EXCAVATION & TRENCHING

Purpose

The purpose of this procedure is to protect employees from safety hazards that may be encountered during work in trenches and excavations.

Scope

Because this procedure meets the minimum regulatory requirements, the requirements of this procedure must be met when work is performed on a Pulsar Helium (the company) site. However, this program may be adopted for use by contractors who do not have a formal excavation and trenching program.

Key Responsibilities

Management shall determine which employees within his/her operation is required to receive competent person training.

Management shall select a training facility or use an in-house qualified trainer to supply the training.

Competent Person - One who is capable of identifying existing and predictable hazards in the surroundings or working conditions that are unsanitary, hazardous, or dangerous to employees and who has authorization to take prompt corrective measures to eliminate them.

Employees are required to follow all duties as specified in this procedure.

Procedures

Competent Person Duties
The competent person or their designee shall have the following duties:

Protective Systems or Equipment

- Monitoring water removal equipment and operations.
- Removal of workers if conditions dictate.
- Atmospheric testing.
- Inspecting excavations subject to runoff from heavy rains to determine need for diversion ditches, dikes, or other suitable protection.
- Determining cave-in potential to assess need for shoring or other protective system.
- Examining damaged material or equipment used for protective systems to determine its suitability for continued use.
- Classifying soil and rock deposits, by both visual analysis and by testing, to determine appropriate protection; re-classifying, if necessary, based on changing conditions.
- Determining the appropriate slope of an excavation to prevent collapse due to surcharge loads from stored material or equipment, operating equipment, adjacent structures, or traffic, and assuring that such slope is achieved.

Inspecting Trench and Protective Systems

- Inspections prior to entry and authorizing immediate removal of employees from the hazardous area where evidence of possible cave-in, failure of protective systems, hazardous atmospheres, or other hazardous conditions exists.

Unsafe Access/Egress

- Structural ramps used for access or egress of equipment must be designed by a competent person qualified in structural design.

Buried Utilities and Pre-work Site Inspection

- A One Call locate must be performed prior to excavation activities.
- The approximate location of subsurface installations, such as sewer, telephone, fuel, electric, water lines, or any other subsurface installations that reasonably may be expected to be encountered during excavation work, shall be determined by the excavator prior to opening an excavation.
- 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.

General Requirements

Safe Means of Access/Egress

- A safe means of access/egress (e.g. ladders, ramps, stairs, etc.) shall be provided for workers entering and exiting an excavation.
- The safe means of egress 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.

Structural Ramps

- Structural ramps used solely by employees as a means of access or egress from excavations shall be designed by a competent person.
- Ramps and runways constructed of two or more structural members shall have the structural members connected together 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 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.
- 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 ladder.
- 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 shall not be allowed to carry any object or load while on the ladder that could cause them to lose their balance and fall.

Protection from Vehicular Traffic and Falling Loads

- 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.

- No employee shall be permitted underneath loads (or where loads may fall) 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 provide adequate protection for the operator during loading and unloading operations.

Barriers and Walkways

- Barriers shall be used around excavations and/or trenches.
- 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.
- 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.
- 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.

Atmospheric Testing

- The atmosphere of excavations and trenches shall be tested for air contaminants (oxygen, flammable gases, etc.) in excavations over 4 feet deep or if a hazardous atmosphere exists or could reasonably be expected to exist, prior to workers entering. A hazardous atmosphere could be expected, for example, in excavations in landfill areas, in excavations in areas where hazardous substances are stored nearby, or in excavations near or 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.
- Pulsar Helium will ensure safe operation of internal combustion engines in excavations or shafts. Whenever internal combustion engine-driven equipment is operated inside a shaft, a ventilation system shall be provided.
- When controls are used that are intended to reduce the level of atmospheric contaminants to acceptable levels, continuous air monitoring will be performed. 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.

Personal Protective Equipment

- All employees working in trenches or excavations shall wear approved hard-hats 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 exposed to hazards produced by, or performing, welding, cutting, or brazing operations shall wear approved spectacles or a welding face shield or helmet.
- 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.
- 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.

Procedures for Rescue and Equipment Needs

- Emergency rescue equipment, such as breathing apparatus, a safety harness and line, or a basket stretcher, shall be readily available where hazardous atmospheric conditions exist or may reasonably be expected to develop during work in an excavation. This equipment shall be attended when in use.
- Only personnel that have received approved training and have appropriate equipment shall attempt retrieval that would require entry into a hazardous atmosphere.

Procedures for Accidental Contact with Energized Utilities

To protect against electrical shock injury in the event of contact between equipment or vehicles and an energized utility, remember the following:

- The operator should remain inside the cab.
- All other personnel should keep away from the equipment, vehicle, cables, ropes, and load, since the ground around the unit might be energized.
- If the line has not been severed, the operator should try to remove the unit from contact by moving it in the reverse direction from that which caused the contact.
- If the unit cannot be moved away from contact, the operator should remain inside cab until the lines have been de-energized.
- If the operator must leave the equipment because of a more immediate hazard, then this person must jump clear from the unit and shuffle their feet in small steps.
- Secure the area and do not let anyone except emergency rescue personnel go near the energized equipment.

When a equipment or a vehicle contacts a power line, the rigger, ground crews or nearby observers are most likely to be affected. The operator sitting in the cab is at the same electrical potential as the equipment. When a boom truck contacts a power line, the operator, who is usually standing on the ground, is most likely to be affected. Any other worker who may be standing near the equipment will also be affected.

Everyone around the unit must be very careful to not touch any part of the equipment and the ground at the same time. If this contact is made, an electrocution injury can result.

If an operator must leave the equipment, or a worker needs to get away from an energized crane, shuffle your feet in very small steps. After a power line contact, the current flows outward through the ground in a ripple pattern. Areas of high and low electrical potential fields circle the energized equipment like ripples in a pond after a stone hits the surface. If a worker steps from an area of high electrical potential to an area of low electrical potential, electricity can flow through their legs causing injury or death. This is why small shuffles of your feet during an escape is the key to staying alive.

If one of your coworkers is hit by the electricity, remember, the power flowing through the ground could easily injure and kill you. Then, instead of one victim, there will be two, or three. No matter what you think or feel, you can't go near the energized worker until you know the power is off. Remember, you can't be sure that the power is off just by looking at the victim or power line. Rely only on emergency response professionals and/or utility company personnel to assist with a rescue.

Protection of Employees from Accumulation of Water

- 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 water accumulation.

- 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 competent person trained in the use of the equipment.
- If excavation work interrupts the natural drainage of surface water (such as streams), 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.
- The competent person shall inform workers of the precautions or procedures that are to be followed if water accumulates or is accumulating in an excavation.

Protecting 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.
- The competent person will determine if the excavation work could affect the stability of adjoining buildings, walls, sidewalks 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.

Protection of Employees from Falling Objects and Loose Rocks or Soil

- Removal of Excavation Hazards: All surface encumbrances that are located so as to create a hazard to employees shall be removed or supported, as necessary, to safeguard employees. 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.
- Employees shall be protected from excavated materials, equipment or other materials that could pose a hazard by falling or rolling into excavations.
- Spoil piles or other materials are stored two feet or more from the edge of the excavation. Protection shall be provided by placing and keeping materials or equipment at least 2 feet from the edge of excavations, or by the use of retaining devices that are sufficient to prevent materials or equipment from falling or rolling into excavations or by a combination of both if necessary.
- Materials piled, grouped or stacked near the edge of an excavation must be stable and self-supporting.

Stabilization of Soil

- Soil classifications must be determined by testing and protective systems designed according to soil classifications.
- The most stable type of soil is Type A. It is dense and heavy and consists primarily of clay.
- Type B has a medium level of stability and is made of soils such as silt, sandy loam, and medium clay.
- The least stable soil is Type C, which consists of gravel, loamy sand, and soft clay.
- Employees are restricted from being in the shield or trench box when installing or removing. The shield or trench box must be designed to resist calculated trench forces.

Daily Inspection

- 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.
- The 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 hazard increasing occurrence. These inspections are only required when employee exposure can be reasonably anticipated.

- Where the competent person finds evidence of a situation that could result in a possible cave-in, failure of protective systems, hazardous atmosphere, or other hazardous conditions, exposed employees shall be immediately removed from the hazardous area until precautions have been taken to assure their safety.
- There shall be a written log of all inspections conducted. This log shall include the date, work site location, results of the inspection, and a summary of any action taken to correct existing hazards.

Requirements for Training

- Workers shall be provided training on excavation/trenching.
- Training shall be performed before the employee is assigned duties in excavations.
- Retraining will be performed whenever work site inspections conducted by the competent person or Pulsar Helium management indicates that an employee does not have the necessary knowledge or skills to safely work in or around excavations.
- Training records shall include the date(s) of the training program, the instructor(s) of the training program, a copy of the written material presented, and the names of the employee(s) to whom the training was given.

Excavation Permit

In order to insure the requirements of this procedure are met, a permit shall be completed prior to the commencement of any excavation.