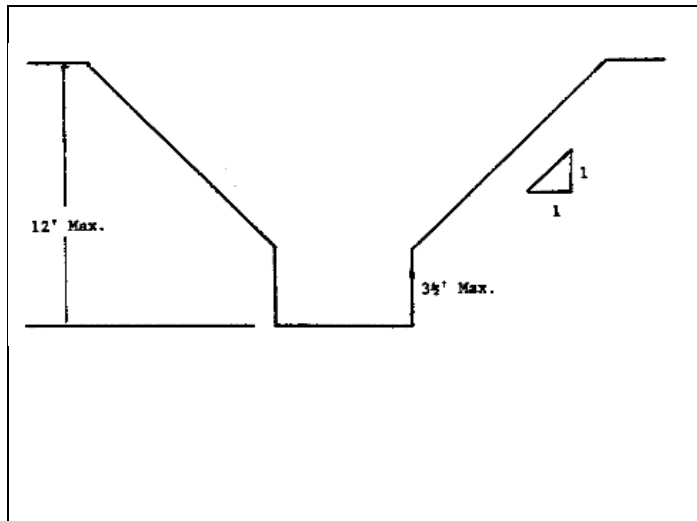
	<p>Simple Slope All simple slope excavations 20 feet or less in depth shall have a maximum allowable slope of 1 to 1.</p>
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<p>This bench allowed in cohesive soil only.</p> <p>20' Max.</p> <p>4' Max.</p> <p>1</p>	<p>Single Bench</p> <p>All benched excavations 20 feet or less in depth shall have a maximum allowable slope of 1 to 1 and maximum bench dimensions as shown to the left.</p>
<p>This bench allowed in cohesive soil only.</p> <p>20' Max.</p> <p>4' Max.</p> <p>4' Max.</p> <p>1</p>	<p>Multiple Bench</p>
<p>Support or shield system</p> <p>20' Max.</p> <p>18" Min.</p> <p>Total height of vertical side</p> <p>1</p>	<p>Vertically Sided Lower</p> <p>All excavations 20 feet or less in depth which have vertically sided lower portions shall be shielded or supported to a height at least 18 inches above the top of the vertical side. All such excavations shall have a maximum allowable slope of 1 to 1.</p>

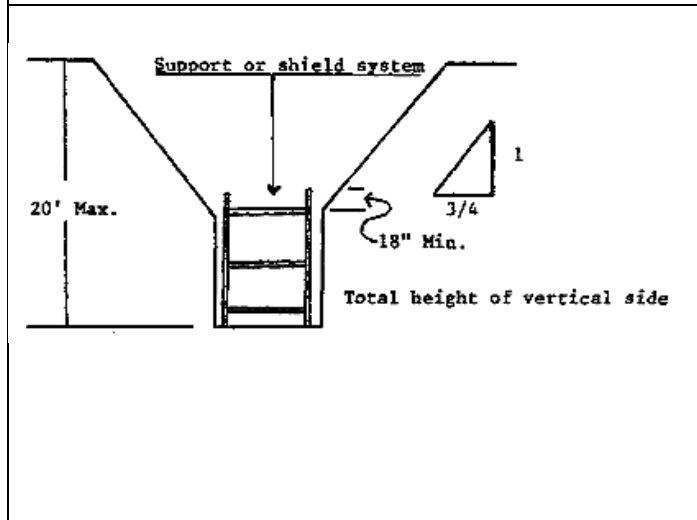
- (2) Maximum allowable slopes, and allowable configurations for sloping and benching systems, shall be determined in accordance with the conditions and requirements set forth in Section 14 Soil Classification. Below are the configurations for Type B and Type A soils.

<p>20' Max.</p> <p>3/4</p>	<p>Simple Slope - General</p>
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	<p>Simple Slope – Short Term Exception: Simple slope excavations which are open 24 hours or less (short term) and which are 12 feet or less in depth shall have a maximum allowable slope of $\frac{1}{2}$ to 1.</p>
	<p>Simple Bench All benched excavations 20 feet or less in depth shall have a maximum allowable slope of $\frac{3}{4}$ to 1 and maximum bench dimensions as shown to the left.</p>
	<p>Multiple Bench</p>
	<p>Unsupported Vertically Sided Lower Portion – Maximum 8 Feet in Depth All excavations 8 feet or less in depth which have unsupported vertically sided lower portions shall have a maximum vertical side of 3-1/2 feet.</p>

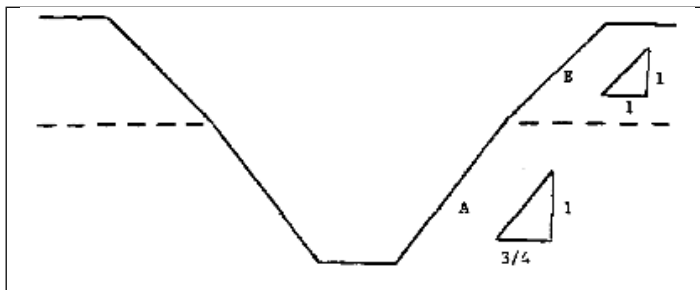


Unsupported Vertically Sided Lower Portion – Maximum 12 feet in Depth
 All excavations more than 8 feet but not more than 12 feet in depth which unsupported vertically sided lower portions shall have a maximum allowable slope of 1 to 1 and a maximum vertical side of 3-1/2 feet.



Supported or Shielded Vertically Sided Lower Portion
 All excavations 20 feet or less in depth which have vertically sided lower portions that are supported or shielded shall have a maximum allowable slope of $\frac{3}{4}$ to 1. The support or shield system must extend at least 18 inches above the top of the vertical side.

- (3) Maximum allowable slopes, and allowable configurations for sloping and benching systems, shall be determined in accordance with the conditions and requirements set forth in Section 13 Soil Classification. Below are the configurations for Layered Soils.
- (4) All excavations 20 feet or less in depth made in layered soils shall have a maximum allowable slope for each layer as set forth below.



B Over A

	C Over A
	C Over B
	A Over B
	A Over C
	B Over C

(C) Option 3: Designs using other tabulated data

- (1) Designs of sloping or benching systems shall be selected from and in accordance with tabulated data, such as tables and charts of 29 CFR 1926 Subpart P or those of a Registered Professional Engineer.
- (2) The tabulated data, approved by a Registered Professional Engineer, shall be in written form and shall include all of the following:
 - Identification of the parameters that effect 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.
- (3) 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 regulatory agencies upon request.

(D) Option 4: Design by a registered professional engineer

- (1) Sloping and benching systems not utilizing Option 1, Option 2, or Option 3 above shall be approved by a registered professional engineer.
- (2) 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.
- (3) 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 regulatory agencies upon request.

9.3 Design of Support Systems, Shield Systems, and Other Protective Systems

Designs of support systems, shield systems, and other protective systems shall be selected and assembled under the direction of a competent person and shall be in accordance to the following:

(A) Option 1: Designs using Soil Classification to Determine Timber Shoring or Aluminum Hydraulic Shoring

- (1) Designs for timber shoring in trenches shall be determined in accordance with the conditions and requirements set forth in the tables below (Appendices C of 29 CFR 1926 Subpart P). Designs for aluminum hydraulic shoring shall be in accordance with the manufacturer's tabulated data. If the data cannot be utilized, designs shall be in accordance with Appendix D of 29 CFR 1926 Subpart P.

Timber Trench Shoring - Minimum Timber Requirements*
Soil Type C

Depth of trench (feet)	Size (actual) and spacing of members**													
	Horizontal spacing (feet)	Cross braces					Vertical spacing (feet)	Whales		Uprights				
		Width of trench (feet)						Size (in.)	Vertical spacing (feet)	Maximum allowable horizontal spacing (feet)				
	Up To 4	Up to 6	Up to 9	Up to 12	Up to 15						Close			
5 TO 10	Up to 6	6 x 8	6 x 8	6 x 8	8 x 8	8 x 8	5	8 x 10	5	2 x 6				
	Up to 8	8 x 8	8 x 8	8 x 8	8 x 8	8 x 10	5	10 x 12	5	2 x 6				
	Up to 10	8 x 10	8 x 10	8 x 10	8 x 10	10 x 10	5	12 x 12	5	2 x 6				
	See Note 1													
10 TO 15	Up to 6	8 x 8	8 x 8	8 x 8	8 x 8	8 x 10	5	10 x 12	5	2 x 6				
	Up to 8	8 x 10	8 x 10	8 x 10	8 x 10	10 x 10	5	12 x 12	5	2 x 6				
	See Note 1													
	See Note 1													
15 TO 20	Up to 6	8 x 10	8 x 10	8 x 10	8 x 10	10 x 10	5	12 x 12	5	3 x 6				
	See Note 1													
	See Note 1													
	See Note 1													
Over 20	See Note 1													

* Mixed oak or equivalent with a bending strength not less than 850 psi.

**Manufactured members of equivalent strength may be substituted for wood.

Timber Trench Shoring - Minimum Timber Requirements*
Soil Type B

Depth of trench (feet)	Size (actual) and spacing of members**													
	Horizontal spacing (feet)	Cross braces					Vertical spacing (feet)	Whales		Uprights				
		Width of trench (feet)						Size (in.)	Vertical spacing (feet)	Maximum allowable horizontal spacing (feet)				
	Up To 4	Up to 6	Up to 9	Up to 12	Up to 15						Close	2	3	
5 TO 10	Up to 6	4 x 6	4 x 6	6 x 6	6 x 6	6 x 6	5	6 x 8	5			2 x 6		
	Up to 8	6 x 6	6 x 6	6 x 6	6 x 8	6 x 8	5	8 x 10	5			2 x 6		
	Up to 10	6 x 6	6 x 6	6 x 6	6 x 8	6 x 8	5	10 x 10	5			2 x 6		
	See Note 1													
10 TO 15	Up to 6	6 x 6	6 x 6	6 x 6	6 x 8	6 x 8	5	8 x 8	5			2 x 6		
	Up to 8	6 x 8	6 x 8	6 x 8	8 x 8	8 x 8	5	10 x 10	5			2 x 6		
	Up to 10	8 x 8	8 x 8	8 x 8	8 x 8	8 x 10	5	10 x 12	5			2 x 6		
	See Note 1													
15 TO 20	Up to 6	6 x 8	6 x 8	6 x 8	8 x 8	8 x 8	5	8 x 10	5	3 x 6				
	Up to 8	8 x 8	8 x 8	8 x 8	8 x 8	8 x 10	5	10 x 12	5	3 x 6				
	Up to 10	8 x 10	8 x 10	8 x 10	8 x 10	10 x 10	5	12 x 12	5	3 x 6				
	See Note 1													
Over 20	See Note 1													

* Mixed oak or equivalent with a bending strength not less than 850 psi.

**Manufactured members of equivalent strength may be substituted for wood.

Timber Trench Shoring - Minimum Timber Requirements*
Soil Type A

Depth of trench (feet)	Size (actual) and spacing of members**													
	Horizontal spacing (feet)	Cross braces					Vertical spacing (feet)	Whales		Uprights				
		Width of trench (feet)						Size (in.)	Vertical spacing (feet)	Maximum allowable horizontal spacing (feet)				
	Up To 4	Up to 6	Up to 9	Up to 12	Up to 15				Close	4	5	6	8	
5 TO 10	Up to 6	4 x 4	4 x 4	4 x 6	6 x 6	6 x 6	4	Not reqrd				2 x 6		
	Up to 8	4 x 4	4 x 4	4 x 6	6 x 6	6 x 6	4	Not reqrd					2 x 8	
	Up to 10	4 x 6	4 x 6	4 x 6	6 x 6	6 x 6	4	8 x 8	4		2 x 6			
	Up to 12	4 x 6	4 x 6	6 x 6	6 x 6	6 x 6	4	8 x 8	4			2 x 6		
10 TO 15	Up to 6	4 x 4	4 x 4	4 x 6	6 x 6	6 x 6	4	Not reqrd				3 x 8		
	Up to 8	4 x 6	4 x 6	6 x 6	6 x 6	6 x 6	4	8 x 8	4	2 x 6				
	Up to 10	6 x 6	6 x 6	6 x 6	6 x 8	6 x 8	4	8 x 10	4		2 x 6			
	Up to 12	6 x 6	6 x 6	6 x 6	6 x 8	6 x 8	4	10 x 10	4			3 x 8		
15 TO 20	Up to 6	6 x 6	6 x 6	6 x 6	6 x 8	6 x 8	4	6 x 8	4		3 x 6			
	Up to 8	6 x 6	6 x 6	6 x 6	6 x 8	6 x 8	4	8 x 8	4		3 x 6			
	Up to 10	8 x 8	8 x 8	8 x 8	8 x 8	8 x 10	4	8 x 10	4		3 x 6			
	Up to 12	8 x 8	8 x 8	8 x 8	8 x 8	8 x 10	4	10 x 10	4		3 x 6			
Over 20	See Note 1													

* Mixed oak or equivalent with a bending strength not less than 850 psi.

**Manufactured members of equivalent strength may be substituted for wood.

Timber Trench Shoring - Minimum Timber Requirements*
Soil Type C

Depth of trench (feet)	Size (actual) and spacing of members**													
	Horizontal spacing (feet)	Cross braces					Vertical spacing (feet)	Whales		Uprights				
		Width of trench (feet)						Size (in.)	Vertical spacing (feet)	Maximum allowable horizontal spacing (feet)				
	Up To 4	Up to 6	Up to 9	Up to 12	Up to 15				Close					
5 TO 10	Up to 6	6 x 6	6 x 6	6 x 6	6 x 6	8 x 8	5	8 x 8	5	3 x 6				
	Up to 8	6 x 6	6 x 6	6 x 6	8 x 8	8 x 8	5	10 x 10	5	3 x 6				
	Up to 10	6 x 6	6 x 6	8 x 8	8 x 8	8 x 8	5	10 x 12	5	3 x 6				
	See Note 1													
10 TO 15	Up to 6	6 x 8	6 x 8	6 x 8	8 x 8	8 x 8	5	10 x 10	5	4 x 6				
	Up to 8	8 x 8	8 x 8	8 x 8	8 x 8	8 x 8	5	12 x 12	5	4 x 6				
	See Note 1													
	See Note 1													
15 TO 20	Up to 6	8 x 8	8 x 8	8 x 8	8 x 10	8 x 10	5	10 x 12	5	4 x 6				
	See Note 1													
	See Note 1													
	See Note 1													
Over 20	See Note 1													

* Douglas Fir or equivalent with a bending strength not less than 1500 psi.

**Manufactured members of equivalent strength may be substituted for wood.

Timber Trench Shoring - Minimum Timber Requirements*
Soil Type B

Depth of trench (feet)	Size (S4S) and spacing of members**													
	Horizontal spacing (feet)	Cross braces					Vertical spacing (feet)	Whales		Uprights				
		Width of trench (feet)						Size (in.)	Vertical spacing (feet)	Maximum allowable horizontal spacing (feet)				
	Up To 4	Up to 6	Up to 9	Up to 12	Up to 15						Close	2	3	
5 TO 10	Up to 6	4 x 6	4 x 6	4 x 6	6 x 6	6 x 6	5	6 x 8	5			4 x 8	4 x 8	
	Up to 8	4 x 6	4 x 6	6 x 6	6 x 6	6 x 6	5	8 x 8	5		3 x 8			
	Up to 10	4 x 6	4 x 6	6 x 6	6 x 6	6 x 8	5	8 x 10	5			4 x 8		
	See Note 1													
10 TO 15	Up to 6	6 x 6	6 x 6	6 x 6	6 x 8	6 x 8	5	8 x 8	5	3 x 6	4 x 10			
	Up to 8	6 x 8	6 x 8	6 x 8	8 x 8	8 x 8	5	10 x 10	5	3 x 6	4 x 10			
	Up to 10	6 x 8	6 x 8	8 x 8	8 x 8	8 x 8	5	10 x 12	5	3 x 6	4 x 10			
	See Note 1													
15 TO 20	Up to 6	6 x 8	6 x 8	6 x 8	6 x 8	8 x 8	5	8 x 10	5	4 x 6				
	Up to 8	6 x 8	6 x 8	6 x 8	8 x 8	8 x 8	5	10 x 12	5	4 x 6				
	Up to 10	8 x 8	8 x 8	8 x 8	8 x 8	8 x 8	5	12 x 12	5	4 x 6				
	See Note 1													
Over 20	See Note 1													

* Douglas Fir or equivalent with a bending strength not less than 1500 psi.

**Manufactured members of equivalent strength may be substituted for wood.

Timber Trench Shoring - Minimum Timber Requirements*
Soil Type A

Depth of trench (feet)	Size (S4S) and spacing of members**													
	Horizontal spacing (feet)	Cross braces					Vertical spacing (feet)	Whales		Uprights				
		Width of trench (feet)						Size (in.)	Vertical spacing (feet)	Maximum allowable horizontal spacing (feet)				
	Up To 4	Up to 6	Up to 9	Up to 12	Up to 15						Close	4	5	6
5 TO 10	Up to 6	4 x 4	4 x 4	4 x 4	4 x 4	4 x 6	4	Not rqrd	Not rqrd				4 x 6	
	Up to 8	4 x 4	4 x 4	4 x 4	4 x 6	4 x 6	4	Not rqrd	Not rqrd					4 x 8
	Up to 10	4 x 6	4 x 6	4 x 6	6 x 6	6 x 6	4	8 x 8	4			4 x 6		
	Up to 12	4 x 6	4 x 6	4 x 6	6 x 6	6 x 6	4	8 x 8	4				4 x 6	
10 TO 15	Up to 6	4 x 4	4 x 4	4 x 4	6 x 6	6 x 6	4	Not rqrd	Not rqrd				4 x 10	
	Up to 8	4 x 6	4 x 6	4 x 6	6 x 6	6 x 6	4	6 x 8	4		4 x 6			
	Up to 10	6 x 6	6 x 6	6 x 6	6 x 6	6 x 6	4	8 x 8	4			4 x 8		
	Up to 12	6 x 6	6 x 6	6 x 6	6 x 6	6 x 6	4	8 x 10	4		4 x 6		4 x 10	
15 TO 20	Up to 6	6 x 6	6 x 6	6 x 6	6 x 6	6 x 6	4	6 x 8	4		3 x 6			
	Up to 8	6 x 6	6 x 6	6 x 6	6 x 6	6 x 6	4	8 x 8	4		3 x 6	4 x 12		
	Up to 10	6 x 6	6 x 6	6 x 6	6 x 6	6 x 8	4	8 x 10	4		3 x 6			
	Up to 12	6 x 6	6 x 6	6 x 6	6 x 8	6 x 8	4	8 x 12	4		3 x 6	4 x 12		
Over 20	See Note 1													

* Douglas Fir or equivalent with a bending strength not less than 1500 psi.

**Manufactured members of equivalent strength may be substituted for wood.

Aluminum Hydraulic Shoring
Vertical Shores for Soil Type B

Depth of trench (feet)	Hydraulic cylinders				
	Maximum horizontal spacing	Maximum vertical spacing	Width of trench (feet)		
			Up to 8	Over 8 up to 12	Over 12 up to 15
Over 5 up to 10	8	4	2 inch dia	2 inch dia (Note 2)	3 inch dia
Over 10 up to 15	6.5				
Over 15 up to 20	5.5				
Over 20	Note 1				

Note 1: For applications other than those listed in the tables, refer to 11.3.2

Option 2 Design using manufacturer's tabulated data. For trech depths in excess of 20 feet, refer to 11.3.2 and 11.3.3

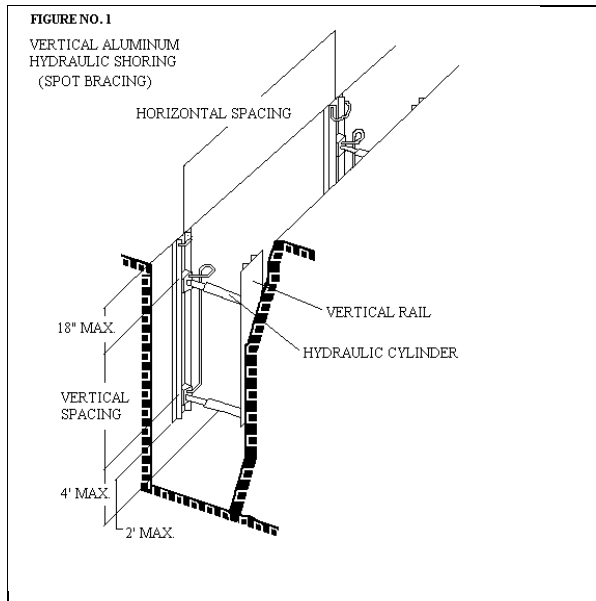
Note 2: 2 inch diameter sylinders, at this width, shall have structural steel tube (3.5 x 3.5 x 0.1875) oversleeves, or structural oversleeves of manufacturer's specification, extending the full, collapsed length.

Aluminum Hydraulic Shoring
Vertical Shores for Soil Type A

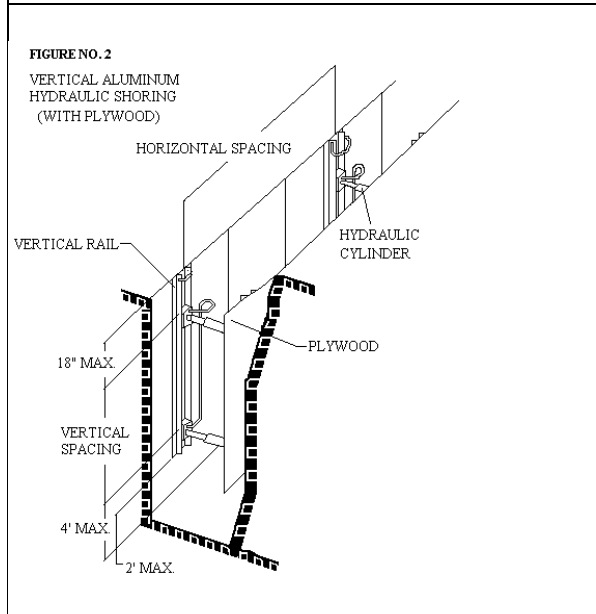
Depth of trench (feet)	Hydraulic cylinders				
	Maximum horizontal spacing (feet)	Maximum vertical spacing (feet)	Width of trench (feet)		
			Up to 8	Over 8 up to 12	Over 12 up to 15
Over 5 up to 10	8	4	2 inch dia	2 inch dia (Note 2)	3 inch dia
Over 10 up to 15	8				
Over 15 up to 20	7				
Over 20	Note 1				

Note 1: For applications other than those listed in the tables, refer to 11.3.2 Option 2 Design using manufacturer's tabulated data. For trench depths in excess of 20 feet, refer to 11.3.2 and 11.3.3

Note 2: 2 inch diameter cylinders, at this width, shall have structural steel tube (3.5 x 3.5 x 0.1875) oversleeves, or structural oversleeves of manufacturer's specification, extending the full, collapsed length.

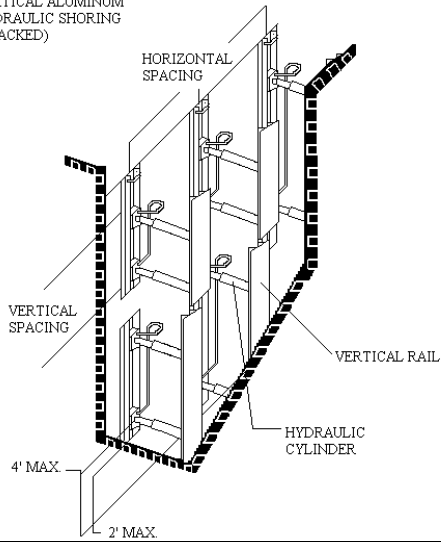


Vertical aluminum hydraulic shoring (spot bracing)



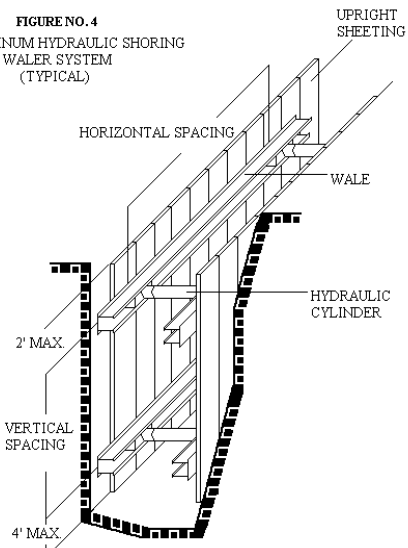
Vertical aluminum hydraulic shoring (with plywood)

FIGURE NO. 3
 VERTICAL ALUMINUM
 HYDRAULIC SHORING
 (STACKED)



Vertical aluminum hydraulic
 shoring (stacked)

FIGURE NO. 4
 ALUMINUM HYDRAULIC SHORING
 WALER SYSTEM
 (TYPICAL)



Aluminum hydraulic shoring
 – Waler system (typical)

Aluminum Hydraulic Shoring
Waler System for Soil Type C

Depth of trench (feet)	Wales		Hdraulic cylinders						Timber uprights		
	Vertical spacing (feet)	Section modulus* (in. ³)	Width of trench (feet)						Max horiz spacing (on center)		
			Up to 8		Over 8 up to 12		Over 12 up to 15		Solid sheet	2 ft.	3 ft.
		Horizontal spacing	Cylinder dia	Horizontal spacing	Cylinder dia	Horizontal spacing	Cylinder dia				
Over 5 up to 10	4	3.5	6.0	2 in.	6.0	2 in. Note 2	6.0	3 in.	3 x 12		
		7.0	6.5	2 in.	6.5	2 in. Note 2	6.5	3 in.			
		14.0	10.0	3 in.	10.0	3 in.	10.0	3 in.			
Over 10 up to 15	4	3.5	4.0	2 in.	4.0	2 in. Note 2	4.0	3 in.	3 x 12		
		7.0	5.5	3 in.	5.5	3 in.	5.5	3 in.			
		14.0	8.0	3 in.	8.0	3 in.	8.0	3 in.			
Over 15 up to 20	4	3.5	3.5	2 in.	3.5	2 in. Note 2	3.5	3 in.	3 x 12		
		7.0	5.0	3 in.	5.0	3 in.	5.0	3 in.			
		14.0	6.0	3 in.	6.0	3 in.	6.0	3 in.			
Over 20	Note 1										

Note 1: For applications other than those listed in the tables, refer to 11.3.2 Option 2 Design using manufacturer's tabulated data. For trench depths in excess of 20 feet, refer to 11.3.2 and 11.3.3
 Note 2: 2 inch diameter cylinders, at this width, shall have structural steel tube (3.5 x 3.5 x 0.1875) oversleeves, or structural oversleeves of manufacturer's specification, extending the full, collapsed length.
 * Consult product manufacturer and/or qualified engineer for Section Modulus of available wales.

Aluminum Hydraulic Shoring
Waler System for Soil Type B

Depth of trench (feet)	Wales		Hdraulic cylinders						Timber uprights		
	Vertical spacing (feet)	Section modulus* (in. ³)	Width of trench (feet)						Max horiz spacing (on center)		
			Up to 8		Over 8 up to 12		Over 12 up to 15		Solid sheet	2 ft.	3 ft.
		Horizontal spacing	Cylinder dia	Horizontal spacing	Cylinder dia	Horizontal spacing	Cylinder dia				
Over 5 up to 10	4	3.5	8.0	2 in.	8	2 in. Note 2	8.0	3 in.	3 x 12		
		7.0	9.0	2 in.	9	2 in. Note 2	9.0	3 in.			
		14.0	12.0	3 in.	12	3 in.	12.0	3 in.			
Over 10 up to 15	4	3.5	6.0	2 in.	6	2 in. Note 2	6.0	3 in.	3 x 12		
		7.0	8.0	3 in.	8	3 in.	8.0	3 in.			
		14.0	10.0	3 in.	10	3 in.	10.0	3 in.			
Over 15 up to 20	4	3.5	5.5	2 in.	5.5	2 in. Note 2	5.5	3 in.	3 x 12		
		7.0	6.0	3 in.	6	3 in.	6.0	3 in.			
		14.0	9.0	3 in.	9	3 in.	9.0	3 in.			
Over 20	Note 1										

Note 1: For applications other than those listed in the tables, refer to 11.3.2 Option 2 Design using manufacturer's tabulated data. For trench depths in excess of 20 feet, refer to 11.3.2 and 11.3.3

Note 2: 2 inch diameter cylinders, at this width, shall have structural steel tube (3.5 x 3.5 x 0.1875) oversleeves, or structural oversleeves of manufacturer's specification, extending the full, collapsed length.

* Consult product manufacturer and/or qualified engineer for Section Modulus of available wales.

(B) Option 2: Designs using manufacturer's tabulated data

- (1) Designs of support systems, shield systems, or other protective systems that are drawn from manufacturer's tabulated data shall be in accordance with all specifications, recommendations, and limitations issued or made by the manufacturer.
- (2) Deviation from the specifications, recommendations, and limitations issued or made by the manufacturer shall only be allowed after the manufacturer issues specific written approval.

- (3) Manufacturer's specifications, recommendations, and limitations, and manufacturer's approval to deviate from the specifications, recommendations, and limitations shall be in written form at the jobsite during construction of the protective system. After that time this data may be stored off the jobsite, but a copy shall be made available to regulatory agencies upon request.

(C) Option 3: Designs using other tabulated data

- (1) Designs of support systems, shield systems, or other protective systems shall be selected from and be in accordance with tabulated data, such as charts and tables approved by a Registered Professional Engineer.
- (2) The tabulated data shall be in written form and include all of the following:
 - Identification of the parameters that effect the selection of a protective system drawn from such data;
 - Identification of the limits of use of the data;
 - Explanatory information as may be necessary to aid the user in making a correct selection of a protective system from the data.
- (3) 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 regulatory agencies upon request.

(D) Option 4: Design by a Registered Professional Engineer

- (1) Support systems, shield system, or other protective systems not utilizing Option 1, Option 2, or Option 3, above, shall be approved by a Registered Professional Engineer.
- (2) Designs shall be in written form and shall include the following:
 - A plan indicating the sizes, types, and configurations of the materials to be used in the protective system; and
 - The identity of the registered professional engineer approving the design.
- (3) At least one copy of the design shall be maintained at the jobsite during construction of the protective system. After that time, the design may be stored off the jobsite, but a copy must be made available to regulatory agencies upon request.

9.4 Materials and Equipment:

- (A) Materials and equipment used for protective systems shall be free from damage or defects that might impair their proper function.
- (B) Manufactured materials and equipment used for protective systems shall 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.
- (C) When material or equipment that is used for protective systems is damaged, a competent person shall examine the material or equipment and evaluate its suitability for continued use.

Note: 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 shall be removed from service, and shall be evaluated and approved by a registered professional engineer before returning to service.

Section 10: Procedures

10.1 Installation and Removal of Support:

- (A) Members of support systems shall be securely connected together to prevent sliding, falling, kick outs, or other predictable failure.
- (B) Support systems shall 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.
- (C) Individual members of support systems shall not be subjected to loads exceeding those which they were designed to withstand.
- (D) Before temporary removal of individual members begin, additional precautions shall be taken to ensure the safety of employees, such as installing other structural members to carry the loads imposed on the support system.
- (E) Removal shall begin at, and progress from, the bottom of the excavation. Members shall be released slowly as to note any indication of possible failure of the remaining members of the structure or possible cave-in of the sides of the excavations
- (F) Backfilling shall progress together with the removal of support systems from excavations.
- (G) Excavation of material to a level no greater than 2 feet below the bottom of the members of a support system shall 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.

- (H) Installation of a support system shall be closely coordinated with the excavation of trenches.

10.2 Sloping and Benching Systems

Employees shall 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.

10.3 Shielding Systems

- (A) Shield systems shall not be subjected to loads exceeding those which the system was designed to withstand.
- (B) Shields shall 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.
- (C) Employees shall be protected from the hazard of cave-ins when entering or exiting areas protected by shields.
- (D) Employees shall not be allowed in shields when shields are being installed, removed, or moved vertically.
- (E) Excavations of earth material to a level not greater than 2 feet below the bottom of a shield shall 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 the bottom of the shield.

Section 11: Soil Classification

11.1 Requirements

Each soil and rock deposit shall be classified by a competent person as Stable Rock, Type A, Type B, or Type C.

- (A) **Basis of classification** The classification of the deposits shall be made based on the results of at least one visual and at least one manual analysis. Analysis shall be in accordance with ASTM, or the U.S. Department of Agriculture textural classification system.
- (B) **Visual and manual analyses** The analyses shall be 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. If the competent person is unable to classify the soil, then Type C shall be noted.

- (1) 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 of primarily coarse-grained material 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 or other underground structures, and to identify previously disturbed soils.
 - (e) Observe 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 ion 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.
- (2) 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 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 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 readily be 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 shear vane.
- (e) Drying test: The basic purpose of the drying test is to differentiate between cohesive materials with fissures, unfissured cohesive material, and granular material. The procedure for the drying test involves drying a sample that is approximately one-inch-thick and six inches in diameter until it is thoroughly dry.
- (f) If the sample develops cracks as it dries, significant fissures are indicated.
- (g) 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.

- (h) If a sample breaks easily by hand, it is either 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.
- (i) Layered systems - In a layered soil system where there are various levels of soil classes, the system shall be classified in accordance with its weakest layer.
- (j) Reclassification - If, after classifying a deposit, the properties, factors, or conditions affecting its classification change in any way, the changes shall be evaluated by a competent person. The deposit shall be reclassified to reflect the change.

Section 12: Sloping and Benching

12.1 Maximum allowable slope The maximum allowable slope for all soil or rock deposits shall be determined from Table B-1 of 29 CFR 1926 Subpart P.

TABLE B-1
MAXIMUM ALLOWABLE SLOPES

SOIL OR ROCK TYPE	MAXIMUM ALLOWABLE SLOPES (H:V)(1) FOR EXCAVATIONS LESS THAN 20 FEET DEEP(3)
STABLE ROCK	VERTICAL (90 Deg.)
TYPE A (2)	3/4:1 (53 Deg.)
TYPE B	
TYPE C	1:1 (45 Deg.)
	1 1/2:1 (34 Deg.)

Footnote(1) Numbers shown in parentheses next to maximum allowable slopes are angles expressed in degrees from the horizontal. Angles have been rounded off.

Footnote(2) A short-term maximum allowable slope of 1/2H:1V (63 degrees) is allowed in excavations in Type A soil that are 12 feet (3.67 m) or less in depth. Short-term maximum allowable slopes for excavations greater than 12 feet (3.67 m) in depth shall be 3/4H:1V (53 degrees).

Footnote(3) Sloping or benching for excavations greater than 20 feet deep shall be designed by a registered professional engineer.

12.2 Actual slope:

- (A) The actual slope shall be less steep than the maximum allowable slope, when there are signs of distress. If that situation occurs, the slope shall 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.
- (B) When surcharge loads from stored material or equipment, operating equipment, or traffic are present, a competent person shall determine the degree to which the actual slope must be reduced below the maximum allowable slope, and shall assure that such reduction is achieved.

Section 13: Training

13.1 Awareness Training

All employees who work in excavations and trenches shall have the following awareness training.

- (A) Definition of an excavation
- (B) Recognition of the general hazards associated with excavation and trenching
- (C) A discussion of specific hazards associated with the jobsite
- (D) The reason for, proper use, and limitations of protective equipment
- (E) How to respond to emergencies
- (F) Duties and responsibilities of employees

13.2 Specific training

Competent person shall be trained in the following:

- (A) Soil analysis;
- (B) The use of protective systems;
- (C) Requirements of this program; and
- (D) First Aid/CPR.

Section 14: Documentation

- (A) All training shall be documented on the appropriate Company form. Original training records shall be forwarded to the designated Company office.
- (B) Soil classification records and any protective system designs shall be kept at the jobsite with copies forwarded to the designated Company office.
- (C) Trenching and shoring checklists shall be forwarded to the designated Company office.

Section 15: Overhead Electrical Hazard Awareness

15.1 Planning for Work Near Overhead Power Lines

- (A) Walk down and survey the work site before beginning the work to identify all overhead power lines. Consider equipment travel paths and movement.
- (B) LOOK UP!
- (C) All overhead power lines shall be considered energized until proven otherwise.
- (D) Under no circumstances will any piece of equipment come within 10ft of any power line.

15.2 Electrical Hazards for Equipment Operators

- (A) Make it a HABIT to always Look up before you raise equipment such as dump beds, or booms. Make sure there are no overhead lines before you start.
- (B) Always look up before you pull forward or move your equipment with the dump bed or boom extended upward.
- (C) If Your Equipment Makes Contact with Power Line
 - (1) Stay on the equipment and wait until the line is de-energized by the power company
 - (2) If you must leave the equipment, such as in a fire, jump clear and attempt to land with both feet together.
 - a. Do not touch any part of the equipment when contacting the ground
 - b. Shuffle away from equipment in small steps while keeping feet together
 - c. DO NOT allow anyone on ground to come near or touch the machine. Warn personnel to stay away from the machine.
- (D) Never touch a person who is in contact with a live power line. Call for help and get power line de-energized.

Section 16: Definitions

- 16.1** Accepted engineering practices – means those requirements which are compatible with standards of practice required by a registered professional engineer.
- 16.2** Aluminum Hydraulic Shoring – means a pre-engineered shoring system comprised of aluminum hydraulic cylinders (crossbraces) used in conjunction with vertical rails (uprights) or horizontal rails (walers). Such system is designed, specifically to support the sidewalls of an excavation and prevent cave-ins.
- 16.3** Bell-bottom pier hole – means a type of shaft or footing excavation, the bottom of which is made larger than the cross section above to form a belled shape.
- 16.4** Benching (benching system) – means 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.
- 16.5** Cemented soils – means a soil in which the particles are held together by a chemical agent, such as calcium carbonate, such that a hand-sized sample cannot be crushed into powder or individual soil particles by finger pressure.
- 16.6** 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 clay silt, sandy clay, silty clay, clay and organic clay.
- 16.7** Competent person – means one who is capable of identifying existing and predictable hazards in the surroundings, or working conditions which are unsanitary, hazardous, or dangerous to employees, and who has authorization to take prompt corrective measures to eliminate them.
- 16.8** Cross braces – mean the horizontal members of a shoring system installed perpendicular to the sides of the excavation, the ends of which bear against either uprights or wales.
- 16.9** Excavation – means any man-made cut, cavity, trench, or depression in an earth surface, formed by earth removal.
- 16.10** Faces or sides – means the vertical or inclined earth surfaces formed as a result of excavation work.
- 16.11** 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.

- 16.12** 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.
- 16.13** 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.
- 16.14** Plastic – means a property of a soil which allows the soil to be deformed or molded without cracking, or appreciable volume change.
- 16.15** Protective system – means a method of protecting employees from cave-ins, from material that could fall or roll from an excavation face or into an excavation, or from the collapse of adjacent structures. Protective systems include support systems, sloping and benching systems, shield systems, and other systems that provide the necessary protection.
- 16.16** Qualified Person. A person who by reason of experience or instruction is familiar with the operation to be performed and the hazards involved.
- 16.17** Qualified Electrical Worker (QEW). A qualified person who by reason of a minimum of two years of training and experience with high-voltage circuits and equipment and who has demonstrated by performance familiarity with the work to be performed and the hazards involved.
- 16.18** 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 as a pocket penetrometer or shear vane.
- 16.19** Soil classification system – means 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.
- 16.20** Sheeting – means the members of a shoring system that retain the earth in position and in turn are supported by other members of the shoring system.
- 16.21** Shield (Shield system) – means a structure that is able to withstand the forces imposed on it by a cave-in and thereby protect employees within the structure. Shields can be permanent structures or can be designed to be portable and moved along as work progresses. Additionally, shields can be either pre-manufactured or job-built in accordance with § 1926.652(c)(3) or (c)(4). Shields used in trenches are usually referred to as "trench boxes" or "trench shields."

- 16.22** Shoring (Shoring system) – means 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.
- 16.23** Sloping (Sloping system) – means 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. 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.
- 16.24** Stable rock – means natural solid mineral material that can be excavated with vertical sides and will remain intact while exposed. Unstable rock is considered to be stable when the rock material on the side or sides of the excavation is secured against caving-in or movement by rock bolts or by another protective system that has been designed by a registered professional engineer.
- 16.25** Support system – means a structure such as underpinning, bracing, or shoring, which provides support to an adjacent structure, underground installation, or the sides of an excavation.
- 16.26** Submerged soil – means soil which is underwater or is freely seeping.
- 16.27** Tabulated data – means tables and charts approved by a registered professional engineer and used to design and construct a protective system.
- 16.28** Trench (Trench excavation) – means a narrow excavation (in relation to its length) made below the surface of the ground. In general, the depth is greater than the width, but the width of a trench (measured at the bottom) is not greater than 15 feet (4.6 m). If forms or other structures are installed or constructed in an excavation so as to reduce the dimension measured from the forms or structure to the side of the excavation to 15 feet (4.6 m) or less (measured at the bottom of the excavation), the excavation is also considered to be a trench.
- 16.29** Trench box – See "Shield."
- 16.30** Trench shield – See "Shield."
- 16.31** Type A – means: Cohesive soils with an unconfined compressive strength of 1.5 tons per square foot (tsf) or greater. Examples of cohesive soils are: clay, silty clay, sandy clay, clay loam and in some cases, silty clay loam and sandy clay loam. Cemented soil such as caliche and hardpan are also considered Type A. However, no soil is Type A if:
- The soil is fissured;
 - The soil is subject to vibration from heavy traffic, pile driving, or similar effects;
 - The soil has been previously disturbed;
 - 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 the material is subject to other factors that would require it to be classified as a less stable material.

- 16.32** Type B – means: Cohesive soil with an unconfined compressive strength greater than 0.5 tsf but less than 1.5 tsf 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.

Previously disturbed soils except those which would otherwise be classed as Type C soil. Soil that meets the unconfined compressive strength or cemented requirement of Type A, but is fissured or subject to vibration dry rock that is not stable 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.

- 16.33** Type C – means: Cohesive soil with an unconfined compressive strength of 0.5 tsf or less; Granular soils including gravel, sand and loamy sand; Submerged soil or soil from which water is freely seeping; Submerged rock that is not stable. 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.

- 16.34** Uprights – mean the vertical members of a trench shoring system placed in contact with the earth and usually positioned so that individual members do not contact each other. Uprights placed so that individual members are closely spaced, in contact with or interconnected to each other, are often called "sheeting."

- 16.35** Wales – means horizontal members of a shoring system placed parallel to the excavation face whose sides bear against the vertical members of the shoring system or earth.