Trenching & Excavating

PURPOSE

This Excavation Safety Program has been developed to protect employees from safety hazards that may be encountered during work in trenches and excavations. This program is intended to assure that:

- Employees who perform work in excavations are aware of their responsibilities and know how to perform the work safely.
- Advanced Excavating Specialists and Five Rivers Construction have appointed one or more individuals within the company to assure compliance with the requirements of this program.
- The responsibilities of Supervisors and workers are clearly detailed.
- All people involved in excavation and trenching work have received appropriate training in the safe work practices that must be followed when performing this type of work.

RESPONSIBILITIES

Safety manager

- Monitor the overall effectiveness of the program.
- Provide atmospheric testing and equipment selection as needed.
- Provided personal protective equipment as needed.
- Provide protective systems as needed.
- Provide training to affected employees and supervisors.
- Provide technical assistance as needed.
- Review and update the program on at least an annual basis, or as needed.

Supervisor

The Supervisors acts as the competent persons in reference to this program, and must assure that:

- The procedures described in this program are followed.
- Employees entering excavation or trenches are properly trained and equipped to perform their duties safely.
- All required inspections, tests, and recordkeeping functions have been performed.

Employees

- All employees, including contractor personnel, who work in or around excavations, must comply with the requirements of this program.
- Employees are responsible for reporting hazardous practices or situations to AES Management, as well as reporting incidents that cause injury to themselves or other employees to an AES Supervisor.

TRAINING

Training Schedule

- All personnel involved in trenching or excavation work shall be trained in the requirements of this program by the site superintendent.
- Training shall be performed before employees are assigned duties in excavations.
- Retraining will be performed when work site inspections indicate that an employee does not have the necessary knowledge or skills to safely work in or around excavations, or when changes to the program are made.
- Training records will be maintained by office staff, and shall include:
    - Date of the training program.
    - Name(s) of the instructor(s) who conducted the training.
    - A copy of the written material presented.
    - Name(s) of the employee(s) who received the training.

Training Components

The training provided to all personnel who perform work in excavations shall include:

- The work practices that must be followed during excavating or working in excavations.
- The use of personal protective equipment that will typically be required during work in excavations, including but not limited to safety shoes, hardhats, and fall protection devices.
- Procedures to be followed in a hazardous atmosphere exist or could reasonably be expected to develop during work in an excavation.
- The OSHA Excavation Standard, 29 CFR 1926, Subpart P.
- Emergency and non-entry rescue methods, and the procedure for calling rescue services.
- Policy on reporting incidents that cause injury to employees.

EXCAVATION REQUIREMENTS

Utilities and Pre-Work Site Inspection

Prior to excavation, the site shall be thoroughly inspected by the site foreman to determine if special safety measures must be taken.

Surface Encumbrances

All equipment, materials, supplies, permanent installations (i.e., buildings or roadways), trees, brush, boulders, and other objects at the surface that could present a hazard to employees working in the excavation shall be removed or supported as necessary to protect employees.

Underground Installations

- The location of sewer, telephone, fuel, electric, water, or any other underground installations or wires that may be encountered during excavation work shall be determined and marked prior to opening an excavation. Arrangements shall be made as necessary by superintendents/foreman with the appropriate utility entity or '"Call Before You Dig" for the protection, removal, shutdown, or relocation of underground installations.
- If it is not possible to establish the exact location of these installations, the work may proceed with caution if detection equipment or other safe and acceptable means are used to locate the utility.
- Excavation shall be done in a manner that does not endanger the underground installations or the employees engaged in the work. Utilities left in place shall be protected by barricades, shoring, suspension, or other means as necessary to protect employees.

Protection of the Public

Barricades, walkways, lighting, and posting shall be provided as necessary for the protection of the public prior to the start of excavation operations.

- Guardrails, fences, or barricades shall be provided on excavations adjacent to walkways, driveways, and other pedestrian or vehicle thoroughfares. Warning lights or other illumination shall be maintained as necessary for the safety of the public and employees from sunset to sunrise.

- Wells, holes, pits, shafts, and all similar hazardous excavations shall be effectively barricaded or covered and posted as necessary to prevent unauthorized access. All temporary excavations of this type shall be backfilled as soon as possible.
- Walkways or bridges protected by standard guardrails shall be provided where employees and the general public are permitted to cross over excavations. Where workers in the excavation may pass under these walkways or bridges, a standard guardrail and toe board shall be used to prevent the hazard of falling objects. Information on the requirements for guardrails and toe boards can be found in the "Fall Protection" Manual.

Protection of Employees

Stairs, ladders, or ramps shall be provided at excavation sites where employees are required to enter trench excavations over four (4) feet deep. The maximum distance of lateral travel (along the length of the trench) necessary to reach the means of egress shall not exceed 25 feet.

- Structural Ramps
    - Structural ramps 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 or egress of equipment shall be designed by a person qualified in structural design and shall be constructed in accordance with the design.
    - Ramps and runways constructed of two or more structural members shall have the structural members connected to prevent movement or displacement.
    - Structural members used for ramps and runways shall be of uniform thickness.
    - Cleats or 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.
    - Structural ramps used in place of steps shall be provided with cleats or other surface treatments on the top surface to prevent slipping.
- Ladders
    - When portable ladders are used, the ladder side rails shall extend a minimum of three (3) feet above the upper surface of the excavation.
    - Ladders shall have nonconductive side rails if work will be performed near exposed energized equipment or systems.
    - Two or more ladders, or a double-cleated ladder, will be provided where 25 or more employees will be conducting work in an excavation where ladders serve as the primary means of egress, or where ladders serve two-way traffic.

- Ladders will be inspected prior to use for signs of damage or defects. Damaged ladders will be removed from service and marked with "Do Not Use" until repaired.
- Ladders shall be used only on stable and level surfaces unless secured. Ladders placed in any location where they can be displaced by workplace activities or traffic shall be secured, or barricades shall be used to keep these activities away from the ladders.
- Non self-supporting ladders shall be positioned so that the foot of the ladder is one-quarter of the working length away from the support.
- Employees are not permitted to carry any object or load while on a ladder that could cause them to lose their balance and fall.

Exposure to Vehicular Traffic

Employees exposed to vehicular traffic shall be provided with and shall wear warning vests or other suitable garments marked with or made of reflective or high-visibility material. Warning vests worn by flagmen shall be red or orange and shall be reflectorized material if worn during night work. Emergency lighting, such as spotlights or portable lights, should be provided as needed to perform work safely.

Exposure to Falling Loads

No employee is permitted underneath loads being handled by lifting or digging equipment. Employees are 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 provide adequate protection for the operator during loading and unloading operations.

Warning System for Mobile Equipment

A warning system shall be used when mobile equipment is operated adjacent to the edge of an excavation if the operator does not have a clear and direct view of the edge of the excavation. The warning system shall consist of barricades, hand, or mechanical signals, or stop logs. If possible, the grade should be away from the excavation.

Hazardous Atmospheres

AES Supervisor will test the atmosphere in excavations over four (4) feet deep if a hazardous atmosphere exists or could reasonably be expected to exist. A hazardous atmosphere could be

expected, for example, in excavations in landfill areas, areas where hazardous substances are stored nearby, or near areas containing gas pipelines.

- Adequate precautions shall be taken to prevent employee exposure to atmospheres containing less than 19.5 percent oxygen and other hazardous atmospheres. These precautions include providing proper respiratory protection or forced ventilation of the workspace.
- Forced ventilation or other effective means shall be used to prevent employee exposure to an atmosphere containing a flammable gas in excess often (10) percent of the lower flammability limit of the gas.
- When controls are used that are intended to reduce the level of atmospheric contaminants to acceptable levels, continuous air monitoring will be performed by AES Supervisor. The device used for atmospheric monitoring shall be equipped with an audible and visual alarm.
- Atmospheric testing will be performed using a properly calibrated direct reading gas monitor. Direct reading gas detector tubes or other acceptable means may also be used to test potentially toxic atmospheres.
- Each atmospheric testing instrument shall be calibrated by a supervisor on a schedule and in the manner recommended by the manufacturer. In addition:
    - Any atmospheric testing instrument that has not been used within 30 days shall be recalibrated prior to use.
    - Each atmospheric testing instrument shall be calibrated at least every six (6) months.
- Each atmospheric testing instrument will be field checked immediately prior to use to ensure that it is operating properly.

Personal Protective Equipment

- All employees working in trenches or excavations shall wear approved hardhats and steel-toed shoes or boots.
- Employees exposed to flying fragments, dust or other materials produced by drilling, sawing, sanding, grinding, and similar operations shall wear approved safety glasses with side shields.
- Employees performing welding, cutting, or brazing operations, or are exposed to the hazards produced by these tasks, shall wear approved spectacles or a welding face shield or helmet, as determined by the site supervisor.

- 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 to at all times while the employee wearing the lifeline is in the excavation.
- Employees shall wear approved gloves or other suitable hand protection.
- Employees using or working in the immediate vicinity of hammer drills, masonry saws, jackhammers, or similar high-noise producing equipment shall wear suitable hearing protection.
- Each employee working at the edge of an excavation six (6) feet or deeper shall be protected from falling. Fall protection shall include guardrail systems, fences, barricades, covers, or a tie-back system meeting OSHA requirements.
- Emergency rescue equipment, such as breathing apparatus, a safety harness and line, and a basket stretcher, shall be readily available where hazardous atmospheric conditions exist or may develop during work in an excavation. This equipment shall be attended to when in use. Only personnel who have received approved training and have appropriate equipment shall attempt retrieval that would require entry into a hazardous atmosphere. If entry into a known hazardous atmosphere must be performed, then the site superintendent shall be given advance notice so that the hazards can be evaluated and rescue personnel placed on standby if necessary.

Walkways and Guardrails

Walkways shall be provided where employees or equipment are permitted to cross over excavations. Guardrails shall be provided where walkways, accessible only to on-site project personnel, are six (6) feet or more above lower levels.

Protection from Water Accumulation Hazards

- Employees are not permitted to work in excavations that contain or are accumulating water unless precautions have been taken to protect them from the hazards posed by water accumulation. Precautions may include special support or shield systems to protect from cave-ins, water removal to control the level of accumulating water, or use of safety harnesses and lifelines.
- If water is controlled or prevented from accumulating by the use of water removal equipment, the water removal equipment and operation shall be monitored by a person trained in the use of that equipment.

- If excavation work interrupts the natural drainage of surface water (such as streams), diversion ditches, dikes, or other suitable means shall be used to prevent surface water from entering the excavation. Precautions shall also be taken to provide adequate drainage of the area adjacent to the excavation. Excavations subject to runoff from heavy rains shall be re-inspected by the site superintendent after each rain incident to determine if additional precautions, such as special support or shield systems to protect from cave-ins, water removal to control the level of accumulating water, or use of safety harnesses and lifelines, should be used.
- Superintendents shall inform affected workers of the precautions or procedures that are to be followed if water accumulates or is accumulating in an excavation.

Stability of Adjacent Structures

The site superintendent will determine if the excavation work could affect the stability of adjoining buildings, walls, sidewalks, or other structures.

- Support systems (such as shoring, bracing, or underpinning) shall be used to assure the stability of structures and the protection of employees where excavation operations could affect the stability of adjoining buildings, walls, or other structures.
- Excavation below the level of the base or footing of any foundation or retaining wall that could be reasonably expected to pose a hazard to employees shall not be permitted, except when:
    - A support system, such as underpinning, is provided to ensure the safety of employees and the stability of the structure.
    - The excavation is in stable rock.
    - 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.
    - A registered professional engineer has approved the determination that such excavation work will not pose a hazard to employees.
- Sidewalks, pavements, and appurtenant structures shall not be undermined unless a support system or other method of protection is provided to protect employees from the possible collapse of such structures.
- Where review or approval of a support system by a registered professional engineer is required, the project manager or superintendent shall secure this review and approval in writing before the work begins.

Protection from Falling Objects and Loose Rocks or Soil

- Adequate protection shall be provided to protect employees from loose rock or soil that could pose a hazard by falling or rolling from an excavation face. Such protection shall consist of:
    - Scaling to remove loose material.
    - Installation of protective barricades, such as wire mesh or timber, at appropriate intervals on the face of the slope to stop and contain falling material; or
    - Benching sufficient to contain falling material.
- Excavation personnel shall not be permitted to work above one another where the danger of falling rock or earth exists.
- Employees shall be protected from excavated materials, equipment, or other materials that could pose a hazard by falling or rolling into excavations.
- Protection shall be provided by keeping such materials or equipment at least two (2) feet from the edge of excavations, by use of restraining devices that are sufficient to prevent materials or equipment from falling or rolling into excavations, or by a combination of both if necessary.
- Materials and equipment may, as determined by AES Supervisor. need to be stored further than two (2) feet from the edge of the excavation if a hazardous loading condition is created on the face of the excavation.
- Materials piled, grouped, or stacked near the edge of an excavation must be stable and self-supporting.

Supervisor Duties

- The site Superintendent (or designated Foreman) shall conduct daily inspections of excavations, adjacent areas, and protective systems for evidence of a situation that could result in possible cave-ins, failure of protective systems, hazardous atmospheres, or other hazardous conditions. An inspection shall be conducted prior to the start of work and as needed throughout the shift. Inspections shall also be made after every rainstorm or other hazard-increasing occurrence. These inspections are only required when the trench will be or is occupied by employees.
- Where the evidence of a situation that could result in a possible cave-in, failure of protective systems , hazardous atmosphere, or other hazardous conditions are found, exposed employees shall be removed from the hazardous area until precautions have been taken to assure their safety.

- Conducted Inspections are to be recorded and must include the date, work site location, results of the inspection, and a summary of any action taken to correct existing hazards.

PROTECTIVE SYSTEM REQUIREMENTS

Protection of Employees

- Employees in an excavation shall be protected from cave-ins by using either an adequate sloping and benching system or an adequate support or protective system. The only exceptions are:
    - Excavations made entirely in stable rock.
    - Excavations less than five (5) feet in depth where examination of the ground by a competent person provides no indication of a potential cave-in.
- Protective systems shall be capable of resisting all loads that could reasonably be expected to be applied to the system.

Design of Sloping and Benching Systems

The slope and configuration of sloping and benching systems shall be selected and constructed by the site superintendent in accordance with the following options:

1 - Allowable configurations and slopes
    i. Excavations shall be sloped at an angle no steeper than one and one-half (1 ½) horizontal to one (1) vertical (34 degrees measured from the horizontal), unless one of the options listed below is used.
    ii. Slopes shall be properly excavated depending on soil type as shown in 29 CFR 1926, Subpart P, Appendix B.

2 - Determination of slopes and configurations using 29 CFR 1926, Subpart P, Appendices A and B. The maximum allowable slopes and allowable configurations for sloping and benching systems shall meet the requirements set forth in these appendices.

3 - Designs using other tabulated data. The design of sloping or benching systems may be selected from, and shall be constructed in accordance with, other tabulated data, such as tables and charts. The tabulated data used must be in written form and include the following:
    i. Identification of the factors that affect the selection of a sloping or benching system.
    ii. Identification of the limits of the use of the data, including the maximum height and angle of the slopes determined to be safe.

iii. Other information needed by the user to make the correct selection of a protective system.

iv. At least one copy of the tabulated data that 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, and shall be maintained by the Equipment Manager.

4 - Design by a registered professional engineer

i. Sloping or benching systems designed in a manner other than those described in the preceding three options shall be approved by a registered professional engineer.

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

a. the maximum height and angle of the slopes that were determined to be safe for a particular project; and

b. the identity of the registered professional engineers who approved the design.

iii. At least one copy of the design shall be maintained at the jobsite while the slope is being constructed. After that time, the design may be stored off the jobsite, and shall be maintained by the Equipment Manager.

iv. Design of Support, Shield, and Other Protective Systems.

The design of support systems, shield systems, and other protective systems shall be selected and constructed by a competent person in accordance with the following requirements:

1 - Designs using 29 CFR 1926, Subpart P, Appendices A, C and D.

i. Timber shoring in trenches shalt be designed in accordance with the requirements of the OSHA guidelines.

ii. Aluminum hydraulic shoring shall be designed in accordance with the manufacturer's tabulated data or the requirements of the OSHA guidelines.

2 - Designs using manufacturer's tabulated data

i. Support systems, shield systems, and other protective systems designed from manufacturer's tabulated data shall be constructed and used in accordance with all specifications, recommendations, and limitations issued or made by the manufacturer.

ii. Deviation from the specifications, recommendations, and limitations issued or made by the manufacturer shall be allowed only after the manufacturer issues specific written approval.

iii. Manufacturer's specifications, recommendations, and limitations, as well as the manufacturer's written approval to deviate from the specifications, recommendations, and limitations, shall be kept in written form at the jobsite during construction of the protective system(s). After that time, the information may be stored off the jobsite, and shall be maintained by the Equipment Manager.

3 - Designs using other tabulated data. Designs of support systems, shield systems, and other protective systems shall be selected from and constructed in accordance with tabulated data, such as tables and charts.

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

ii. identification of the factors that affect the selection of a protective system drawn from such data;

iii. identification of the limits of the use of such data; and

iv. information needed by the user to make a correct selection of a protective system from the data.

i. At least one written 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, and shall be maintained by AES Management.

v. Design by a registered professional engineer

4 - Support systems, shield systems, and other protective systems designed in a manner other than the preceding three options shall be approved by a registered professional engineer.

i. Designs shall be in written form and shall include:

a. a plan indicating the sizes, types, and configurations of the materials to be used in the protective system; and

b. the identity of the registered professional engineer who approved the design.

ii. 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, and shall be maintained by the Equipment Manager.

Materials and Equipment

- Materials and equipment used for protective systems shall be free from damage or defects that might affect their proper function.
- Manufactured materials and equipment used for protective systems shall be used and maintained in accordance with the recommendations of the manufacturer, and in a manner that will prevent employee exposure to hazards.
- When materials or equipment used for protective systems are damaged, the Equipment Manager shall ensure that these systems are examined by a competent person to evaluate suitability for continued use. If the competent person cannot assure that 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. The material or equipment shall then be evaluated and approved by a registered professional engineer before being returned to service.

Installation and Removal of Supports

1 - General

i. Members of support systems shall be securely connected together to prevent sliding, falling, kickouts, or other potential hazards.
ii. 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 systems.
iii. Individual members of the support systems shall not be subjected to loads exceeding those that they were designed to support.
iv. Before temporary removal of individual support members begins, additional precautions shall be taken as directed by Supervisor to ensure the safety of employees (i.e., the installation of other structural members to carry the loads imposed on the support system).
v. Removal of support systems shall begin at, and progress from, the bottom of the excavation. Members shall be released slowly. If there is any indication of possible failure of the remaining members of the structure or possible cave in of the sides of the excavation, the work shall be halted until it can be examined by a Superintendent.

vi. Backfilling shall progress in conjunction with the removal of support systems from excavations.

2 - Additional Requirements

i. Excavation of material to a level no greater than two (2) feet below the bottom of the members of a support system is allowed, but only if the system is designed to resist the forces calculated for the full depth of the trench. There shall be no indications of a possible loss of soil from behind or below the bottom of the support system while the trench is open.

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

Sloping and Benching Systems

Employees are not permitted to work above other employees in the faces of sloped or benched systems, except when employees at lower levels are protected from the hazards of falling, rolling, or sliding material or equipment.

Shield Systems

1 - General

i. Shield systems shall not be subjected to loads that are greater than those they are designed to withstand.

ii. Shields shall be installed in a manner that will restrict lateral or other hazardous movement of the shield and could occur during cave-in or unexpected soil movement.

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

iv. Employees are not permitted in trenches when shields are being installed, removed, or moved vertically.

2 - Additional Requirements

i. Excavation of material to a level no greater than two (2) feet below the bottom of the shield system is allowed, but only if the system is designed to resist the forces calculated for the full depth of the trench.

ii. There shall be no indications of a possible loss of soil from behind or below the bottom of the shield system while the trench is open.

ACCIDENT INVESTIGATIONS

All incidents that result in injury to workers, as well as near misses, regardless of their nature, shall be reported and investigated. Investigations shall be conducted by Supervisor & Management as soon after an incident as possible to identify the cause and means of prevention to eliminate the risk of reoccurrence.

In the event of such an incident, the Excavation Safety Program shall be reevaluated by Safety Management to determine if additional practices, procedures, or training are necessary to prevent similar future incidents.

CHANGES TO PROGRAM

Any changes to the Excavation Safety Program shall be approved by Safety Management, and shall be reviewed by a qualified person as the job progresses to determine additional practices, procedures, or training needs necessary to prevent injuries. Affected employees shall be notified of procedure changes and trained if necessary.