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INTERNATIONAL TECHNOLOGY CORPORATION

Project No. 305951
November 1993

Plan

Site Health and Safety Plan
Removal Action
Site 11-School of Music Plating Shop
Naval Amphibious Base Little Creek
Norfolk, Virginia

Contract No. N47408-92-D-3045
Delivery Order No. 0010

Prepared for:

Naval Construction Battalion Center
Naval Facilities Engineering Command
Contracts Office, Code 2723, Building 90
Port Hueneme, California 93043-5000

Prepared by:

IT Corporation
2790 Mosside Boulevard
Monroeville, Pennsylvania 15146-2792

RESPONSIVE TO THE NEEDS OF ENVIRONMENTAL MANAGEMENT

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Prepared by:
IT Corporation
Englewood, Colorado

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Removal Action
School of Music Plating Shop
Installation Restoration Site 11
Naval Amphibious Base
Little Creek, Virginia

Prepared by: _____

Tammy Bernardi, IT-Englewood
Health and Safety Coordinator

Approval Signatures:

_____ 11-23-93

Harry Dravecky, IT-Pittsburgh
Project Manager — Date

_____ 11-15-93

Warren Houseman, CIH, IT-Pittsburgh
Health and Safety Manager — Date

November 1993

Site Health and Safety Plan
Removal Action
School of Music Plating Shop
Installation Restoration Site 11
Naval Amphibious Base
Little Creek, Virginia

Acknowledgment Form

I have read, understand and agree to abide by the provisions as detailed in this Site Health and Safety Plan (HASP) prepared by IT Corporation (IT). Failure to comply with these provisions may lead to disciplinary action and/or my dismissal from the work site.

Printed Name	Signature	Company	Employee Number	Date

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1.0 Introduction

1.1 Objective

This Site Health and Safety Plan (HASP) establishes the work practices necessary to help ensure protection of IT Corporation (IT) personnel and IT subcontractors during the Removal Action for the School of Music Plating Shop, Installation Restoration Site 11, Naval Amphibious Base (NAB), Little Creek, Virginia.

The objective of this HASP is to provide a mechanism for the establishment of safe working conditions at the site. The safety organization and procedures have been established following an analysis of potential hazards at the site. Specific hazard control methodologies have been evaluated and selected in an effort to minimize the potential of accident or injury.

All site operations will be performed in accordance with applicable federal, state, local, and IT policies and procedures; Occupational Safety and Health Administration (OSHA) standards; and client requirements. All IT employees and IT subcontractors must comply with the requirements of this HASP.

1.2 Policy Statement

The policy of IT is to provide a safe and healthful work environment for all its employees. IT considers no phase of operations or administration to be of greater importance than the prevention of injury and illness. Safety takes precedence over expediency or shortcuts. Every accident and every injury is avoidable and IT will take every reasonable step to reduce the possibility of injury, illness, or accident.

This HASP prescribes the procedures that must be followed by all site personnel during Removal Action activities. Operational changes which could affect the health or safety of personnel, the community, or the environment will not be made without prior approval of the Project Manager (PM) and the Health and Safety (HS) Manager.

The provisions of this HASP are mandatory to all IT personnel and IT subcontractors assigned to the project, and all visitors to the work site are required to abide by these procedures. Work conditions may change as operations progress; therefore, the HS Manager will provide written addenda to this HASP when changes warrant. No changes to the plan will be implemented without prior approval of the HS Manager or his authorized representative.

1.3 References

This HASP complies with applicable OSHA and Environmental Protection Agency (EPA) regulations. This HASP follows the guidelines established in the following documents:

- *Standard Operating Safety Guides* (EPA, 1984)
- *Occupational Safety and Health Guidance Manual for Hazardous Waste Site Activities* (NIOSH 85-115)
- *U.S. Department of Labor/OSHA, Title 29 of the Code of Federal Regulations, Part 1910.120*
- *U.S. Department of Labor/OSHA, Title 29 of the Code of Federal Regulations, Part 1926.*

Contents of this HASP are consistent with the applicable IT Health and Safety Policies and Procedures listed in Appendix A.

These policies and procedures and their implementation for this project are central to IT's accident prevention program.

2.0 Project Staff Responsibilities

2.1 All Personnel

All personnel are responsible for continuous adherence to these health and safety procedures during the performance of their assigned work. No person shall work in a manner that conflicts with the intent or the inherent safety and environmental precautions outlined in this HASP. After due warnings, any person who violates safety procedures will be dismissed from the site and be subject to termination. IT employees are subject to progressive discipline and may be terminated for continued violations.

2.2 Health and Safety (HS) Manager: Warren Houseman, CIH

The HS Manager is responsible for the development, implementation, and oversight of the health and safety protocols applicable to the scope of work covered by this HASP. The HS Manager will review and approve this HASP and issue addenda if changed conditions warrant. The HS Manager is the contact for regulatory agencies on matters of safety and health. Additional responsibilities include general health and safety program administration; determining the level of personnel protection required; updating equipment or procedures based on information obtained during site operations; establishing air monitoring parameters based on expected contaminants; establishing employee exposure monitoring notification programs; investigating significant accidents and illnesses and implementing corrective action plans; performing periodic site inspections; and developing site-specific employee/community emergency response plans as required based on expected hazards. The HS Manager possesses authority to halt operations due to imminent danger or unsafe conditions. The HS Manager has a minimum of five years of working experience in the environmental industry. He has working knowledge of applicable federal, state, and local regulations. He has a formal education and training in occupational safety and health or a related field, and certification in industrial hygiene by the American Board of Industrial Hygiene (ABIH).

2.3 Site Safety and Health Officer (SSHO)

The SSHO is responsible for providing technical assistance to the Site Superintendent with respect to health and safety matters. The SSHO will conduct daily inspections to determine if operations are being conducted in accordance with this HASP and applicable regulations. The SSHO will report to the HS Manager and the Site Superintendent. In the absence of a SSHO, the Site Superintendent will assume the responsibilities of the SSHO.

The SSHO will have a minimum of one year of working field experience at hazardous waste sites utilizing EPA Levels D, C, and B personal protective equipment (PPE). Specialized training in respiratory PPE; program implementation; proper use of air monitoring instruments, air sampling methods, and interpretation of results is required. He/she shall have current certification in first aid and cardiopulmonary resuscitation (CPR) by a recognized organization such as the American Red Cross, and he/she must have working knowledge of applicable federal, state, and local occupational safety and health regulations. The SSHO possesses the authority to halt operations due to eminent danger or unsafe conditions.

2.4 Project Manager (PM): Harry Dravecky

The PM is responsible for ensuring that the necessary personnel are available for this project and that the reporting, scheduling, and budgetary obligations for this project are met.

The PM has a minimum of three years of experience in management of hazardous waste operations and/or emergency response and an education in the environmental profession or a related field. The PM possesses authority to halt operations due to imminent danger or unsafe conditions.

2.5 Site Superintendent

The Site Superintendent will supervise all IT activities at the site and is responsible for field implementation of this HASP. This includes communicating site requirements to all personnel, ensuring field supervisors and subcontractors enforce all provisions of the plan, and consulting with the HS Manager regarding changes to this HASP. Additional responsibilities include reading and becoming familiar with this HASP and IT Policies and Procedures; enforcing this HASP and other safety regulations; stopping work as required to ensure personal and environmental safety and health; determining evacuation routes, establishing and posting local emergency telephone numbers, and arranging emergency transportation; and ensuring that all site personnel and visitors have received the proper training and medical clearance prior to entering the site; establishing exclusion, decontamination, and clean zones; presenting tailgate safety meetings and maintaining attendance logs and records; assuring that the respiratory protection program is implemented; assuring that decontamination procedures meet established criteria; assuring that there is a qualified first aid person on site; discussing potential hazards with the SSHO, HS Manager, and the PM; and implementing changes as directed.

2.6 IT Subcontractors

IT subcontractors and their personnel are responsible to know, understand, and comply with the requirements of this HASP relevant to their assigned tasks for this project. Subcontractors are also required to follow the guidelines established in IT's *General Safety Rules for Contractors*. Subcontractors shall sign the Acknowledgement Form for this HASP. Subcontractors shall attend daily tailgate safety meetings to coordinate activities planned for the day. Any person(s) who observes safety problems should immediately report observations or concerns to appropriate IT personnel.

2.7 Site Visitors

Site visitors are required to register and sign in on the visitors log located in the site administration office or trailer. Visitors requiring access to restricted areas will meet with the SSHO to discuss planned activities and present qualification and training records, when applicable. All visitors will be escorted to the accessible areas on site. Only visitors who have been authorized by IT or a client representative may gain access to the Exclusion Zone (EZ) or Contamination Reduction Zone (CRZ). Individuals making deliveries or equipment repairs in the Support Zone (SZ) will not be required to comply with the medical and training requirements of this HASP. However, site access will be restricted to designated work or delivery areas only.

3.0 Site Description and Background

NAB Little Creek is a 2,147-acre complex that lies to the north of the cities of Virginia Beach and Norfolk, Virginia. North of the base lies the Chesapeake Bay while east of the base are Chubb Lake, Lake Bradford, and the Chesapeake Bay Bridge Tunnel ramps. U.S. Route 60 (a.k.a. Shore Drive) borders the base to the south and west with Lake Whitehurst and Lake Smith/Little Creek Reservoir abutting Shore Drive on the south.

The mission of NAB Little Creek is to provide on-base logistic facilities and other support services as required to local commands, organizations, and other U.S. and allied units, homeported ships, and commands of operating forces to meet the amphibious training and other requirements of the Armed Forces of the U.S.

One of the tenant commands is the School of Music which provides training for selected enlisted personnel of all the armed forces in order to prepare them for early usefulness in the field of music. Located adjacent to the School of Music (otherwise known as Building 3602) is a small plating shop where musical instrument parts were stripped, replated, and relacquered. This is Building 3651 and is commonly called the School of Music Plating Shop. The electroplating operations began with the start-up of the music school in 1964. From 1964 to 1974, approximately 1,320 gallons of plating wastes were disposed through the drains of the shop which lead to a limestone-filled tank where partial neutralization occurred prior to overflowing into a nearby storm drain. Plating wastes consisting of silver cyanide, copper cyanide, brite dip (i.e., chromic acid), nickel plating baths, striping acids, lacquers, and lacquer strippers were disposed at an annual rate of 10 gallons each. This method of disposal was discontinued in 1974 at which time the electroplating operation was moved to Room 3B2 in the School of Music Building 3602. Since 1974 all plating wastes are drummed, temporarily stored in the original plating shop (i.e., Building 3651), and disposed by Public Works.

The area to be remediated consists of an in-ground precast concrete acid neutralization tank and associated piping. The neutralization tank is approximately 10 feet east of the southeast corner of the School of Music Plating Shop (Building 3651). The neutralization tank has a diameter of 5 feet and a depth of 8 feet and contains approximately 2.5 cubic yards (yd^3) of crushed limestone which was placed in the tank to neutralize the acidic plating wastes. During operation, the wastewater entered the neutralization tank via an acid-resistant cast iron drainpipe located at a sink drain in Building 3651. Neutralized wastewater was discharged

from the tank into the storm sewer via an outlet and drain from the northeast side of the tank. Flow through the tank was controlled by a standpipe and drain positioned so that all wastewater has to pass through the limestone before it could enter the discharge pipe connected with the storm sewer.

Section 1.1 of the Removal Action Work Plan contains a further discussion on prior site investigations conducted at Site 11, School of Music Plating Shop.

3.1 Planned Work Activities

This HASP contains recommended health and safety guidelines for planned work activities to be conducted during the removal action operation.

3.1.1 Site Preparation and Mobilization

- Mobilize equipment.
- Set up site control zones and support facilities.
- Grade site for equipment and material staging area.
- Construct access roads on site where needed.
- Install erosion/sediment controls.
- Install protective measures surrounding existing features where needed.
- Make electrical connections where needed.

3.1.2 Removal of Acid Neutralization Tank and Associated Tasks

- Excavate soils to uncover tank.
- Remove drain and plug to building.
- Remove piping associated with tank.
- Remove neutralization tank.
- Remove pipe and plug from existing catch basin.
- Remove cleanout.
- Open top manhole to tank.
- Remove liquid and sludge from the tank.
- Personnel and equipment decontamination.

3.1.3 Site Restoration

- Place clean backfill in excavation to match existing elevations.
- Reseed all disturbed areas.

3.1.4 Demobilization

- Demobilize support facilities and equipment.

Potential hazards associated with each of these planned activities is discussed in Chapter 4.0 of this HASP.

4.0 Hazard Analysis

4.1 Scope of Work

IT will remove the acid neutralization tank and affected soils from the School of Music Plating Shop. The following tasks will be necessary to accomplish this task:

- Site preparation and mobilization
- Removal of acid neutralization tank and associated tasks
- Site restoration
- Demobilization

4.2 Hazard Analysis

The hazard analysis identifies potential safety, health, and environmental hazards and provides for the protection of personnel, the community, and the environment. Because of the complexity and constant change of remediation projects, supervisors must continually inspect the work site to identify hazards which may harm site personnel, the community, or the environment. The PM, Site Superintendent, and SSHO must be aware of these changing conditions and discuss them with the HS Manager. The HS Manager shall write addenda as needed to include hazard analysis for tasks not included in this HASP.

The hazard analysis for each task is listed in Table 4.1.

Chemical hazards during site preparation and demobilization are expected to be minimal. Exposures to tank liquids and sludges during these work activities are not anticipated. Personnel shall wear PPE during these activities which will protect them from physical construction hazards (i.e., hard hat, safety glasses, steel-toe/shank boots).

During work activities, physical hazards expected will be standard construction industry type hazards. These include, but are not limited to, confined space entry; uneven surfaces; slips, trips, and falls; sensory and dexterity hazards from wearing PPE; electrical hazards; heat and cold stress; noise; and physical and overhead hazards involved with the use of heavy equipment, personnel hoists, or cranes.

All intrusive activities, tank and soils removal, and associated activities present the potential for exposure to high concentrations of tank liquids or aerosolized liquids. For these reasons, work activities will be conducted in Level B PPE as outlined in Chapter 6.0 of this HASP.

Intrusive activities and tank decontamination will not require personnel to enter the tank through the top access port. Due to the physical constraints, ventilation restrictions, and potential chemical exposure hazards, no entries into the acid neutralization tank will be authorized.

Heat stress may be a significant hazard during intrusive activities and tank decontamination. Depending on ambient weather and site conditions, either a work/rest regime or appropriate personal cooling devices shall be used to prevent heat stress during intrusive activities. In addition, adequate precautions shall be made to prevent heat stress in workers who have not been acclimatized and those who are more sensitive or susceptible to heat stress conditions. Heat stress is further defined in Chapter 5.0 of this HASP.

Cold stress may also present a hazard dependent upon when these project activities are performed. Workers will be provided insulated clothing (i.e., glove liners, insulated coveralls, hard hat liners) when work environment temperatures drop below 40°F. Breaks will be taken in a warm area and PPE will be removed. Cold stress is further defined in Chapter 5.0 of this HASP.

Good housekeeping shall be practiced daily throughout the project to protect against fire and potential slip, trip, and fall hazards. Work areas shall be kept free of loose tools, oily rags, boards, wood, scraps, and other debris. Flammable materials will be stored in approved safety containers placed in the SZ.

PPE and respiratory equipment will be necessary to protect site workers. At a minimum, hard hat, steel-toe/shank shoes, gloves, and safety glasses will be required on site. PPE used shall meet American National Standards Institute (ANSI) performance criteria.

Steel-toe/shank safety boots with proper soles will provide adequate worker protection and traction. Sandals, open-toe shoes, or tennis shoes are prohibited in the designated work areas.

The type of glove worn by the worker depends on the job. Leather and cloth gloves will be used for handling rough, sharp, and abrasive materials; insulated gloves are used for handling hot objects; and chemically-resistant gloves are used for handling soils and tank liquids and sludges. Loose or poor-fitting gloves will not be worn while working on, around, or in close proximity to moving machinery.

Eye protection will be selected dependent upon the potential hazards involved. Workers will be required to wear ANSI-approved safety glasses with side shields for impact resistance. For welding operations, the welder will be required to wear safety cup-type goggles and a welder's helmet with the properly tinted lens.

The use of PPE by site workers inherently reduces dexterity, mobility, and sensory perception. Workers shall proceed at a comfortable pace and always use the buddy system. No horseplay or unauthorized use of equipment is allowed.

Workers required to operate cranes, hoists, manlifts, and other equipment shall be thoroughly trained in the use of this equipment before operating it. Suspended loads shall never be carried over personnel. The maximum load capacity for each lifting device shall not be exceeded. Any worker elevated in a manlift shall wear a waist belt with lanyard attached to the siderail.

All electrical hookups shall be performed by a licensed electrician. Electrician tools shall be kept dry and clean. Electricians shall wear rubber insulating gloves for live line work on transmission lines.

Noise levels during excavation activities may become significant due to the confinement of the work area and reverberation. Engineering and administrative controls will be implemented at 80 decibels (dB) when possible to reduce noise levels in the work zones. When workers are subjected to noise levels at 85 dB, workers will be required to wear hearing protection devices. Noise hazard areas will be marked with caution signs indicating the presence of hazardous noise levels and the requirement for hearing protection.

Additional unforeseen hazards may arise once work begins and as site conditions change. Potential hazards will be analyzed on a task-specific basis by the SSHO and the HS Manager as necessary.

All IT personnel and IT subcontractors will be familiar with these hazards, and strictly adhere to the appropriate safety procedures. The potential hazards and the appropriate controls will be presented to project personnel during daily Tailgate Safety Meetings.

4.3 Hazardous and Toxic Materials

Table 4.2 lists the compounds associated with materials that are used on the site or are likely to be encountered on site. The HS Manager will update this section as information obtained during this project warrants. Minimization or elimination of hazardous and toxic materials exposure to site personnel is the objective of this HASP. Reduction of potential for exposures will be obtained through proper implementation of engineering controls, PPE and respiratory protective equipment, and minimizing exposure duration as appropriate.

The potential chemical compounds expected at the site are primarily cyanide and chlorinated organic compounds. The most common routes of entry into the body are contact and inhalation. Toxic effects in humans include dermatitis, dizziness, drowsiness, confusion, nausea, vomiting, and abdominal pains. Repeated exposure may cause liver and kidney damage.

Table 4.3 lists the concentration and media previously identified on site respective to each chemical compound anticipated.

4.4 Exposure Standards

Threshold limit values (TLVs) refer to airborne concentrations of substances which represent conditions that nearly all employees may be repeatedly exposed to day after day without adverse effect. These TLVs are prescribed by the American Conference of Governmental Industrial Hygienists (ACGIH) and are based upon the best available information obtained through industrial experience and animal or human studies. Because of the wide variation in individual susceptibility, a small percentage of workers may experience discomfort from some substances at concentrations below the recommended values. IT uses these guidelines for good hygienic practices; however, whenever applicable, stricter guidelines will be utilized.

Currently, exposure guidelines for many chemical compounds are regulated by OSHA. These exposures are based upon the time-weighted average (TWA) concentration for a normal 8-hour workday and a 40-hour work week. Several chemical compounds have short-term exposure limits (STELs) or ceiling values which allow a maximum concentration to which workers can be exposed continuously for a short period of time without suffering from (1) irritation, (2) chronic or irreversible tissue damage, and/or (3) narcosis of a sufficient degree to result in accidental injury, impaired self-rescue abilities, or substantially reduced work efficiency.

The STEL is defined by the ACGIH as a "15-minute TWA which should not be exceeded at any time during a workday even if the 8-hour TWA is within the TLV-TWA. Exposures above the TLV-TWA up to the STEL should not be longer than 15 minutes and should not occur more than four times per day. There should be at least 60 minutes between successive exposures in this range. An averaging period other than 15 minutes may be recommended when this is warranted by observed biological effects."

Under certain chemical substance listings, a "skin" notation may appear. This refers to the potential contribution to the overall exposure by the cutaneous route, including mucous membranes and eye, either airborne or by direct contact. Little quantitative data is available describing absorption as a function of the concentration to which the skin is exposed. Biological monitoring may be considered to determine the relative contribution of dermal exposure to the total dose.

The ACGIH and OSHA have recognized through epidemiological studies, toxicology studies, and to a lesser extent, case histories that certain chemical substances may have the potential to be carcinogenic in humans. Because of the long latency period for many carcinogens, it is often impossible to base timely risk management decisions on the results of such information. Two categories of carcinogens are designated based upon the most current literature and information. These include confirmed human carcinogens and suspected human carcinogens. These chemical categories are based on either: (1) limited epidemiologic evidence or (2) demonstration of carcinogens in one or more animal species by appropriate methods.

The worker potentially exposed to a known human carcinogen must be properly equipped to ensure virtually no contact with the chemical constituents. In the case of a suspected human carcinogen, worker exposure by all routes must be carefully controlled by the use of personal and respiratory protection and through administrative or engineering controls.

Table 4.2 represents the strictest set of guidelines currently established by either ACGIH or OSHA.

Table 4.1
Hazard Analysis

Removal of Acid Neutralization Tank and Associated Tasks

Removal of Acid Neutralization Tank and Associated Tasks	Potential Hazards	Control Measures
Principal Steps: • Excavate soils to uncover tank. • Remove drain and plug to building. • Remove piping associated with tank. • Remove pipe and plug from existing catch basin. • Remove cleanout. • Open top manhole to tank. • Remove liquid and sludge from the tank. • Personnel and equipment decontamination • Remove acid neutralization tank. Equipment to be Used: • Level B PPE • Forklift • Backhoe/trackhoe • Front-end loader • Grader • Dozer • Jackhammer • Generator Inspection Requirements: • Daily Training Requirements: • Task-specific training • Proper use and operation of hand tools • First Aid/CPR (American Red Cross) • Level B PPE • Excavation safety training	Slip, trip, fall	• Site workers will be required to wear hard hat, safety glasses with side shields, work gloves, and steel-toe boots when working in the field. • Whenever possible, avoid routing cords, ropes, and hoses across walking pathways. • Flag or cover inconspicuous holes to protect against falls. • Open excavation will be clearly marked and secured.
	Poor housekeeping	• Work areas will be kept clean and orderly. • Garbage and trash will be disposed of regularly in approved refuse containers. • Tools and accessories will be properly maintained and stored. • Work areas and floors will be kept free of dirt, grease, and slippery materials. • Materials shall be stored to allow clear access to aisles, pathways, and travel routes. • Field vehicles will be kept clean and orderly (i.e., cab, truck beds, tool boxes, trunk, camper shells).
	Manual lifting	• Size up the job. Think it through. • Lift with your legs, not your back. • Use mechanical equipment whenever possible. • Get assistance when manually lifting awkwardly-sized items or those items over 60 pounds.
	Minor cuts and bruises	• Workers shall wear appropriate field attire (i.e., no tank tops, shorts, open-toe shoes, jewelry). • Tools not functioning properly shall be removed from service immediately and tagged for repair. • Worker shall wear cotton or leather work gloves when handling equipment. • Have at least one IT person on site trained in First Aid/CPR. • All crew personnel on site shall use the buddy system (working in pairs or teams).
	Chemical contact	• Material Safety Data Sheets (MSDSs) shall be obtained for chemicals brought on site. • MSDSs shall be reviewed with project personnel before using the chemical material.

Table 4.1
Hazard Analysis

Removal of Acid Neutralization Tank and Associated Tasks (continued)

Removal of Acid Neutralization Tank and Associated Tasks (continued)	Potential Hazards	Control Measures
Principal Steps: • Excavate soils to uncover tank. • Remove drain and plug to building. • Remove piping associated with tank. • Remove pipe and plug from existing catch basin. • Remove cleanout. • Open top manhole to tank. • Remove liquid and sludge from the tank. • Personnel and equipment decontamination • Remove acid neutralization tank. Equipment to be Used: • Level B PPE • Forklift • Backhoe/trackhoe • Front-end loader • Grader • Dozer • Jackhammer • Generator Inspection Requirements: • Daily Training Requirements: • Task-specific training • Proper use and operation of hand tools • First Aid/CPR (American Red Cross) • Level B PPE • Excavation safety training	Personal injury; property damage; or equipment damage due to heavy equipment operations.	• Only authorized personnel shall operate heavy equipment. • Use qualified and trained equipment operators. • Moving heavy equipment must have properly functioning back-up alarms. • Spotters on the ground will assist operators in manipulating vehicles and equipment into tight or confined spaces. • Operators shall maintain a constant awareness of personnel and equipment in the work areas. • Machinery or equipment shall not run unattended. • Blade, bucket, etc. will be fully lowered or blocked when in use or being repaired. • Rollover protection shall be used when conditions call for such use. • No overhead work shall be performed when, as a result of that work, the possibility of a falling object striking any person exists. • Cranes, derricks, drill rigs, booms or similar equipment shall have a minimum 15 feet clearance from overhead electrical power lines. • If lines have appreciable sag, or if windy conditions exist, this distance will be 20 feet. • Loads shall never be carried over personnel. • When any machinery or equipment is found to be unsafe as a deficiency is noted, the equipment shall immediately be taken out of service and its use prohibited until unsafe conditions have been corrected. • Machinery or equipment shall not be operated in a manner that will endanger persons or property nor shall the safe operating speeds or loads be exceeded. • Getting off or on any equipment while it is in motion is prohibited. • Seats should be provided for each occupant of the equipment. • Equipment operated on the highway shall be equipped with headlights, taillights, brake lights, back-up lights, and turn signals visible from the front and rear. • All mobile equipment and the areas in which they are operated shall be adequately illuminated. • Mechanized equipment shall be shut down prior to and during fueling operations. • Whenever equipment is parked, the parking brake shall be set. • The rated capacity on lift trucks and cranes shall be posted on the vehicle so as to be clearly visible. • The load capacity ratings shall not be exceeded at any time. • No guard, safety appliance, or device shall be tampered with. • Heavy equipment operators shall inform their Supervisor(s) of any prescribed medication that they are taking that would impair their judgment. • When conditions are such that lightning is occurring, all equipment operations shall cease. • Personnel are not allowed to work off of machinery or to use them as ladders. • Never walk or work directly in back of or to the side of heavy equipment without the operator's knowledge. • Heavy equipment shall be equipped with a fire extinguisher. • Site workers shall establish hand signals when verbal communication becomes difficult. • Leave machinery in low gear on steep grades. • The operator will ensure that the equipment is on solid ground or foundation with outriggers extended before starting. • Before coupling support equipment (i.e., sheepsfoot roller, air compressor) to other equipment, the machine shall be stopped, the transmission placed in neutral, and the brakes set before allowing any workers to couple the equipment. • If heavy equipment is being used to pull or tow other equipment, use tow straps (nylon) instead of chains. • Blast shield shall be used when necessary to protect the operator from airborne debris. • Use hearing protection when noise levels exceed 85 dB in the work area. • Drill rig shall only be moved with the derrick lowered.

Table 4.1
Hazard Analysis

Removal of Acid Neutralization Tank and Associated Tasks (continued)

Removal of Acid Neutralization Tank and Associated Tasks (continued)	Potential Hazards	Control Measures
Principal Steps: • Excavate soils to uncover tank. • Remove drain and plug to building. • Remove piping associated with tank. • Remove pipe and plug from existing catch basin. • Remove cleanout. • Open top manhole to tank. • Remove liquid and sludge from the tank. • Personnel and equipment decontamination • Remove acid neutralization tank. Equipment to be Used: • Level B PPE • Forklift • Backhoe/trackhoe • Front-end loader • Grader • Dozer • Jackhammer • Generator Inspection Requirements: • Daily Training Requirements: • Task-specific training • Proper use and operation of hand tools • First Aid/CPR (American Red Cross) • Level B PPE • Excavation safety training	Cave-Ins	• Entry into excavation/trench shall be allowed only after consultation with the Site Superintendent and SSHO. • Excavations/trenches >5 feet deep shall not be entered unless sloped, stepped, or shored. • Design of any support system shall be reviewed and approved by a professional engineer. • A competent person trained in soils identification will be present in the field. • Nonessential equipment will be staged at least 6 feet outside the immediate work area. • Material used for piling, bracing, shoring, and under-pinning shall be in good serviceable condition. • Foundations adjacent to where the excavation is to be made below foundation depth shall be supported by shoring, bracing, or underpinning.
	Slip, trip, fall due to excavation/ trenching	• All work shall be performed from a stable ground position. • Workers who enter excavations 5 feet or greater in depth shall be protected by sloping, shoring, or benching. • For entry into excavations/trenches 4 feet or greater, a means of entry/egress shall be provided every 25 lateral feet. • Spoil material shall be placed at least 2 feet from the edge of the excavation/trench to avoid load strain on the sidewalls. • The excavation/trench shall be guarded on all sides. • Excavations/trenches shall be backfilled as soon as practical after work is completed and all associated equipment removed. • Ladders placed into excavation/trench shall extend 3 feet above the top of the excavation.
	Underground utilities	• Identify work area to be cleared. • Look at underground drawings. • Receive approval for excavation/trenching or relocate activities. • Complete Excavation Permit as required by client procedures. • Review expiration date of Excavation Permit, if applicable.
	Electrocution; explosion due to underground hazards	• Before beginning intrusive activities, the Site Superintendent shall ensure that underground utilities (i.e., electrical, phone, gas, water lines) are located. • Review blueprints and as-built drawings of facility layout. • When underground utilities are exposed, they shall be protected to avoid damage. • All uncovered lines shall be identified before work proceeds. • Personnel on the ground will assist in probing the soils to find the exact location of the lines and will use hand shovels to carefully remove the soil adjacent to the lines. • Identify work area to be cleared. • Look at underground drawings. • Contact client representative to assist in verification of underground hazards. • Receive approval for excavation/trenching or relocate activities. • Complete Excavation Permit as required by client procedures. • Review expiration date of Excavation Permit, if applicable.

Table 4.1
Hazard Analysis

Removal of Acid Neutralization Tank and Associated Tasks (continued)

Removal of Acid Neutralization Tank and Associated Tasks (continued)	Potential Hazards	Control Measures
Principal Steps: • Excavate soils to uncover tank. • Remove drain and plug to building. • Remove piping associated with tank. • Remove pipe and plug from existing catch basin. • Remove cleanout. • Open top manhole to tank. • Remove liquid and sludge from the tank. • Personnel and equipment decontamination • Remove acid neutralization tank. Equipment to be Used: • Level B PPE • Forklift • Backhoe/trackhoe • Front-end loader • Grader • Dozer • Jackhammer • Generator Inspection Requirements: • Daily Training Requirements: • Task-specific training • Proper use and operation of hand tools • First Aid/CPR (American Red Cross) • Level B PPE • Excavation safety training	Electrocution; electrical burns; fire	• Maintain a distance of 20 feet between electrical lines and any part of equipment. • Portable electrical tools and equipment will be double-insulated. • Portable fire extinguishers will be kept on site. • Workers will not handle electrical equipment or wires if their hands are wet or they are standing on wet surfaces. • Electrical cords shall be pulled from the outlet by the plug, not the electrical cord. • Identify the location of electrical lines in the work area. • Power tools shall be tagged and removed from service when not functioning properly. • Lockout/tagout procedures shall be implemented when employees need to perform repair or maintenance on electrical equipment where the unexpected energization, or start-up of stored energy could cause injury. • Worn or frayed extension cords shall be replaced. • All electrical wiring and equipment shall be a type listed by Underwriters Laboratories or another recognized listing agent for the specific application. • Before work begins, the Site Superintendent shall ensure by inquiry, observation, or instruments that any part of an electric power circuit will not bring any person, tool, or machine into contact with it. • Extension cords shall not be fastened with staples, hung from nails, or suspended by bare wire.
	Hearing impairment due to excessive noise	• Review elements of Hearing Conservation Program. • Provide annual audiograms for employees. • Conduct noise surveys for activities on site. • Provide hearing protection on site. • Required use of hearing protection when noise levels are at or exceed 85 dB. • Exposure to impulsive or impact noise should not exceed 140 dB peak sound level. • Use engineering controls (i.e., guards, mufflers, distance) to reduce worker exposure. • Conduct noise surveys on activities in question. • Employee shall inform employees of high noise areas where hearing protection is required and demarcate them.
	Spills, leaks due to drum handling	• The drums and containers will be inspected and their integrity assured prior to being relocated. If a container holding hazardous waste is not in good condition or if it begins to leak, the material must be transferred from this container to a container that is in good condition. • Any drums or containers under pressure, as evidenced by bulging, will not be moved. The cause for the excessive pressure will be determined immediately and appropriate containment procedures implemented to protect employees from explosive relief of the drum or container.
	Personnel injury; back injury; and chemical exposure due to drum handling	• Prior to the movement of any drums or containers, employees involved in the drum transfer or movement shall be warned of the potential hazards associated with the contents of the drums or containers. Levels of personal protection will be based on the container contents, but at a minimum, will include steel-toe boots, and gloves, hard hats, and chemical-resistant gloves. • Employees shall not stand upon or work from drums or containers. • If drums need to be moved any distance, a drum dolly or forklift should be used. • If a worker loses control of a drum while attempting to move it, STAND CLEAR and DO NOT try to prevent its fall. If the fallen drum remains unopened or unbroken, get assistance from coworker(s) to upright the drum.

Table 4.1
Hazard Analysis

Removal of Acid Neutralization Tank and Associated Tasks (continued)

Removal of Acid Neutralization Tank and Associated Tasks (continued)	Potential Hazards	Control Measures
Principal Steps: • Excavate soils to uncover tank. • Remove drain and plug to building. • Remove piping associated with tank. • Remove pipe and plug from existing catch basin. • Remove cleanout. • Open top manhole to tank. • Remove liquid and sludge from the tank. • Personnel and equipment decontamination • Remove acid neutralization tank. Equipment to be Used: • Level B PPE • Forklift • Backhoe/trackhoe • Front-end loader • Grader • Dozer • Jackhammer • Generator Inspection Requirements: • Daily Training Requirements: • Task-specific training • Proper use and operation of hand tools • First Aid/CPR (American Red Cross) • Level B PPE • Excavation safety training	Fires	• Fire extinguishing equipment will be on hand and ready for use to control releases of flammable or ignitable materials. The fire extinguishing equipment will be rated for the anticipated blaze. • All drums will be marked as to the contents.
	Slip, trip, fall due to poor housekeeping	• Personnel will clean-up the work site regularly and dispose of trash. • Refuse containers or bins will be readily available on site. • Provide adequate storage for tools and equipment. • Provide adequate lighting in all work areas. • Provide adequate ventilation in all work areas. • Work areas and floors shall be kept clear of debris. • Materials shall not be stacked higher than 6 feet. • Provide stools, ladder where workers need to access elevated storage areas. • Protruding nails in scrap boards, planks, and lumber shall be removed, hammered in, or bent over flush with the wood. • Weeds and grass shall be kept down. • Flammable materials shall be placed in approved flammable storage containers.
	Heat rash	• Keep the skin clean and dry. • Change perspiration-soaked clothing, as necessary. • Bathe at end of work shift or day. • Apply powder to affected areas.
	Heat cramps	• Drink plenty of cool fluids even when not thirsty. • Provide cool fluids for work crews. • Move victim to shaded, cool area.
	Heat exhaustion	• Physiological worker monitoring as needed (i.e., heart rate, oral temperature). • Set up work/rest periods. • Use the buddy system. • Allow workers time to acclimate. • Have ice packs available for use on breaks. • Heat stress monitoring should begin when workers are wearing PPE, including Tyvek coveralls, and the ambient temperature exceeds 78°F. • When ambient temperatures exceed 90°F and impermeable protective garments are worn, physiological monitoring will be implemented.
	Heat stroke	• Evaluate possibility of night work. • Perform physiological monitoring on workers during breaks. • Wear body cooling devices. • Heat stress monitoring should begin when workers are wearing PPE, including Tyvek coveralls, and the ambient temperature exceeds 78°F. • When ambient temperatures exceed 90°F and impermeable protective garments are worn, physiological monitoring will be implemented.

Table 4.1
Hazard Analysis

Removal of Acid Neutralization Tank and Associated Tasks (continued)

Removal of Acid Neutralization Tank and Associated Tasks (continued)	Potential Hazards	Control Measures
Principal Steps: • Excavate soils to uncover tank. • Remove drain and plug to building. • Remove piping associated with tank. • Remove pipe and plug from existing catch basin. • Remove cleanout. • Open top manhole to tank. • Remove liquid and sludge from the tank. • Personnel and equipment decontamination • Remove acid neutralization tank. Equipment to be Used: • Level B PPE • Forklift • Backhoe/trackhoe • Front-end loader • Grader • Dozer • Jackhammer • Generator Inspection Requirements: • Daily Training Requirements: • Task-specific training • Proper use and operation of hand tools • First Aid/CPR (American Red Cross) • Level B PPE • Excavation safety training	Frost nip; frostbite, and hypothermia due to cold stress	• Wear insulating clothing when temperatures drop below 40°F. • Drink warm beverages on breaks. Refrain from drinking caffeinated beverages. • Remove wet clothing promptly. • Take breaks in warm areas. • Reduce work periods as necessary. • Layer work clothing.
	Vehicle accidents and personal injury due to traffic	• Place physical barrier (i.e., barricades, fencing) around work areas regularly occupied by pedestrians. • If working adjacent to roadways, have workers wear fluorescent orange vests. • Use warning signs or lights to alert oncoming traffic. • Assign flag person(s) if necessary to direct local traffic. • Set up temporary parking locations outside the immediate work area. • Motor vehicle operators shall obey all posted traffic signs, signals, and speed limits. • Pedestrians have the right-of-way. • Wear seat belts when vehicles are in motion.
	Dermatitis due to poisonous plants	• Post areas that have been identified with poisonous plants. • Avoid contact with these plants to the extent possible. • Wear clothing or coveralls with long sleeves. • Promptly wash clothing that has contacted poisonous plants. • Wash affected areas immediately with soap and water. • Apply ointment to affected areas.
	Rabies and bites due to Cottonmouth, Copperhead, and Cane Break Rattlesnakes	• Keep work areas clear of vegetation and small brush. • Avoid placing hands or feet into obscure areas (i.e., beneath rocks, well pads, brush piles). • Have a snakebite kit on site. • Wear rubber or PVC boots into vegetated areas where poisonous snakes or animals inhabit. • Use the buddy system. • Postpone work in areas where poisonous snakes or animals are nested. • Avoid walking in high grass or underbrush. • Visually inspect work area prior to start-up of activities. • Do not attempt to kill any snakes on site.
	Ticks	• Wear light colored clothing (can see ticks better). • Mow vegetated and small brush areas. • Wear insect repellant. • Wear long sleeves and long pants. • Visually check oneself promptly and frequently after exiting the work area.

Table 4.1
Hazard Analysis

Removal of Acid Neutralization Tank and Associated Tasks (continued)

Removal of Acid Neutralization Tank and Associated Tasks (continued)	Potential Hazards	Control Measures
Principal Steps: • Excavate soils to uncover tank. • Remove drain and plug to building. • Remove piping associated with tank. • Remove pipe and plug from existing catch basin. • Remove cleanout. • Open top manhole to tank. • Remove liquid and sludge from the tank. • Personnel and equipment decontamination • Remove acid neutralization tank. Equipment to be Used: • Level B PPE • Forklift • Backhoe/trackhoe • Front-end loader • Grader • Dozer • Jackhammer • Generator Inspection Requirements: • Daily Training Requirements: • Task-specific training • Proper use and operation of hand tools • First Aid/CPR (American Red Cross) • Level B PPE • Excavation safety training	Bees, mosquitos, wasps, ants	• Identify infested areas to the Site Superintendent and SSHO. • Workers who are allergic or capable of allergic reactions to bee, wasp, or ant stings or bites shall notify their Supervisor(s). • Evaluate need for sensitive workers to have prescribed antibiotic or medicine to combat onset of symptoms. • Do not approach or disturb nests. • Wear insect repellant. • Cover exposed skin. • Avoid wearing sweet fragrances or bright clothing. • Move slowly and do not swat at flying insects.

Table 4.1
Hazard Analysis

Site Restoration

Site Restoration	Potential Hazards	Control Measures
Principal Steps: • Place clean backfill in excavation to match existing elevations. • Reseed all disturbed areas	Slip, trip, and fall	• Utilize good housekeeping practices. • Hard hats, safety glasses, steel-toe/shank boots are required outside the office trailers.
	Manual lifting	• Use proper lifting techniques. • Get assistance when manually lifting loads greater than 60 pounds. • Use mechanical equipment whenever possible.
	Noise	• Hearing protection shall be provided to and worn by personnel in areas where noise levels exceed 85 dB. • Whenever possible, stage noisy equipment in a remote area.
	Heavy equipment	• Use qualified and trained equipment operators. • Moving heavy equipment must have properly functioning backup alarms. • Operators shall inspect their equipment prior to and during each use to ensure that it is functioning properly. • Spotters on the ground will provide guidance to operators. • Machinery or equipment shall not run unattended. • Bulldozer and scraper blades, and buckets will be fully lowered or blocked when in use or being repaired.

Table 4.1
Hazard Analysis

Demobilization

Demobilization	Potential Hazards	Recommended Controls
Principal Steps: • Demobilize support facilities and equipment Equipment to be Used: • Forklift Inspection Requirements: • None Training Requirements: • Forklift training.	Slip, trip, and fall	• Utilize good housekeeping practices. • Hard hats, safety glasses, steel-toe/shank boots are required outside the office trailers.
	Manual lifting	• Use proper lifting techniques. • Get assistance when manually lifting loads greater than 60 pounds. • Use mechanical equipment whenever possible.
	Noise	• Hearing protection shall be provided to and worn by personnel in areas where noise levels exceed 85 dB. • Whenever possible, stage noisy equipment in a remote area.
	Heavy equipment	• Use qualified and trained equipment operators. • Moving heavy equipment must have properly functioning backup alarms. • Operators shall inspect their equipment prior to and during each use to ensure that it is functioning properly. • Spotters on the ground will provide guidance to operators. • Machinery or equipment shall not run unattended. • Bulldozer and scraper blades, and buckets will be fully lowered or blocked when in use or being repaired. • Heavy equipment shall be given the right of way.

Table 4.1
Hazard Analysis

Underground/Overhead Utility Checklist

Project Name/Number:_____ **Date:**_____

Location:_____

This checklist should be completed for any intrusive subsurface work such as excavating. It records the fact that all underground and overhead structures and utilities in the work area are identified and located. The PM must request utility markouts before the start of field operations to allow the client and utility companies time to complete them. If complete information is not available, a magnetometer survey must be performed to locate obstacles prior to excavating or drilling.

Procedure: A diagram of the project area depicting the proposed location of excavation should be attached to this HASP. The diagram must clearly indicate the areas checked for underground structures/utilities and overhead power lines. This form and the diagram must be signed by the PM, the IT Site Superintendent, and the client representative (if applicable).

Checklist:

Type of Structure	Present	Not Present	Method of Markout
Electric power line			
Natural gas line			
Telephone line			
Water line			
Product line			
Steam line			
Sewer line			
Drain line			
Underground tank			
Overhead power line			
Overhead product line			
Septic tank/drain			

Client Representative (if applicable) _____ (signature) _____ (date)

IT Project Manager _____ (signature) _____ (date)

IT Site Superintendent _____ (signature) _____ (date)

Table 4.2

Chemical Compounds Technical Assessment
School of Music Plating Shop
Installation Restoration Site 11
Naval Amphibious Base
Little Creek, Virginia

Compound (Synonyms) (Abbreviation)	PEL (OSHA)/ TLV (ACGIH)	IDLH	Physical/Chemical Characteristics	Routes of Exposure	First Aid	Exposure Symptoms
Acetone 67-64-1	750 ppm 750 ppm	20,000 ppm	Colorless liquid with a fragrant mint-like odor. Fl. pt.: 0°F IP: 9.69 eV LEL: 2.5% UEL: 13% VP: 180 mm Hg	Inhalation Ingestion Contact	Irrigate and wash affected area immediately; artificial respiration; seek medical attention.	Eye, nose and throat irritation; headache; dizziness; dermatitis.
Chloroform (Trichloromethane) 67-66-3	50 ppm (C) 10 ppm	Carcinogen 1000 ppm	Colorless liquid with a pleasant odor IP: 11.42 eV VP: 160 mm Hg	Inhalation Ingestion Contact	Irrigate and wash affected area immediately; artificial respiration; seek medical attention.	Dizziness, mental dullness, nausea; disorientation, headache, fatigue; anesthesia, eye and skin irritation.
Chromium (Chrome) 7440-47-3	1.0 mg/m^3 0.5 mg/m^3		Metal: blue-white to steel gray, lustrous, brittle, hard solid.	Inhalation Ingestion	Irrigate and wash affected area immediately; artificial respiration; seek medical attention.	Fibrosis of lungs
Cyanides (as CN) 151-50-8 (KCN) 143-33-9 (NaCN)	5.0 mg/m^3 5.0 mg/m^3	50 mg/m^3	White granular or crystalline solids with a faint almond odor. VP: 0 mm Hg	Inhalation Absorption Ingestion Contact	Irrigate and wash affected area immediately; artificial respiration; seek medical attention.	Asphyxia and death can occur; weak; headache; confusion; nausea; vomiting; eye and skin irritation.
1,1-Dichloroethane (1,1 Ethylidene dichloride) 75-34-3	100 ppm 100 ppm	4,000 ppm	Colorless liquid; chloroform-like odor. Fl. pt.: 22°F (open cup) IP: 11.06 eV LEL: 5.6% VP: 230 mm Hg (77°F)	Inhalation Ingestion Contact	Irrigate and wash affected area immediately; artificial respiration; seek medical attention.	Central nervous system depression; skin irritation; liver and kidney damage.

Table 4.2

Chemical Compounds Technical Assessment
School of Music Plating Shop
Installation Restoration Site 11
Naval Amphibious Base
Little Creek, Virginia

Compound (Synonyms) (Abbreviation)	PEL (OSHA)/ TLV (ACGIH)	IDLH	Physical/Chemical Characteristics	Routes of Exposure	First Aid	Exposure Symptoms
1,2-Dichloroethane (Ethylene dichloride) 107-06-2	50 ppm 10 ppm	Carcinogen 1000 ppm	Clear liquid; sweet odor. Fl. pt.: 56°F IP: 11.05 eV LEL: 6.2% UEL: 16% VP: 64 mm Hg	Inhalation Absorption Ingestion Contact	Irrigate and wash affected area immediately; artificial respiration; seek medical attention.	Central nervous system depression; nausea and vomiting; dermatitis; eyes irritated and fogged.
trans-1,2-Dichloroethene (Trans acetylene dichloride) 156-60-5			Colorless liquid, pleasant odor. Fl. pt.: 36°F LEL: 9.7% UEL: 12.8%	Inhalation Contact	Irrigate and wash affected area immediately; artificial respiration; seek medical attention.	Drowsiness, hallucinations, distorted perception. Nausea, vomiting, weakness; dermatitis.
1,2-Dichloropropane (Propylene dichloride)	75 ppm 75 ppm	2,000 ppm Carcinogen	Colorless liquid with a chloroform like odor. IP: 10.87 eV UEL: 14.5% LEL: 3.4% Fl. pt.: 60°F	Inhalation Contact Ingestion	Irrigate and wash affected area immediately; artificial respiration; seek medical attention.	Eye, skin irritation; drowsiness; light-headedness
Methylene chloride (Dichloromethane) 75-09-02	500 ppm 50 ppm	Carcinogen 5000 ppm	Colorless liquid, pleasant, sweet odor. IP: 11.32 eV LEL: 14% UEL: 22% VP: 350 mm Hg	Inhalation Ingestion Contact	Irrigate and wash affected area immediately; artificial respiration; seek medical attention.	Fatigue; weak; sleepy and light-headed; limbs numb or tingle; nausea; eye and skin irritation.

Table 4.2

Chemical Compounds Technical Assessment
School of Music Plating Shop
Installation Restoration Site 11
Naval Amphibious Base
Little Creek, Virginia

Compound (Synonyms) (Abbreviation)	PEL (OSHA)/ TLV (ACGIH)	IDLH	Physical/Chemical Characteristics	Routes of Exposure	First Aid	Exposure Symptoms
Toluene (Methyl benzene) (Toluol) 108-88-3	200 ppm 50 ppm	2000 ppm	Colorless liquid, aromatic odor. Fl. pt.: 40°F IP: 8.82 eV LEL: 1.2% UEL: 7.1% VP: 20 mm Hg (65°F)	Inhalation Absorption Ingestion Contact	Irrigate and wash affected area immediately; artificial respiration; seek medical attention.	Fatigue and weakness; confusion; euphoria and dizziness; headache; dilated pupils; lacrimination; nervousness; muscle fatigue; insomnia; dermatitis.
1,1,1-Trichloroethane (Methyl chloroform) (1,1,1-TCE) 71-55-6	350 ppm 350 ppm	1000 ppm	Colorless liquid, mild sweet odor. LEL: 7.5% UEL: 12.5% VP: 100 mm Hg	Inhalation Ingestion Contact	Irrigate and wash affected area immediately; artificial respiration; seek medical attention.	Eye irritation; dermatitis; headache.
Trichloroethylene (Ethylene trichloride) 79-01-6	100 ppm 50 ppm	Carcinogen 1000 ppm	Colorless liquid, sweet odor. Fl.pt.: 90°F IP: 9.45 eV LEL: 8% (77°F) UEL: 10.5% (77°F) VP: 58 mm Hg	Inhalation Ingestion Contact	Irrigate and wash affected area immediately; artificial respiration; seek medical attention.	Headache; vertigo; visual disturbance; nausea; eye and skin irritation.

Table 4.2

Chemical Compounds Technical Assessment
School of Music Plating Shop
Installation Restoration Site 11
Naval Amphibious Base
Little Creek, Virginia

KEY:

ACGIH	- American Conference of Governmental Industrial Hygienists
atm	- atmosphere
C	- Ceiling: Concentration shall not be exceeded at any time.
CAS No.	- Chemical Abstract Service Registry Number
Fl. pt.	- Flash point - closed cup, unless otherwise noted.
IDLH	- immediately dangerous to life and health: Maximum concentration from which one could escape within 30 minutes without experiencing any irreversible health effects.
IP	- Ionization potential (eV)
LEL	- lower explosive limit
mm Hg	- millimeters of mercury
mg/m^3	- milligrams per cubic meter
MPC	- Maximum Permissible Concentration
OSHA	- Occupational Safety and Health Administration
pg/m^3	- picograms per cubic meter
PEL	- permissible exposure limit: Concentrations that nearly all workers may be repeatedly exposed to, day after day, without adverse effect. (Based on an 8-hour workday and 40-hour workweek).
ppm	- parts per million
REM	- Roentgen equivalent man
STEL	- short-term exposure limit: A 15 minute TWA exposure that should not be exceeded at any time during a workday.
TLV	- threshold limit value: Concentrations that nearly all workers may be repeatedly exposed to, day after day, without adverse effect. (Based on an 8-hour workday and 40-hour workweek).
uCi/ml	- microcurie per milliliter
UEL	- Upper Explosive Limit
VP	- Vapor Pressure at 68°F, in millimeters (mm) mercury (Hg) unless otherwise noted.
†	- No regulatory agency has established an exposure limit. IT has established an exposure limit after review of available data.
?	- Information not available.
*	- Proposed Final Rule Limit, not yet adopted.
ALARA	- As low as reasonably achievable.
	- Blanks indicate information not available.

Table 4.2

Chemical Compounds Technical Assessment
School of Music Plating Shop
Installation Restoration Site 11
Naval Amphibious Base
Little Creek, Virginia

REFERENCES:

American Conference of Governmental Industrial Hygienists, Threshold Limit Values and Biological Exposure Indices for 1992-1993.

Documentation of the Threshold Limit Values, 4th Edition, American Conference of Governmental Industrial Hygienists, Inc., Cincinnati, Ohio, 1980.

ERM-Southwest, Inc., Remedial Investigation Report Management of Migration; Second Operable Unit 2, prepared for the Hardage Steering Committee, 1989.

IT Corporation Procedure 9551.9C, Handling of Dioxin and Furan Contaminated Materials, July 1989.

National Institute of Occupational Safety and Health, Pocket Guide to Chemical Hazards, June 1990.

Sax, N. Irving, and Richard J. Lewis, Sr., Rapid Guide to Hazardous Chemicals in the Workplace. Von Nostrand Reinhold Company, New York, 1986.

29 Code of Federal Regulations, Part 1910, July 1992.

Sax, N. Irving, and Richard J. Lewis, Sr., Dangerous Properties of Industrial Materials, 7th Edition, Van Nostrand Reinhold Company, New York, 1989.

Table 4.3
Chemical Compounds Field Assessment
School of Music Plating Shop
Installation Restoration Site 11
Naval Amphibious Base
Little Creek, Virginia

Compound	Concentration	Media
Acetone	0.31 ppm	Soil
Chloroform	3.2 ppb	Groundwater
Chromium, Total	4,200 ppm	Soil
Cyanide	19 ppm	Soil
1,1-Dichloroethane	17 ppb	Groundwater
1,2-Dichloroethane	37 ppb	Groundwater
1,2-Dichloropropane	6.5 ppb	Groundwater
Trans-1,2-Dichloroethene	1.9 ppb	Groundwater
Methylene Chloride	0.73 ppm	Soil
Toluene	0.0012 ppm	Soil
1,1,1-Trichloroethane	340 ppb and 0.0010 ppb	Groundwater and Soil
Trichloroethylene	490 ppb	Groundwater

ppb = parts per billion

ppm = parts per million

5.0 Hazard Control Program

The following procedures are mandatory for IT personnel and IT subcontractor personnel entering the EZ. All site visitors entering EZs must follow these procedures. Personnel not following procedures will be warned and, if they refuse to follow these procedures, they will be escorted from the site.

5.1 General Practices

All information regarding work to be performed, emergency procedures, and health and safety hazards will be reviewed before the work begins during a daily Tailgate Safety meeting. No work will be performed before this meeting has taken place. At least one copy of this HASP will be available at the job work site for reference and review by site personnel.

Only authorized personnel will be permitted in the work area. These authorized individuals must have successfully completed a medical exam and have been properly trained in the use of respiratory protective equipment and specific health and safety hazards. All visitors will check in with the IT or client representative. All personnel entering the site will be thoroughly briefed on the hazards, equipment requirements, safety practices, emergency procedures and communication methods.

Protective clothing and respiratory protective equipment will be used for various stages of the operation as needed. The levels of protection are specified in Chapter 6.0 of this HASP, and will depend upon the degree of hazard.

At least two persons trained in a minimum of both American Red Cross first-aid and CPR will be on site whenever activities are ongoing. As an alternative, this requirement is satisfied when a 911 emergency responder can respond within five minutes to the site.

No food, beverages or tobacco products will be present, consumed or used in contaminated areas or potentially contaminated areas. Taking medication, smoking or applying cosmetics are also prohibited. These activities are allowed only in the established clean room and clean areas.

At the end of each work shift, before leaving the site, personnel worked in contaminated zones will thoroughly shower or wash themselves to remove any contamination.

Before eating, drinking, or smoking employees will wash their hands and remove outer protective garments.

Containers will be moved only with the proper equipment and will be secured to prevent dropping or loss of control during transport.

Emergency equipment will be located in readily accessible uncontaminated locations. A complete first-aid kit and a fire extinguisher will be readily available on site for the team's use in the event of an emergency. The fire extinguisher will be located not more than 25 feet from the work activity. In addition, an eyewash will be readily available and must be capable of washing both eyes at once and delivering at least 0.4 gallons per minute for at least 15 minutes. At least one eyewash will be maintained in the CRZ.

Employee entrance and exit routes will be planned and emergency escape routes designated.

All operators of equipment used on site will be familiar with the requirements for inspection and operation of such equipment. Unfamiliar operations will be discussed with affected employees before beginning work. The Site Superintendent will be responsible for checking the proficiency of the operator. Audio and/or visual backup alarms will be utilized on all heavy equipment on site.

Personnel will be prohibited from being transported by any means other than those prescribed for movement of personnel. When trucks or other heavy equipment enter or leave the site, an individual will direct the driver.

Only intrinsically safe electrical equipment will be permitted in areas where a flammable atmosphere may exist. All static ignition sources will be identified and eliminated by the use of bonding and grounding techniques.

MSDSs will be obtained for every chemical product used on site. This information will be made readily available to all employees upon request and stored in a central location. All containers of any chemical products will be properly labeled to comply with OSHA Hazard Communication Standard [29 Code of Federal Regulations (CFR) 1910.1200].

Work areas will be illuminated to a minimum of 20-foot candles. Supplementary lighting may be necessary inside buildings, tanks, at night, or in other poorly lit areas.

When working around heavy equipment or materials, employees and visitors will adhere to the following precautions:

- Hard hats must be worn at all times on the site.
- Pay attention at all times.
- Maintain visual contact at all times.
- Establish hand signal communication when verbal communication is difficult. Determine one person per work group to give hand signals to equipment operators.
- Be aware of footing at all times.
- All heavy equipment will have backup alarms of some type.
- Use chain hoists, straps and any other equipment to safely aid in moving heavy materials.
- Use proper personal lifting techniques. Use your legs, not your back.
- Get help whenever you are in doubt about a material's weight.
- Never walk directly in back or to the side of heavy equipment without the operator's knowledge.
- Never walk underneath any suspended load and always look overhead when a crane is in use.
- Only qualified people are to operate heavy equipment.

5.1.1 Buddy System

All on-site personnel will use the buddy system. Buddies will maintain visual contact with each other. Personnel must observe each other for signs of heat stress or toxic exposure, such as:

1. Changes in complexion and skin discoloration
2. Changes in coordination or demeanor
3. Excessive salivation and pupillary response
4. Changes in speech pattern

Personnel will inform their supervisor of nonvisual effects of toxic exposure such as:

1. Headaches, dizziness, blurred vision
2. Nausea
3. Cramps
4. Irritation of eyes, skin or respiratory tract

5.1.2 Fall Protection

The walking and working surfaces may become wet and slippery during these tasks. Use extra caution when working on these surfaces. In addition, visible barriers will be erected around any open excavations to prevent personnel from falling into these areas.

5.2 Project-Specific Practices

To prevent personnel exposure to heat or cold stress during all tasks, the practices outlined in Sections 5.2.1 and 5.2.2 will be followed.

The work area must be marked in such a way as to prevent traffic from passing within 10 feet of the work area. Cones, caution tape, barricades or other means must be used to define the work area.

All on-site personnel must wear steel toed safety shoes, hard hats and safety glasses. Long pants or trousers and shirts covering the upper body and upper arms must also be worn.

5.2.1 Working in Hot Environments

Heat Stress. Heat stress due to protective clothing decreasing body ventilation, is an important factor. Heat stress of employees on site will be monitored by the American Red Cross method of monitoring heart rates as personnel come out for rest and cooling off.

One or more of the following control measures can be used to help control heat stress and are mandatory if heat stress is detected by elevated heart rate above 110 beats per minute:

1. Employees should drink plenty of water throughout the day and should increase their salt intake slightly by salting their food a little heavier.

2. On site drinking water will be kept cool (50-60°F) to encourage personnel to drink often.

3. A work regimen that will provide adequate rest periods for cooling down will be established as required.

4. All personnel will be advised of the dangers and symptoms of heat stroke and exhaustion

5. Cooling devices such as vortex tubes or cooling vests can be worn beneath protective garments.

6. Employees will be cautioned to monitor themselves and their co-workers for the effects of heat disorders and to take additional breaks as needed.

7. All breaks are to be taken in a shaded rest area.

8. Employees will not do other tasks during rest periods.

9. Employees will remove impermeable garments during rest periods.

10. All employees will be informed of the importance of adequate rest, acclimatization and proper diet in the prevention of heat stress.

5.2.2 Working in Cold Environments

Cold Stress. One or more of the following control measures may be used to help control cold stress:

- Workers will be provided with warm clothing, such as mittens and heavy socks, when the air temperature is below 4 to 7°C (equivalent to 40 to 45°F)

- Protective clothing may be used to protect the employee when the air temperature is below 0 to 7°C (equivalent to 32 to 40°F). Depending on employee comfort, clothing for warmth in addition to protective clothing will be provided. This will include:

  - Insulated suits, such as whole-body thermal underwear

  - Wool or polypropylene socks to keep moisture off the feet if there is a potential of work activity which would cause sweating

  - Insulated gloves and boots

- At air temperatures below 2°C (equivalent to 35°F), the following work practices must be observed:

  - If the clothing of the employee might become wet on the job site, the outer layer of the clothing must be impermeable to water.

  - If an employee's underclothing (socks, mittens, etc.) becomes wet in any way, the employee must change into dry clothing immediately. If the clothing

becomes wet from sweating, the employee may finish the task which caused the sweating before changing into dry clothing.

- Employees must be provided with a warm area, 18°C (equivalent to 65°F) or above in which to change from work clothing into street clothing.

5.3 Hearing Conservation

All on site personnel will wear hearing protection (E.A.R. foam inserts or equivalent) when operating heavy equipment or whenever noise levels exceed 85 dB, according to IT Procedure HS402. All personnel required to wear hearing protection will receive baseline and annual audiograms and training on the causes and prevention of hearing loss.

5.4 Excavation Safety

All excavating and soil removal conducted by IT and IT subcontractors will comply with IT Procedure HS307 as listed in Appendix B and OSHA regulations governing excavation and trenching.

All excavation will be performed from a stable ground position, and daily inspections of the excavation will be made by a competent person who has received training in excavation safety. The inspector will determine the likelihood of a cave in, and remedial action such as sloping or shoring will be taken if the walls appear to be unstable.

All spoil will be located at least 2 feet from the edge of the excavation to prevent it from falling back into the excavation. The excavation will be guarded on all sides by barricades or caution tape at least 2 feet from the edge.

All project personnel will participate in the daily Tailgate Safety Meetings and be instructed on the following requirements:

1. Before excavating, the existence and location of underground pipe, electrical equipment and gas lines will be determined. This will be done, if possible, by contacting the appropriate utility company and/or client representative to mark the location of the lines. If the client's knowledge of the area is incomplete, an appropriate device, such as a cable avoiding tool, will be used to locate the service line.

2. No ignition sources are permitted if the ambient airborne concentration of flammable vapors exceeds 10 percent of the lower explosive limit (LEL) during the excavation. A combustible gas indicator will be used to make this determination.

3. Operations must be suspended and the area vented if the airborne flammable concentration reaches 10 percent of the LEL in the area of an ignition source (i.e., internal combustion engine, exhaust pipe).

4. A combustible gas reading of the general work area will be made regularly.

5. If excavating is located in the vicinity of overhead power lines, a distance of 15 feet will be maintained between the lines and any point on the equipment. If the lines have appreciable sag, or if windy conditions exist, this distance will be 20 feet.

5.5 Confined Space Entry

The removal of liquids and sludges from the acid neutralization tank will be conducted from outside the tank. Worker entry into the tank is not authorized by this HASP.

The removal of contaminated soil may require personnel to enter the excavation. IT's procedure for confined entry will be followed for each such activity. A confined space is defined by IT as having limited means of egress due to location, size, or number of openings with unfavorable natural ventilation. Contaminated soil excavations may pose additional hazards such as air contamination, flammable or explosive atmosphere and oxygen deficiency. IT has detailed training for confined-space entry, and only personnel properly trained will supervise and participate in confined-space entry procedures.

All personnel entering a confined space (excavation) will be trained in proper procedures and the use of PPE. Only properly trained persons will initiate confined-space entry procedures, perform tests on confined space and authorize entry.

The procedures for such entry are identified in IT Procedure HS300 and are highlighted as follows:

- The confined space must be isolated to prevent the introduction of contaminations during entry.

- Mechanical ventilation may be necessary to purge the space of vapors and verify sufficient oxygen supply.

- The confined space will be tested prior to entry. Tests will be performed to determine the level of oxygen, flammable vapors and toxic contaminants. Tests will be repeated as often as necessary to verify the safety of personnel entering the confined space.

- No entry will occur in a space where conditions are immediately dangerous to life and health (IDLH). (Examples are oxygen less than 20 percent, greater than 10 percent LEL.)

- Proper protective clothing and respiratory protective equipment will be used for confined-space entry

- Personnel entry into any excavation 4 feet deep or greater is only permitted if the walls are properly shored or sloped. A ladder will be provided and placed at an angle not more than 30 degrees from vertical, and secured as necessary. Ladder side rails will extend at least 3 feet above the ground surface.

A copy of IT Procedure HS300 is listed in Appendix C.

5.6 Sanitation

Sanitation facilities will be provided for the use of all personnel at the project site. IT employees will keep the work and support areas neat and orderly and free of trash and debris.

Shower and/or wash facilities will be in close proximity to the field operations for access by all employees exposed to potentially hazardous substances at the site. The showers and change rooms will be located in the CRZ. Personnel working in Level B PPE in the CRZ or EZ are required, at a minimum, to wash their hands and face each time they exit the work areas for breaks, lunch or shift end.

5.6.1 Break Area

An area will be established that is upwind from the work area and outside the contamination zone where personnel can take a break. The area must be clearly marked and no contaminated personnel or equipment is permitted there.

5.6.2 Potable Water

Potable water will be provided in the break trailer and other areas of the SZ. Water containers will be clearly marked and will have a tap to dispense individual servings. Single serving cups will be stored in a clean, sanitary dispenser. Eating will be permitted in designated areas of the SZ only.

5.6.3 Non-Potable Water

Outlets for non-potable shall be posted with signs that warn site personnel to refrain from consumption of this water. The signs shall read: "CAUTION WATER UNFIT FOR

DRINKING, WASHING, OR COOKING." There shall be no cross connections between potable and non-potable water supplies.

5.6.4 Food Handling

A lunch room shall be provided for employees in the SZ. The lunch room shall be kept clean and free of debris. Smoking will not be permitted in the lunch room.

5.6.5 Toilet Facilities

Portable chemical toilets shall be provided in the SZ at a ratio of one to every twenty employees. The entrance to the facility will have a door and a lock controlled form inside. The toilet facilities shall be serviced regularly by the facility supplier or vendor.

6.0 Personal Protective Equipment (PPE)

The PPE outlined below has been selected according to the site characterization and analysis, job tasks, site hazards, intended use and duration of potential employee exposures. Maintenance and storage of PPE, decontamination, donning and doffing procedures, inspection and monitoring of effectiveness, and limitation are outlined in this section.

6.1 Respiratory Program

A comprehensive respiratory protection program has been established by IT and is required in all locations where use of such equipment is intended to lessen the potential for adverse health affects to any employee.

As part of the respiratory training program, each employee is instructed in the following elements:

- Nature of the respiratory hazard on the work site and the appraisal of potential consequences if the respiratory protection is not utilized
- Use and proper fitting of the respirator
- Cleaning, disinfecting, inspection, maintenance and storage of the respirator
- Proper selection, capabilities and their limitations.

Routinely used respiratory equipment will be inspected, cleaned and disinfected daily to help assure proper hygienic practices. An inspection of these breathing devices will include the following:

- Examination of the head straps for breaks, loss of elasticity, broken or malfunctioning buckles and other attachments
- Examination of the face-piece for excessive dirt, cracks, tears, distortion, holes or inflexibility
- Examination of the exhalation and inhalation valves for any foreign material, cracks, tears or distortion in the valve. Additional checks will be made to inspect for proper insertion, defective valve covers or improper installation
- Examination of air purifying elements for incorrect cartridge, expired shelf-life of the cartridge, cracks or dents in the cartridge or cartridge-holder

- Examination for proper insertion of the cartridges into the face-piece and a check of the gaskets inside the cartridge-holder

- Examination of air cylinders for adequate air volume. Only Grade D air will be utilized for breathing air.

When Level C protection is required, respiratory cartridges will be changed daily or when breakthrough occurs. All respirators will be inspected prior to each day's use. If broken or malfunctioning parts are found during the cleaning process, these parts will be replaced or new respiratory equipment will be issued to the user.

The respiratory protective equipment will be stored in an area protected from any mechanical damage. These devices will also be stored in a location that provides protection against dust, heat, excessive moisture, or damage by chemical contact. The storage area for the respirators should be in a readily accessible location.

- Only employees who have been trained to wear and maintain respirators properly will be allowed to use respiratory protection.

- Selection of respirators, as well as any decisions regarding upgrading or downgrading of respiratory protection, will be made by the HS Manager or his designee.

- Positive and negative pressure tests will be performed by the user each time the respirator is donned.

- Only employees who have been fit tested within the last 12 months will be allowed to work in atmospheres where respirators are required. IT subcontractors will provide to the SSHO certificates of respirator fit test completed within the last 12 months for each of their worker(s) on site.

- Respirator users will be instructed in the proper use and limitations of respirators.

- If a worker has difficulty in breathing during the fit test or during use, he will be evaluated medically to determine if he can wear a respirator safely while performing assigned tasks.

- No worker will be assigned to tasks requiring the use of respirators if, based upon the most recent examination, a physician determines that the health or safety of the worker will be impaired by respirator use.

- Contact lenses will not be worn while using any type of respiratory protection.

- Air-supplied respirators will be assembled according to manufacturer's specifications. Hose length, couplings, valves, regulators, manifolds and all accessories will meet ANSI and the manufacturer's requirements.
- Respirators will be cleaned and sanitized daily after use.
- Respirators will be stored in a convenient, clean and sanitary location on site.
- Respirators will be inspected during cleaning. Worn or deteriorated parts will be replaced.
- Facial hair that might interfere with a good face-piece seal or proper operation of the respirator is prohibited.
- The IT Site Superintendent will review the respiratory protection program daily to ensure employees are properly wearing and maintaining their respirators and that the respiratory protection is adequately protecting the employees.
- The HS Manager will evaluate the respiratory protection program monthly to ensure the continuing effectiveness.
- Respirators used for emergency response will be inspected weekly by the SSHO.

6.2 Levels of Protection

The level of protection used in the EZ is based on site specific information. Specific levels of protection will be changed whenever site conditions change. They can either be increased to the next higher level or decreased to the next lower level. If the Site Superintendent requests a change in levels of protection, he must contact the IT HS Manager and PM. If the need arises to protect safety and health, the Site Superintendent can upgrade protection levels without input from the HS Manager or PM. He will then discuss the decision with the HS Manager, SSHO, and the PM when they are available. Levels of protection will not be downgraded without prior approval from the HS Manager.

6.2.1 Level A Protection

Level A Protection is not anticipated to conduct these project activities.

6.2.2 Level B Protection

Level B Protection will be required if airborne concentrations of toxic contaminants exceed twice the ACGIH TLV or the OSHA permissible exposure limit (PEL) as determined by air monitoring.

The following equipment will be used for Level B protection:

- SCBA or pressure demand supplied airline with 5-minute egress bottle
- Chemical-resistant coveralls with hood (Saranex, Chemrels, or equivalent)
- Chemical-resistant steel-toe boots (neoprene or PVC)
- Hard hat
- Disposable inner gloves (latex or nitrile)
- Disposable outer gloves (neoprene, butyl, or other adequate material)
- Ankles, wrists, and hood taped
- Cooling device (as required)
- Hearing protection (as required)

6.2.3 Level C Protection

Level C protection will be required when the airborne concentration of suspected contaminants are known to be one half the ACGIH TLV or the OSHA PEL. Level C may occur during the decontamination of personnel and equipment that have entered the EZ.

The following equipment will be used for Level C protection:

- Full-face, air purifying respirators with organic vapor cartridges in combination with high-efficiency particulate air (HEPA) filter which are National Institute of Occupational Safety and Health/Mine Safety and Health Agency (NIOSH/MSHA) approved
- Chemical-resistant coveralls with hood (polyethylene-coated Tyvek or equivalent)
- Disposable inner gloves (latex or nitrile)
- Disposable outer gloves (neoprene, butyl, or other adequate material)
- Chemical-resistant steel-toe boots (neoprene or PVC)
- Ankles and wrists taped
- Hard hat
- Hearing protection (as required).

6.2.4 Modified Level D Protection

Modified Level D protection will be required when a moderate level of skin protection is required (i.e., particulates, soils, dusts) and no respiratory hazards are present. The following equipment will be used for Modified Level D protection:

- Outer coveralls (uncoated Tyvek)
- Disposable inner gloves (latex, or nitrile)
- Disposable outer gloves (neoprene)
- Chemical-resistant steel-toe/shank boots (neoprene)
- Hard hat
- Safety glasses or goggles
- Hearing protection (if necessary).

6.2.5 Level D Protection

The minimal level of protection that will be required of IT personnel and IT subcontractors at the site will be Level D. The following equipment will be used for Level D protection:

- Coveralls or work clothing
- Boots/shoes with steel toes, latex overboots if area is heavily contaminated
- Safety glasses or goggles
- Hard hat
- Disposable gloves as necessary
- Hearing protection (if necessary).

6.2.6 Selection of PPE

The selection of the PPE will be done after a thorough evaluation of the hazards involved at the site during each phase of the operation. Table 6.1 describes the PPE required for each planned work activity.

6.3 Using PPE

All persons entering the EZ will don the required PPE according to established procedures in this plan to minimize exposure potential. When leaving the EZ, PPE will be removed according to these established procedures to minimize the spread of contamination.

6.3.1 Donning Procedures

- Remove street clothes and store in a clean location
- Put on disposable underwear and coveralls
- Put on boots and boot covers and tape the coveralls
- Put on gloves
- Tape the coveralls over the gloves at the wrist
- Don respirator and check for secure fit
- Put hood or head covering over the respirator
- Put on remaining PPE, i.e., hard hat, safety glasses, etc.

One person will remain outside the work area to check that each person entering has the proper PPE. No persons will be allowed to enter an EZ improperly attired.

6.3.2 Doffing Procedures

Whenever a person leaves the work site, the following proper decontamination sequence will be followed:

- Upon entering the CRZ, rinse contaminated mud and debris from boots or remove boot covers.
- Clean reusable PPE.
- Remove protective garments and equipment. All disposable clothing should placed in plastic bags and labeled as contaminated waste.
- Remove respirator.
- Proceed to the clean area and dress.
- Clean respirator and prepare for next use.
- Proceed to the sign out point.

All disposable equipment, garments, and PPE will be bagged in two 6 mil plastic bags and properly labeled for disposal.

6.4 Reassessment of Protection Program

PPE selection and the level of protection provided may be upgraded or downgraded based upon a change in site conditions or air monitoring results.

Hazards must be reassessed when a significant change in site conditions is evident. Circumstances that may require a reassessment of hazards and levels of protection include:

- Commencement of a new work activity
- Change in tasks during a work activity
- Change of season/weather
- Introduction or detection of chemicals different than those previously identified
- Change in concentrations of chemicals
- Change in work activity which affects the degree of contact with chemicals
- Worker safety and health concerns.

Air monitoring results and actual site conditions are the primary determining factors for upgrading or downgrading levels of protection.

Table 6.1
PPE Selection Matrix for Planned Work Activities

Work Activity	Level of Protection
Site Preparation and Mobilization	Level D
Removal of Acid Neutralization Tank and Associated Tasks (i.e., soils excavation, liquids and sludge removal, piping removal, drain, and plug)	Level B
Personnel and Equipment Decontamination	Level C
Site Restoration	Level D
Demobilization	Level D

7.0 Site Control

Site control requires establishing specific measures to prevent unauthorized entry onto the site and to protect all personnel entering the site from recognized safety and health hazards. The following items will be presented to site workers:

- Authorization to Enter
- Hazard Briefing
- Documentation of Certificates
- Entry Log
- Entry Requirements
- Emergency Entry and Exit.

7.1 Authorization to Enter

No IT employee or IT subcontractor will be admitted onto the site without satisfactory proof of U.S. citizenship or without specific authorization from the IT PM and the Site Superintendent or the client representative.

Access to contaminated work areas is regulated and limited to authorized personnel. Only those who have completed the required training and medical requirements will be allowed to enter. Representatives from regulatory agencies will be permitted to enter the site at any time during business hours or at other reasonable times, by appointment, to conduct official business, provided they have completed the required training and medical requirements. Representatives of the news media and other visitors must receive authorization from the client and the IT PM, before entry.

7.2 Hazard Briefing

The Site Superintendent will brief site workers entering the site of the contents of this HASP to inform them of potential site hazards and procedures specific to this site. All personnel will acknowledge this briefing by signing the HASP. This briefing will be further documented in the field activity daily log.

7.3 Documentation of Certificates

Personnel entering the site to work will have satisfied the medical and training requirements of 29 CFR §1910.120. The project file will contain copies of certificates documenting status for all on-site personnel. Personnel not entering the EZs need not meet the above requirements. The Site Superintendent will accommodate requests from representatives of

regulatory agencies to review documentation. All visitors must present documentation of current training and medical status before being granted authorization to enter the EZ.

7.4 Entry Log

The Site Superintendent keeps a daily roster of all on-site personnel and records the time of entry into and exit from the EZ for each person. The Entry Log is shown in Appendix D.

7.5 Entry Requirements

All personnel entering work or EZs will use the proper PPE. All personnel entering EZs will enter and exit through the decontamination units and observe the mandatory decontamination procedures.

7.6 Emergency Entry and Exit

During emergencies, decontamination will be conducted to the extent that is possible without endangering personnel. All persons responding, both on site and off site, will be informed of site safety and health hazards and health hazards associated with contaminated personnel.

8.0 Decontamination

8.1 Contamination Control Zones

The PM will establish contamination control zones for the project based on the location of contamination, excavation activities, accessibility, and site control. These zones must be clearly marked and defended against unauthorized entry.

8.1.1 Exclusion Zone (EZ)

An EZ is the area where contamination does or could occur during site activities. This zone has the highest potential for exposure to the contaminants by contact or inhalation. All employees will use proper PPE when working in these areas. The EZ will be a defined area where there is a possible respiratory and/or contact health hazard. In most instances this area will be a 20-foot radius around the excavation or other site activity. The location of the EZ will be identified by cones or other appropriate means.

8.1.2 Contamination Reduction Zone (CRZ)

A CRZ will be established and decontamination will be performed in the CRZ. All personnel entering or leaving the EZ will pass through this area in order to prevent any cross-contamination and for the purpose of accountability. Tools and any equipment or machinery will be decontaminated in a specific location. The decontamination of all personnel will be performed on site adjacent to the EZ. Personal protective outer garments and respiratory protection will be removed in the CRZ and properly labeled.

8.1.3 Support Zone (SZ)

SZs are established in uncontaminated areas and are used for the storage of supplies and general administrative functions. The SZ will be located to prevent employees from being exposed to any organic vapors or dust levels above regulatory limits. Eating, drinking, or smoking will be permitted in the SZ only after washing face and hands.

Warnings signs or barrier tape will be affixed in readily visible locations to delineate the EZ, CRZ and SZ.

8.2 Decontamination General Rules

- An area outside of the EZ will be designated as the break area. Employees will proceed through personal decontamination before eating, drinking or smoking. No eating, drinking or smoking will take place in the EZ.

- The SSHO will monitor the effectiveness of the decontamination procedures and if ineffective will take appropriate steps to correct any deficiencies or modify the plan as needed.

- Used coveralls, gloves and overboots will be dropped into a bag-lined garbage can for disposal at an approved facility.

- Spent disposable respirator cartridges will be dropped into a bag-lined garbage can.

- Clean respirators, hard hats, goggles and face shields will be placed on the work table at the clean end of the zone.

- Soiled boots, hard hats, respirators and other equipment will be inspected daily, washed and scrubbed in a detergent/water solution. After cleaning, equipment will be rinsed thoroughly in water and allowed to dry on a clean surface.

- If there is a rip or tear in the employee's protective clothing, that individual will remove the torn garment in the decontamination area and new protective clothing will be issued in order for the employee to return back to work. The same procedure will apply to defective respiratory equipment.

8.3 Equipment Decontamination

The purpose of the CRZ is to limit the spread of contamination by contaminated personnel, tools, equipment and materials from the EZ. Any person, tool, equipment or material from inside the EZ will be considered contaminated and must be cleaned before leaving the work site. Decontamination of all large equipment will be performed on site (prior to personnel decontamination). Verification that all equipment has been properly decontaminated will be the responsibility of the Site Superintendent and the SSHO. All contaminated washwaters generated from the cleaning operation will be collected and containerized for disposal.

Decontamination will be accomplished by water rinse, steam jet, leaching, and or scrubbing.

8.4 Personnel Decontamination

At least one person will remain outside the work area to assist decontaminating personnel in the CRZ.

Whenever a person leaves the work site, the following proper decontamination sequence will be followed:

- Upon entering the CRZ, rinse contaminated mud, etc. from boots or remove boot covers.
- Remove protective garments and equipment. All disposable clothing should placed in plastic bags and labeled as contaminated waste.
- Reusable PPE must be cleaned at the job site.
- Remove respirator after contaminated outer wear has been removed and after showering.
- Proceed to the clean area and dress.
- Clean respirator and prepare for next use.
- Proceed to the sign out point.

All disposable equipment, garments and PPE will be bagged in two 6 mil plastic bags and properly labeled for disposal at the job site.

8.5 Decontamination During Medical Emergencies

The IT SSHO or emergency-care provider will quickly assess the extent of the injury or illnesses to determine if life-saving medical treatment is crucial or if the decontamination procedures will create additional injuries and aggravate the existing condition. Under such circumstances, decontamination procedures will be greatly modified, simplified, or eliminated completely.

Life threatening injuries will be attended to immediately. Respiratory equipment must be removed and outside garments can be removed or cut away if it does not cause delays in treatment or cause further injury to the individual. Care will be taken to minimize the spread of contamination to emergency response personnel and transport vehicle by placing towels, blankets or plastic beneath the victim.

9.0 Site Monitoring

9.1 Air Monitoring

Measurements of airborne volatile organic compounds (VOCs) will be conducted in the work site by using a photoionization detector (PID) (HNu or equivalent) to indicate exposure levels. Airborne concentrations exceeding one half the ACGIH TLV or OSHA PEL will require the use of air purifying respirators.

Measurements of cyanide will be conducted in the work site by using a real-time cyanide monitoring instrument (i.e., GasTech Model 4700 or equivalent) to indicate exposure levels.

Real-time air monitoring will be performed for fugitive dust emissions using a Miniram aerosol monitor. Results will be used to determine the effectiveness of dust control methods. It is unlikely that these airborne dust concentrations will be reached, however, a Miniram will be available to assess dust concentrations.

Measurements of oxygen and combustible gases will not be required for this project.

Air Monitoring Frequency

Work Activity	Instrument	Frequency
Site Preparation and Mobilization	PID	Periodically
Removal of Acid Neutralization Tank and Associated Tasks	PID	Continuously
	HCN	Continuously
	MINIRAM	Periodically
Site Restoration	PID	Periodically
Demobilization	None	N/A

Frequency may be adjusted upon review of air monitoring results.

9.2 Action Levels

All air monitoring equipment will be maintained and calibrated according to manufacturer's recommendations each day.

The action levels listed in Table 9.1 are based on available information and have been reviewed and approved by the HS Manager. Variables such as air-purifying cartridge limitations for specific compounds, real-time direct reading instrument limitations, IT health

and safety policy requirements, and the minimization of potential exposure were considered in determining the selection of the action levels.

9.3 Other Hazardous Conditions

The Site Superintendent will take affirmative action to limit exposures. If unknown chemicals or contamination are encountered, operations will cease until the situation is evaluated. The SSHO or Site Superintendent will contact the HS Manager to evaluate any potentially hazardous situations, or any situation with elevated contamination levels. Operations will only be resumed if they can be accomplished in a safe manner.

9.4 Noise Monitoring

Noise monitoring will be conducted as required using a Quest 2400 noise meter or equivalent. Hearing protection is mandatory for all employees in noise hazardous areas or when operating heavy equipment.

On-site personnel must wear monitoring equipment as instructed by the SSHO and refusal to wear monitoring equipment, or intentional tampering with sampling apparatus, will lead to immediate dismissal from the job site.

9.5 Record Keeping

The SSHO or his designee will be responsible for establishing and maintaining records of all required monitoring as described below:

- Date, time, pertinent task information, exposure information
- Description of the analytical methods, equipment used, calibration data
- Type of PPE worn
- Engineering controls used to reduce exposure.

9.6 Notification

Employees who are exposed to hazardous and toxic materials at job sites will be notified of the results of the industrial hygiene monitoring conducted at the site in accordance with IT procedure HS104.

Table 9.1
Real-Time Air Monitoring Action Levels

Instrument or Parameter	Units	Level D/ Modified Level D	Level C	Level B	Halt Activities
PID	ppm	≤5.0	5.0-25.0	25.0-100.0	>100.0
HCN	ppm	0.0	0.0	≤10.0	>10.0
MINIRAM	mg/m^3	≤2.5	2.5-5.0	2.5-5.0	>5.0

Note: These action levels refer to air monitoring results recorded in breathing zone of the site worker(s).

10.0 Training

IT trains all field personnel in accordance with 29 CFR §1910.120 prior to initial assignment. All field employees receive a minimum of 40 hours of training off site and a minimum of three days of actual field experience under the direct supervision of a trained, experienced supervisor. IT subcontractor personnel performing intrusive work within the EZ(s) must also meet these training requirements. Copies of training certificates are maintained on site in the project files and in the appropriate IT Regional Office. IT subcontractors must submit certificates of training for all employees assigned to the project prior to performing any work on site.

10.1 General Training

Various training requirements for project personnel, including subcontractors, performing field activities are divided into the following categories based upon the nature and type of work to be performed:

- Regular site workers with potential for exposure to hazardous substances
- Regular site workers with potential for exposure to hazardous substances below permissible limits
- Occasional site workers with potential for exposure to hazardous substances below permissible limits
- Annual refresher training for regular and occasional site workers
- Management and supervisory training for personnel engaged in hazardous waste operations
- Site-specific briefings
- Daily safety and health briefings
- Confined Space Training
- First Aid and CPR Training.

According to 29 CFR §1910.120(e), all employees working on site with potential for exposure to hazardous substances or health and safety hazards shall receive training prior to starting work on site.

10.1.1 40-Hour Training

All site workers whose job responsibilities expose or have the potential to expose them to hazardous substances or health hazards are required to comply with 29 CFR §1910.120(e)(3)(i). This regulation requires site workers exposed to hazardous substances to complete an initial 40-hours of off-site training and instruction plus an additional three days supervised field experience under the guidance of a trained supervisor.

10.2 Refresher Training

Annual refresher training in accordance with 29 CFR §1910.120(e)(8) shall be completed each year following the completion of the individual's 40-hour training course. The annual refresher training will be required of all personnel in order to maintain their qualifications for hazardous substances operations.

10.3 Management and Supervisory Training

In accordance with 29 CFR §1910.120(e)(4), all individuals who manage or supervise workers engaged in operations involving hazardous substances at the site must receive 40-hours off-site instruction in addition to three days supervised field experience under the guidance of a trained supervisor as previously described. Management and supervisory personnel shall receive an additional eight hours of specialized training to include discussion of the safety and health program, training requirements, personal protective and respiratory equipment program, health hazard monitoring procedures, accident investigation, and emergency response procedures. All site operations shall be performed under the direction of an IT supervisor who has completed hazardous substances operations supervisory training.

10.4 Site-Specific Briefing

Site-specific briefing is required for all workers prior to their participation in any field activities. Site-specific training shall be conducted by the HS Manager or SSHO and will address, the following items:

- Review and acknowledgment of this HASP and its contents
- Planned work activities and site-specific safety considerations
- Roles and responsibilities of site personnel
- Use of PPE
- General work practices and procedures
- Medical surveillance requirements
- Recognition of signs and symptoms of exposure to hazardous substances
- Engineering controls to reduce potential hazards
- Air monitoring techniques

- Material handling
- Site security and access
- Forklift operations safety training
- Personnel/Equipment decontamination procedures
- Emergency response procedures.

Site specific training is mandatory prior to entering the CRZ or EZ.

10.5 Daily Safety and Health Briefings

The daily tailgate safety meeting shall be held at the beginning of each shift and whenever new personnel report on site. For work activities daily safety meetings shall be conducted by the Site Superintendent or SSHO. Whenever procedural deficiencies are identified, additional safety meetings will be conducted to address the corrective actions. The following topics provide a guideline for the topics of the meetings:

- Review of planned daily activities
- Hazards assessment
- Review of air monitoring results
- Protection levels required
- Communications
- Field personnel responsibilities
- Decontamination procedures
- Emergency procedures.

These daily tailgate safety meetings will be documented on the form in Appendix E. A daily tailgate safety discussion may be conducted for each specific operation scheduled for the day or all operations may be discussed in a tailgate safety meeting attended by all personnel. A tailgate safety meeting shall be conducted for each particular shift.

10.6 Confined Space Training

10.6.1 General Training

Prior to performing confined space entry work, the SSHO will provide training to those workers assigned to confined space operations. The training will discuss hazards of confined spaces, work practices to control these hazards, and individual duties to be performed. Worker proficiency shall be established by testing and/or practical demonstration.

IT's Corporate Health and Safety Department maintains training records for all IT employees, these records include the employee's date and type of training, the employees name and

signature and signature of the trainer. Documentation of each employee's confined space training will also be maintained at the project site.

Confined space training includes specialized instruction for performing the following duties:

- Entrants/Attendants: Workers trained to enter permit-required confined spaces (PRCSs) or assist in such activities.
- Entry Supervisors and/or Personnel Conducting Atmospheric Testing: Qualified Person trained to complete and sign confined space permit.
- Rescue Service Personnel: Personnel assigned to provide emergency entry and rescue services shall be trained annually in the proper use of personal protective and rescue equipment. Such training shall include a simulated rescue exercise. In addition, rescue personnel shall be trained in the hazards and proper work practices for handling blood or other potentially infectious materials while providing first aid or CPR. All rescue personnel shall have current training and certification for first-aid and CPR.

Personnel assigned to attendant duties shall be trained in non-entry rescue procedures.

10.6.2 Retention of Inspection and Test Logs

A copy of all entry permits and other documents related directly to the PRCS entry (e.g., hot work permits, daily logs, etc.) shall be maintained by the SSHO.

10.6.3 Confined Space Entry Program Review

The SSHO shall review all entry permits and records for incidents or potential problems occurring during entry. Such incidents or problems may include injuries, accidents, unauthorized entries, or any other event that may indicate that improvements be made in the confined space entry program. Proposed changes will be reviewed with appropriate operations personnel and recommendations for program revisions shall be forwarded to the PM and HS Manager for review. Improvements and modifications shall be implemented as necessary. Additional requirements for PRCS activities are listed in Appendix C of this HASP.

10.7 First Aid and Cardiopulmonary Resuscitation (CPR)

The SSHO shall have and maintain current certification in first aid and CPR training issued by the American Red Cross Association or other accredited program. The SSHO shall ensure that at least two individuals currently certified in first aid and CPR are present on site during

each shift(s) that invasive, intrusive, or soil/liquid/sludge handling activities are being conducted.

10.8 Documentation of Training

All training must be properly documented and filed on site for reference by the SSHO or designated representative. All personnel required to meet the training requirements must present evidence of this training at the site. The SSHO is responsible to verify that training records are complete and current. The SSHO shall periodically review the documentation and prohibit worker access to any area where an individual does not possess the required qualifications.

10.9 Hazard Communication

As required by 29 CFR §1910.1200 Hazard Communications standard, IT and all IT subcontractors shall request and obtain MSDSs for all chemical products used on site. The SSHO will organize and file all MSDSs and provide and document training in the use of these products on the daily Tailgate Safety Meeting forms. MSDSs will be maintained on site and made available to all persons. Additional copies will be posted in support areas readily accessible to all site personnel.

10.10 Exempt Personnel

Site access by personnel making deliveries, performing repairs to utilities, public or government officials, visitors, or local residents will be limited to support areas only. These persons will not be required to comply with the medical and training requirements as previously defined. SZ access will be limited to designated work, delivery or observation areas to minimize any potential exposure to site contaminants. Site observation areas will be located upwind from predominant wind directions and access to observation areas may be restricted by weather conditions or site activities. Authorization for limited site access will be determined on a case by case basis by the SSHO in consultation with the HS Manager and IT PM. Site access for such personnel will be limited to areas with no potential for exposure during routine operations. Exempt personnel will be escorted on site and will be strictly prohibited from entering the CRZ or EZ.

11.0 Medical Surveillance

IT will utilize the services of a Board-Certified Occupational Medicine physician for the medical surveillance requirements for this project. Dr. David Barnes (below) will review all medical examinations and will be available for medical consultation on an "as-needed" basis.

Dr. David Barnes
4360 Chamblee Dunwoody Road, Suite 207
Atlanta, Georgia 30341

11.1 Medical Examination

As required by IT Policy and Procedure HS100 all personnel on site will have successfully completed a preplacement or periodic/updated physical examination.

11.1.1 Preplacement Exam

This examination has been designed to meet 29 CFR §1910.120 requirements for hazardous waste site operations and 29 CFR §1926.58 requirements for asbestos operations.

The IT medical surveillance program examination consists of:

- Medical and occupational history questionnaire which includes information on past gastrointestinal, hematologic, renal cardiovascular, reproductive, immunological and neurologic problems. Information and history of respiratory disease and personal smoking habits.
- Physical examination.
- Blood pressure measurements.
- Complete blood count and differential to include hemoglobin and hematocrit determinations, red cell indices, and smear of peripheral morphology.
- Blood urea nitrogen and serum creatinine.
- SMAC 24.
- Chest x-ray.
- Pulmonary function test.
- Audiogram.

- EKG for employees over 35 years old or when other complications indicate the necessity.
- Drug and alcohol screening.
- Visual acuity.

The following information is provided to the examining physician:

- Description of employee's duties
- Anticipated chemical and asbestos exposure and levels
- Description of the PPE to be used
- Information from previous medical exams

The medical surveillance provided to the employee includes a judgment by the medical examiner of the ability of the employee to use either positive- or negative-pressure respiratory equipment. Any employee found to have a medical condition which could directly or indirectly be aggravated by exposure to these chemical substances or by the use of respiratory equipment will not be employed for the project. A copy of the medical examination is provided at the employee's request.

The employee will be informed of any medical conditions that would result in work restriction or that would prevent them from working at hazardous waste sites.

IT subcontractors will certify that all their employees have successfully completed a physical examination by a qualified physician on the IT subcontractor Certification Form shown in Appendix F. The physical examinations will meet the requirements of 29 CFR §§1910.120 and 1910.134.

IT subcontractors will supply copies of the medical examination certificate for each of their site worker(s).

11.1.2 Annual Exam

All IT employees receive an annual update exam meeting the requirements of 29 CFR §1910.120. The results of these exams are compared to previous results and the baseline physical to determine if any effects due to exposure have occurred. Appropriate actions are taken as recommended by the physician should the results indicate an exposure; otherwise, employees are cleared for continued work.

11.1.3 Exit Exam

IT offers exit physical exams for all employees involved in the medical surveillance program who are leaving the company for any reason to ensure they are in good health.

11.1.4 First Aid and Medical Treatment

Employees are trained in Red Cross first aid treatment skills and IT retains a local medical clinic for all of its offices. Employees have access to the clinic at any time during their working hours should an occupational injury or illness occur.

11.2 Medical Restriction

Should an occupational injury or illness occur that restricts an employees ability to function at full capacity, IT maintains a policy of providing these employees with light duty assignments whenever possible to allow them to continue to be productive.

11.3 Medical Records

Medical and personal exposure monitoring records will be maintained according to the requirements of 29 CFR §1910.20 and will kept for a minimum of 30 years. Employee confidentiality will be maintained.

12.0 Emergency Procedures

IT develops each HASP to allow hazardous waste operations to proceed without adverse impacts on the safety and health of the worker, the environment and the community. In addition, supplementary plans have been developed to cover extraordinary conditions that might occur at various sites.

12.1 General

The Site Superintendent and the SSHO will establish evacuation routes and assembly areas for the site. All personnel entering the site are informed of these routes and assembly areas. If the evacuation routes are not clear, a site plan will be prepared marking the evacuation routes and will be posted at conspicuous locations.

The Site Superintendent and the SSHO will evaluate the site for the potential for fire, explosion, chemical release or other catastrophic events. As part of the training, site workers are instructed to report unusual events, activities, chemicals and conditions to the Site Superintendent.

Protective clothing and respiratory protective equipment will be used for various stages of the operation as needed. The level of protection is listed in Chapter 6.0 of this HASP and will depend upon the degree of hazard.

At least two persons trained in a minimum of both American Red Cross first-aid techniques and CPR will be on site whenever activities are performed. As an alternative, this requirement is satisfied when a 911 emergency responder can respond within five minutes to the site.

Emergency equipment will be located in readily accessible uncontaminated locations. A complete first-aid kit and a fire extinguisher will be readily available on site for the team's use in the event of an emergency. The fire extinguisher will be located not more than 25 feet from the work activity. In addition, an eyewash will be readily available and must be capable of washing both eyes at once and delivering at least 0.4 gallons per minute for at least 15 minutes. At least one eyewash will be maintained in the CRZ.

Employee entrance and exit routes will be planned and emergency escape routes designated.

12.2 Emergency Response

The objective of emergency response actions is to minimize adverse health risks to site workers, the environment and the local community. The SSHO or the Site Superintendent will be the Site Emergency Coordinator.

Responsibilities. The Site Emergency Coordinator will have the responsibility for directing the response activity in the event of an emergency. The responsibilities are described below:

- Assess the emergency situation and notify site security personnel
- Determine the required response measures and inform the Navy Technical Representative
- Notify the appropriate response teams of the specific action that will be taken upon request
- Determine and coordinate the on-site personnel actions for the particular emergency situation
- Contact and coordinate with appropriate governmental or regulatory agency
- Act as liaison between responding agencies and site personnel
- Immediately complete the Supervisor Employee Injury Report form upon occurrence of an accident or incident
- The Site Emergency Coordinator will notify the PM and the SSHO of any incident.

The Site Emergency Coordinator has the authority to commit resources as needed to contain and control released material and to prevent its spread to off site areas.

12.3 Safety Signals

Vehicle, tractor and portable gas-operated horns are used for safety signals as follows:

- One long blast: Warning alarm—prepare for Emergency Response
- Two short blasts: Activation alarm—initiate Emergency Response activities as directed by Site Emergency Coordinator
- Three short blasts: All clear—return to normal activities.

12.4 Medical Emergency

Emergency medical personnel will be summoned without delay in the event of a medical emergency. The Site Emergency Coordinator will stay on the line with the 911 Operator until the 911 Operator hangs up.

Worker Injury. If a person working in an area is physically injured, American Red Cross first-aid procedures will be followed. Depending upon the severity of the injury or illness, emergency medical response may be obtained accordingly. If the person can be moved, that person will be taken to a location where emergency first aid treatment can be administered. The local emergency medical facility should be contacted along with an ambulance.

If the injury to the worker is of chemical nature, the following first-aid procedures will be instituted as soon as possible:

- Eye Exposure: If contaminated material gets into the eyes, the eyes will be flushed immediately at the eyewash station using copious amounts of water while lifting up the lower and upper eyelids.

- Skin Exposure: If contaminated sludge or corrosive liquid material gets on the skin, the affected area will be washed with soap or mild detergent.

- Inhalation: If an individual inhales a volume of toxic or corrosive vapors, the employee will be removed to fresh air at once. If breathing has stopped, artificial respiration will be performed on the affected individual until medical attention can arrive on scene and transport the patient to the nearest medial facility.

- Ingestion: In the event a person ingests a toxic liquid or solid material, medical attention will be obtained at once.

12.5 Reporting Injuries and Illnesses

Workers will report all injuries to their supervisor immediately and report illnesses as soon as the employee knows he/she is sick. Supervisors will submit completed "Supervisor's Employee Injury Report" to the IT Health and Safety Department within 24 hours of the occurrence. If there is any indication that the illness is work-related, the supervisor will submit a completed "Supervisor's Employee Injury Report" to the Health and Safety Department within 24 hours after notification by the worker.

12.6 Emergency Information

12.6.1 Public Agencies

FIRE: • Suffolk Fire Department Emergency • Emergency	804 934-3111 or 804 925-1439 911
POLICE: • Suffolk Police Department Emergency • Emergency	804 934-3111 or 804 925-1439 911
HOSPITAL: • Minor Injuries: Obici Memorial Hospital • Major Injuries: Emergency	804 934-4800 911
Tidewater Poison Control Center	800 552-6337
U.S. Coast Guard Pollution, Toxic Chemical, and Oil Spill Hotline	800 424-8802
National Weather Service	804 853-3013
HOSPITAL LOCATION MAP: • Bayside Hospital	Refer to Appendix G of this HASP

12.6.2 Key IT Personnel

Position	Name	Contact Phone Number
IT Program Manager	Harry Dravecky	412 372-7701
IT Program HS Manager	Warren Houseman	412 372-7701

12.6.3 Key Navy Personnel

Position	Name	Contact Phone Number
Remedial Project Manager	Scott Park	804 322-4788
NTR	Chris Reich	804 464-7713
Contracts Specialist	Don Bruce	805 982-5189
Contracting Officer's Technical Representative	Jai Jeffrey or Nick Ta	805 982-3020 805 982-5478

ACTIVITY ER COORD.

12.7 Spill Response

If a spill of hazardous material occurs, the following actions will be taken:

- Notify the SSHO immediately
- Take immediate measures to control and contain the spill within site boundaries
- Keep unnecessary personnel away, isolate the hazardous area, and deny entry
- Stay upwind and keep out of low-lying areas
- Allow no flares, smoking or flames in hazard areas
- For liquids, keep combustibles away from the spilled material
- Take necessary steps to clean up the spill and all contaminated material

12.7.1 Small Dry Spills

Shovel contaminated materials into dry containers and cover. Use care not to make material airborne. Label the containers as to contents and remove the designated staging area.

12.7.2 Small Liquid Spills

Absorb the liquid with sand, clean fill, or other noncombustible, absorbent material. Place contaminated material into a container and label the contents prior to transporting to the designated staging area.

Appendix A

IT Health and Safety Policies and Procedures
Table of Contents

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These polices and their implementation are central to IT's accident prevention program. IT will make copies of its Health and Safety Policies and Procedures available to the client representative upon request.

Appendix B

IT Procedure HS307
Excavation/Trenching

Approved by

PROCEDURE

(subject) EXCAVATION AND TRENCHING

1.0 PURPOSE AND SUMMARY

This procedure presents the federal requirements for excavation safety. Excavation operations pose unique and serious hazards.

With very few exceptions, protective systems must be designed and installed to protect employees who enter excavations of 5 feet or more in depth. Accepted protective systems include; sloping, shoring and shielding.

The protective system must be designed by a registered professional engineer (civil), and plans must be available for inspections on-site, under prescribed conditions.

In addition to these federal requirements, some states (California) and localities may require notification of trenching/excavation operations prior to beginning work.

2.0. TABLE OF CONTENTS

3.0 RESPONSIBILITY MATRIX

3.1 **Procedure Responsibility.** The Corporate Director, Health and Safety, is responsible for the issuance, revision, and maintenance of this procedure.

3.2 **Action/Approval Responsibilities.** The Responsibility Matrix can be found as Attachment 4 in section 8.0.

4.0 DEFINITIONS

Accepted Engineering Requirements. Those requirements or practices which are compatible with standards required by a registered professional engineer.

Angle of Repose. The greatest angle above the horizontal plane at which a material will lie without sliding.

Benching. 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 of steps, usually with vertical or near-vertical surfaces between levels.

Competent Person. (Federal OSHA, 29CFR 1926.32(f)). A person, such as a supervisor or engineer, 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 the authority to take prompt corrective measures to eliminate them. Nomenclature for responsibilities equivalent to a competent person varies from state to state. For example, in California, the individual with excavation/trenching installation and supervision responsibilities is a "qualified person".

Confined Space. Enclosure having limited means for entry and exit, by reason of location, size, or numbers of openings; and unfavorable natural ventilation that could contain or produce dangerous air contaminants, flammable atmospheres, and/or oxygen deficiency.

Design Engineer. An individual, currently registered as a civil engineer in the applicable state, who, in all other respects, meets the requirements of a pertinent State OSHA Program, or Federal OSHA in terms of his or his ability to design shoring, sloping, benching, or alternate trench/excavation systems.

Excavation. Any man-made cut, cavity, trench or depressional in an earth surface, including its sides, walls, or faces, formed by earth removal.

Project Manager. An individual who is responsible to coordinate and direct the activities of both the Design Engineer and Project Supervisor. The Project Manager is responsible to assure that all pre-excavation requirements are met: site preparation, health and safety office notification, OSHA and/or IT internal project permitting, and employee training.

Project Supervisor. A person, such as a supervisor or engineer, who is familiar with the installation of shoring or sloping/benching systems and the attendant hazards of excavation or trenching operations. Project supervisors shall meet the particular requirements of State OSHA programs, or where applicable, the requirements of a Federal OSHA competent person. Project Supervisors shall assure that excavation/trenching work practices are properly followed.

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.

Shield. 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. Shields may be 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".

Shoring. 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.

Sloping. 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.

Spoil. The earth material that is removed in the formation of an excavation, or trench.

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.

Tabulated Data. Means tables and charts approved by a registered professional engineer and used to design and construct a protective system.

Trench. An excavation made below the surface of the ground. In general, the depth is greater than the width at the bottom, but the width of a trench at the bottom is not greater than 15 feet.

5.0 TEXT

5.1 Pre-Excavation Requirements.

5.1.1 Underground Installations.

Prior to opening an excavation, the estimated location of utility installations such as sewer, telephone, fuel, electric, water lines, or any underground installations that may reasonably by expected to be encountered during the excavation work shall be determined.

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.

When utility companies or owners cannot respond to a request within 24 hours - excluding weekends and holidays - (or longer if required by state or local law), or if the exact location of installations cannot be established, excavation may proceed with caution, provided detection equipment or other means to locate utility installations are used.

5.1.2 **Surface Encumbrances.**
All surface encumbrances (trees, poles, boulders, etc.) that are located so as to create a hazard to employees shall be removed or supported, as necessary, to safeguard employees.

5.1.3 **Training.**
Employees shall not be assigned, or permitted, to design, supervise, or work in or about excavations until they have completed formal classroom training to include:

- Types of hazards associated with excavation operations,
- safe work practices and techniques,
- a review of applicable Federal, state and local regulations, and
- a review of this procedure.

All personnel subject to this procedure shall be periodically retrained in the above subject areas. Proof of training and retraining shall be documented in writing. Training records shall be maintained by the Corporate Training Manager (Ref. ITC PRO HSO0).

Tailgate Safety Meetings detailing the specific hazards of the work to be performed and safety precautions and procedures specific for the job shall be conducted by the project supervisor at the beginning of each shift for each job. The meeting shall be documented on the Tailgate Safety Meeting Form (Form HS051-1).

Formal training shall be complemented with on-the-job training and instruction by management as part of standard employee supervision, and to the extent necessary to assure compliance with this procedure, and all other applicable health and safety practices.

5.1.4 **Hazard Assessment.**
During the project planning stage, an assessment of potential hazards shall be made to include:

- the presence and quantity of hazardous substances in the area of the excavation;
- the toxicity and flammability of hazardous substances present, or to be introduced into, the area of the excavation;
- the potential for work meeting the definition of confined space work (ref. ITC PRO HS300);
- the presence of nearby above-ground or overhead utility installations;
- the exposure of the general public to the excavation operations; and
- the potential for surface water runoff into the excavation.

5.2 Excavation Work Practices.

5.2.1 General.

Each employee in an excavation shall be protected from cave-ins by an adequate protective system designed in accordance with 29CFR1926.652. The project supervisor shall ensure that the required protective system is installed and maintained per the design specifications.

No employees shall be permitted to enter the excavation unless they are specifically required to do so. Unauthorized persons shall not be allowed access.

5.2.2 Supervision.

Work in an excavation shall at all times be supervised by an IT project supervisor. This individual will remain outside of the excavation at all times, and will be responsible for identifying any unusual developments above ground which may warn of impending earth movement.

5.2.3 Access and Egress.

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 or egress of equipment shall be designed by a competent person qualified in structural design, and shall be constructed in accordance with the design. Ramp design and construction shall comply with 29CFR1926.651(c).

A stairway, ladder, ramp or other safe means of egress shall be located in trench excavations that are 4 more feet in depth so as to require no more than 25 feet of lateral travel for employees.

5.2.4 Protective Systems.

Protective systems designed in accordance with 29CFR1926.652(b) or (c) shall be installed except when:

1. the excavation is made entirely in stable rock, or
2. the excavation is less than 5 feet in depth, and examination of the ground by a competent person provides no indication of a potential cave-in.

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. (See Attachments 1, 2 and 3).

5.2.5 Placement of Spoil.

All spoil shall be placed at least 2 feet from the edge of the excavation. It is strongly recommended that spoil be placed 4 or more feet from the excavation edge so as not to cover surface indicators of subsidence (such as fissures or cracks). No method that disturbs the soil in place (such as driving stakes) shall be used to contain the spoil material.

5.2.6 Exposure to Falling Loads.

No employees 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 an spillage or falling materials. Operators may remain in the cabs of vehicles being loaded or unloaded provided the vehicles are equipped with protection as specified in 29CFR1926.601(b)(6).

5.2.7 **Warning System for Mobil Equipment.**
When mobil equipment is operated adjacent to 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.

5.2.8 **Hazardous Atmospheres.**
Where an oxygen deficient (less that 20% O_2) or hazardous atmosphere exists, or could reasonably be expected to exist, the excavation shall be tested before employees enter.

Adequate precautions shall be taken to prevent employee exposure to oxygen deficient or hazardous atmospheres. As appropriate, ventilation and/or respiratory protective devices shall be used.

Adequate precautions, including ventilation, shall be taken to prevent employee exposure to atmospheres containing a concentration of flammable gas in excess of 10 percent of the lower explosive limit (LEL) of the gas.

Testing shall be conducted as often as necessary to ensure that the atmosphere remains safe. See also ITC PRO HS300, for additional requirements for confined space work.

5.2.9 **Water Accumulation Hazards.**
Employees shall not work in excavations in which there is accumulated water, or in excavations in which water is accumulating, 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 operations shall be monitored by a competent person to ensure proper operation.

If the excavation work interrupts the natural drainage of surface water (streams, run-off channels), diversion ditches dikes, or other suitable means shall be used to prevent surface water from entering the excavation and to provide adequate drainage of the area adjacent to the excavation.

Excavations subject to run-off from heavy rains shall be inspected by a competent person in compliance with section 5.2.10 below.

5.2.10 **Stability of Adjacent Structures.**
The stability of structures adjoining the excavation shall be supported to protect employees.

Excavation below the level of the base or 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 support system (underpinning) is provided to ensure the safety of employees and the stability of the structure; or
- the excavation is in stable rock; or
- a registered professional engineer has determined that the structure will be unaffected by the excavation; or
- a registered professional engineer has determined that the structure will be unaffected by the excavation; or
- a registered professional engineer has determined that such excavation will not pose a hazard to employees.

Sidewalks, pavements and appurtenant structure 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.

5.2.11 **Protection of Employees from Loose Rock or Soil.**
Employees shall be protected from loose rock or soil which could fall or roll from the excavation face. Such protection could be scaled to remove loose materials, or the installation of barriers.

Employees shall be protected from spoil or other materials or equipment which could fall or roll into the excavation. Such materials shall be kept at least 2 feet from the excavation edger, and/or retaining devices shall be used to present materials or equipment from falling or rolling into excavations.

5.2.12 **Inspections.**
A competent person shall make daily inspections of excavations, the adjacent areas and protective systems for evidence of conditions that could result in a cave-in, indications of failure of protective systems, hazardous atmospheres, or other hazardous conditions.

The inspection shall be made prior to start of work, and as needed throughout the shift. Inspections shall be made after each rainstorm or other hazard-increasing event.

Where the inspection finds evidence of any hazardous condition, exposed employees shall be removed from the hazardous area until necessary precautions have been taken.

5.2.13 **Fall Protection.**
Where employees or equipment are permitted to cross over excavations, walkways or bridges with standard guardrails shall be provided.

Adequate barrier physical protection shall be provided at all remotely located excavations. All wells, pits, shafts, etc., shall be barricaded or covered. Temporary well, pits, shafts, etc., shall be backfilled as soon as possible.

5.3 **Requirements for Employees in Excavations.**

5.3.1 **Protection for Employees in Excavations.**
Each employee in an excavation shall be protected from cave-ins by an adequate protective system designed and installed in compliance with 29CFR1926.652(b) or 29CFR1926.652(c), except when

- excavation is made entirely in stable rock; or
- the excavation is less than 5 feet in depth and a competent person determines there is no danger of cave-in.

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.

6.0 EXCEPTION PROVISIONS (No exceptions to the requirements of this policy are permitted.)

7.0 CROSS REFERENCES

29CFR1926 Subpart P - Excavations
§ 650; Scope, application and definitions
§ 651; General requirements
§ 652; Requirements for protective systems
Appendices A-F, mandatory
ITC PRO HSO50, Training Requirements
ITC PRO HSO51, Tailgate Safety Meetings
ITC PRO HS300, Confined Spaces, Industrial

8.0 ATTACHMENTS

Form HS307.1 Trench/Excavation Notification Worksheet. This form is mandatory. It is to be completed by the project manager and/or design engineer. After the form is completed, a copy is submitted to the responsible health and safety professional who will review it, and make any necessary state or local notifications.

Attachment 1: Selection of Protective Systems for Excavations 20 Feet or Less in Depth.
Attachment 2: Sloping Options
Attachment 3: Shoring or Shielding Options
Attachment 4: Responsibility Matrix
Attachment 5: 29CFR1926 Subpart P - Excavations
Attachment 6: Form HS307.2, Excavation and Trenching Notification Log. This form is optional. This log format may be used by the local health and safety professional to track excavation projects.

INTERNATIONAL TECHNOLOGY CORPORATION

TRENCH/EXCAVATION NOTIFICATION WORKSHEET

Project Number _____ Project Name _____

Customer's Name: _____

Specific Jobsite Location: _____

Nearest Major Cross Street: _____

City: _____ County: _____

Name and Title of Site Supervisor: _____

Starting Date: _____ Estimated Completion Date: _____

High Voltage Lines in Proximity: YES_____ NO_____ How Near_____

Depth Range (ft): ___ ___ (min max) Width Range(ft): ___ ___ (min max) Length(ft): _____

Project Description: _____

_____

Anticipated Soil Condition: Hard Compact___ Unstable___ Running___

Ground Protection Method: Sloping_____ Shoring_____
Trench Shield_____ Alternate_____

ALL METHODS MUST MEET ACCEPTED ENGINEERING REQUIREMENTS.
PLANS MUST BE KEPT ON-SITE.

Describe Chemical Hazards at Site: _____

_____

Subcontractor's Name: _____

Equipment to be Used: _____

Design Engineer: _____ Project Supervisor: _____

Phone: ( ) _____

==========

Health & Safety Use Only

IT Permit Number: _____ Date Issued: _____ Expires: _____

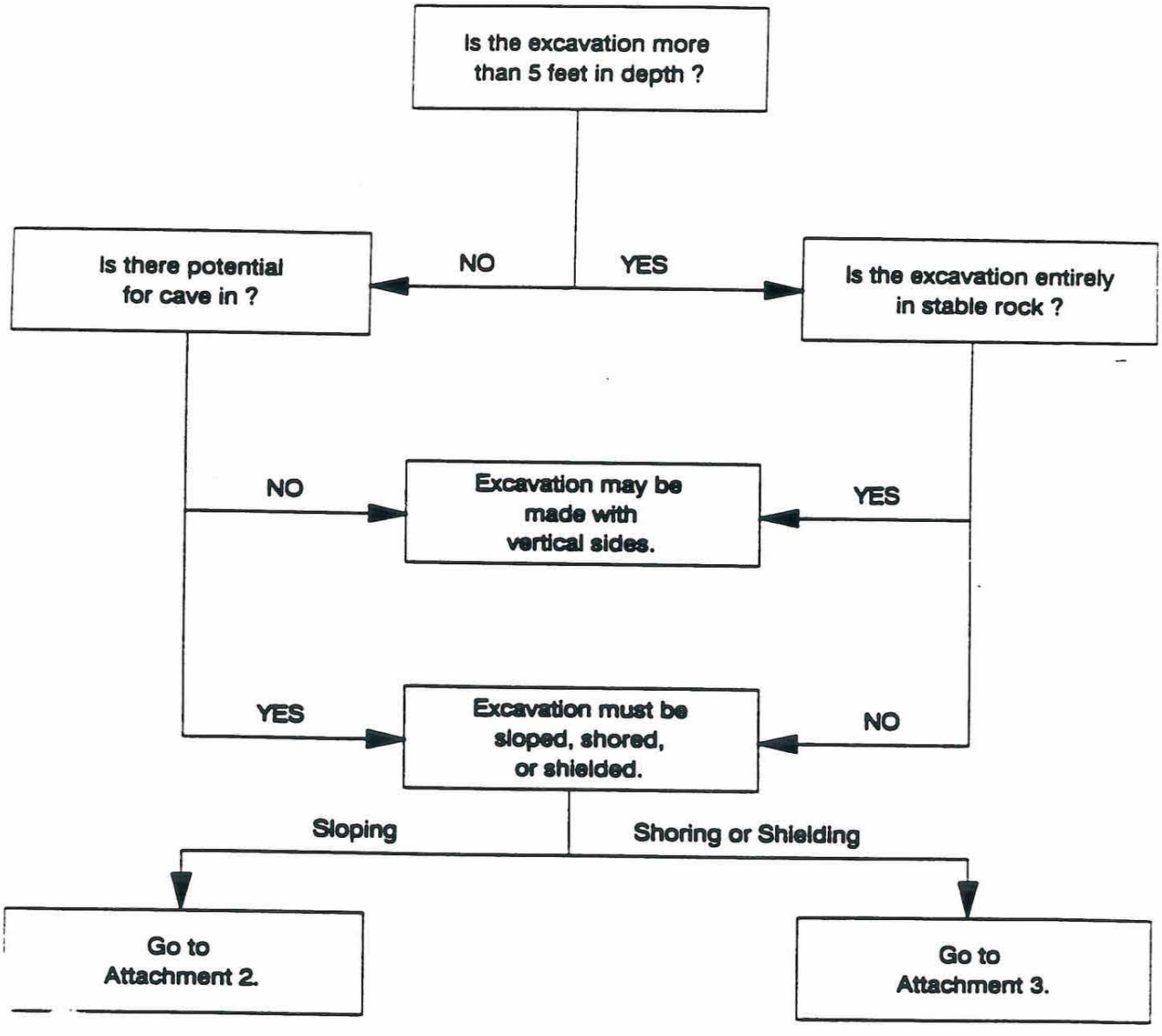
Issued By: _____

CAL/OSHA Notification: Date: _____ By: _____

District Office: _____ Contact: _____

ATTACHMENT 1

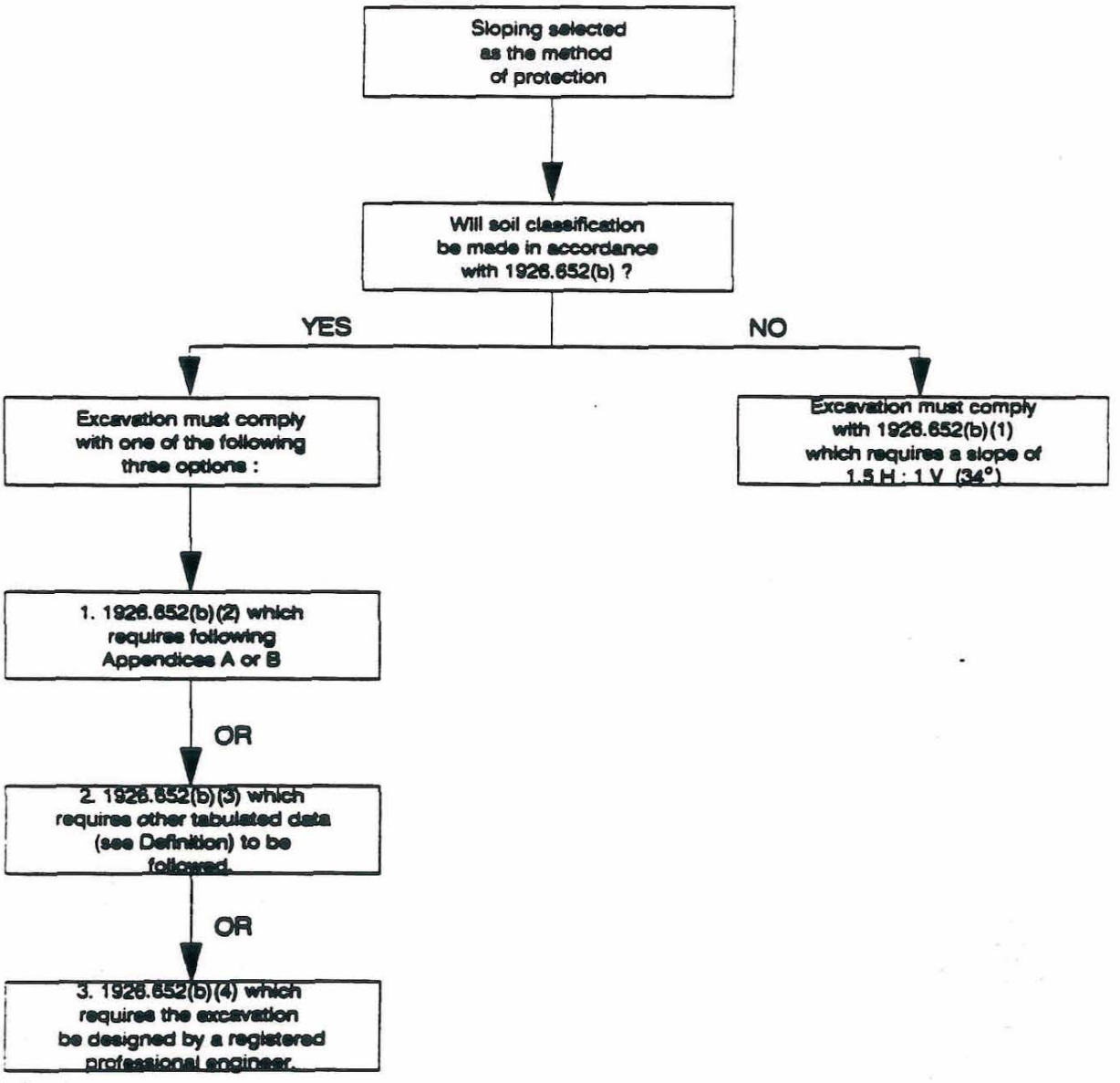
SELECTION OF PROTECTIVE SYSTEMS FOR EXCAVATIONS 20 FEET OR LESS IN DEPTH



For excavations greater than 20 feet in depth, design by a registered professional engineer in compliance with 1926.652(b) and (c) is required.

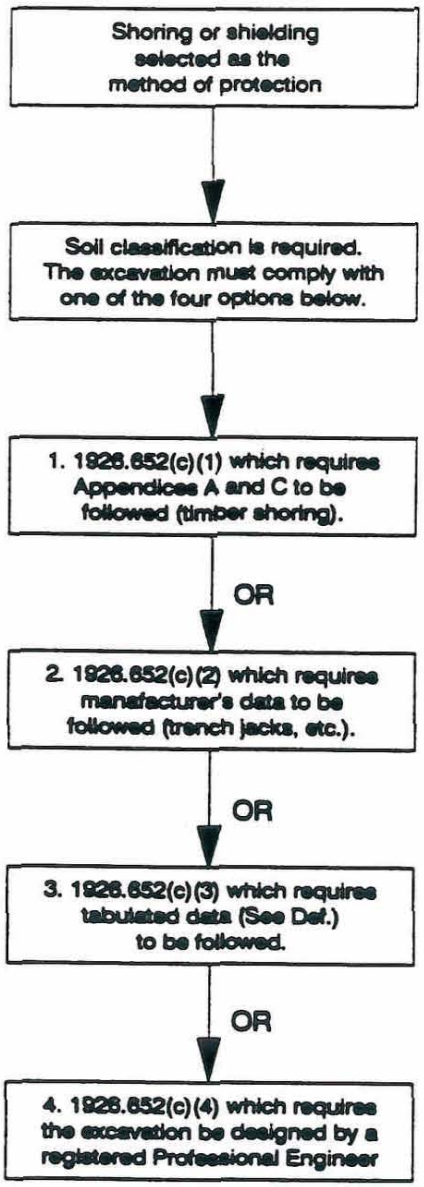
ATTACHMENT 2

SLOPING OPTIONS



ATTACHMENT 3

SHORING OR SHIELDING OPTIONS



ATTACHMENT 4

EXCAVATION AND TRENCHING
MATRIX RESPONSIBILITY

	Individual	Leadman/ Supervisor	Design Engineer	Project Manager	Profit Center Manager	Regional General Manager	Division Director	H&S Professional	Regional Purchasing Manager
Understanding and Complying with Procedure	X	X	X	X	X	X	X	X	
Conducting Pre-Work Hazard Assessment			X					X	
Selection and Design of Protective System (s)			X						
Pre-Qualifying Subcontractors				X				X	X
Inspecting Excavation for Hazardous Conditions	X	X	X					X	
Enforcing Safe Work Practices		X	X	X	X	X	X	X	

installation, or the sides of an excavation.

Tabulated data means tables and charts approved by a registered professional engineer and used to design and construct a protective system.

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.

Trench box. See "Shield."

Trench shield. See "Shield."

Uprights means 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."

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.

§ 1926.651 General requirements.

(a) *Surface encumbrances.* All surface encumbrances that are located so as to create a hazard to employees shall be removed or supported, as necessary, to safeguard employees.

(b) *Underground installations.* (1) The estimated location of 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 prior to opening an excavation.

(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 actual excavation. When utility companies or owners cannot respond to a request to locate underground utility installations within 24 hours (unless a longer period is required by state or local law), or cannot establish the exact location of these installations, the employer may proceed, provided the employer does so with caution, and provided detection equipment or other acceptable means to locate utility installations are used.

(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.

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

(c) *Access and egress*—(1) *Structural ramps.* (i) 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 or egress of equipment shall be designed by a competent person qualified in structural design, and shall be constructed in accordance with the design.

(ii) Ramps and runways constructed of two or more structural members shall have the structural members connected together to prevent displacement.

(iii) Structural members used for ramps and runways shall be of uniform thickness.

(iv) 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.

(v) Structural ramps used in lieu of steps shall be provided with cleats or other surface treatments on the top surface to prevent slipping.

(2) *Means of egress from trench excavations.* A stairway, ladder, ramp or other safe means of egress shall be located in trench excavations that are 4 feet (1.22 m) or more in depth so as to require no more than 25 feet (7.62 m) of lateral travel for employees.

(d) *Exposure to vehicular traffic.* 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.

(e) *Exposure to falling loads.* 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, in accordance with § 1926.601(b)(6), to provide adequate protection for the operator during loading and unloading operations.

(f) *Warning system for mobile equipment.* 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.

(g) *Hazardous atmospheres*—(1) *Testing and controls.* In addition to the requirements set forth in subparts D and E of this part (29 CFR 1926.50–1926.107) to prevent exposure to harmful levels of atmospheric contaminants and to assure acceptable atmospheric conditions, the following requirements shall apply:

(i) Where oxygen deficiency (atmospheres containing less than 19.5 percent oxygen) or a hazardous atmosphere exists or could reasonably be expected to exist, such as in excavations in landfill areas or excavations in areas where hazardous substances are stored nearby, the atmospheres in the excavation shall be tested before employees enter excavations greater than 4 feet (1.22 m) in depth.

(ii) 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 ventilation in accordance with subparts D and E of this part respectively.

(iii) Adequate precaution shall be taken such as providing ventilation, to prevent employee exposure to an atmosphere containing a concentration of a flammable gas in excess of 20 percent of the lower flammable limit of the gas.

(iv) When controls are used that are intended to reduce the level of atmospheric contaminants to acceptable levels, testing shall be conducted as often as necessary to ensure that the atmosphere remains safe.

(2) *Emergency rescue equipment.* (i) 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.

(ii) Employees entering bell-bottom pier holes, or other similar deep and confined footing excavations, shall wear a harness with a life-line 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.

(h) *Protection from hazards associated with water accumulation.* (1) Employees shall not work in excavations in which there is accumulated water, or in excavations in which water is accumulating, unless adequate precautions have been taken to protect employees against the hazards posed by 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.

(2) 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 to ensure proper operation.

(3) 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 and to provide adequate drainage of the area adjacent to the excavation. Excavations subject to runoff from heavy rains will require an inspection by a competent person and compliance with paragraphs (h)(1) and (h)(2) of this section.

(i) *Stability of adjacent structures.* (1) 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.

(2) 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:

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

(ii) The excavation is in stable rock; or

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

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

(3) Sidewalks, pavements, and appurtenant structure 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.

(j) *Protection of employees from loose rock or soil.* (1) 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 at intervals as necessary on the face to stop and contain falling material; or other means that provide equivalent protection.

(2) 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 (.61 m) 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.

(k) *Inspections.* (1) 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 hazard increasing occurrence. These inspections are only required when employee exposure can be reasonably anticipated.

(2) 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 until the necessary precautions have been taken to ensure their safety.

(l) *Fall protection.* (1) Where employees or equipment are required or permitted to cross over excavations, walkways or bridges with standard guardrails shall be provided.

(2) Adequate barrier physical protection shall be provided at all remotely located excavations. All wells, pits, shafts, etc., shall be barricaded or covered. Upon completion of exploration and similar operations, temporary wells, pits, shafts, etc., shall be backfilled.

§ 1926.652 Requirements for protective systems.

(a) *Protection of employees in excavations.* (1) Each employee in an excavation shall be protected from cave-ins by an adequate protective system designed in accordance with paragraph (b) or (c) of this section except when:

(i) Excavations are made entirely in stable rock; or

(ii) Excavations are less than 5 feet (1.52m) in depth and examination of the ground by a competent person provides no indication of a potential cave-in.

(2) 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.

(b) *Design of sloping and benching systems.* The slopes and configurations of sloping and benching systems shall be selected and constructed by the employer or his designee and shall be in accordance with the requirements of paragraph (b)(1); or, in the alternative, paragraph (b)(2); or, in the alternative, paragraph (b)(3), or, in the alternative, paragraph (b)(4), as follows:

(1) *Option (1)—Allowable configurations and slopes.* (i) Excavations shall be sloped at an angle not steeper than one and one-half horizontal to one vertical (34 degrees measured from the horizontal), unless the employer uses one of the other options listed below.

(ii) Slopes specified in paragraph (b)(1)(i) of this section, shall be excavated to form configurations that are in accordance with the slopes shown for Type C soil in Appendix B to this subpart.

(2) *Option (2)—Determination of slopes and configurations using Appendices A and B.* Maximum allowable slopes, and allowable configurations for sloping and benching systems, shall be determined in accordance with the conditions and requirements set forth in appendices A and B to this subpart.

(3) *Option (3)—Designs using other tabulated data.* (i) Designs of sloping or benching systems shall be selected from and be in accordance with tabulated data, such as tables and charts.

(ii) The tabulated data shall be in written form and shall include all of the following:

(A) Identification of the parameters that affect the selection of a sloping or benching system drawn from such data;

(B) Identification of the limits of use of the data, to include the magnitude and configuration of slopes determined to be safe;

(C) Explanatory information as may be necessary to aid the user in making a correct selection of a protective system from the data.

(iii) 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 the Secretary upon request.

(4) *Option (4)—Design by a registered professional engineer.* (i) Sloping and benching systems not utilizing Option (1) or Option (2) or Option (3) under paragraph (b) of this section shall be approved by a registered professional engineer.

(ii) Designs shall be in written form and shall include at least the following:

(A) The magnitude of the slopes that were determined to be safe for the particular project;

(B) The configurations that were determined to be safe for the particular project; and

(C) The identity of the registered professional engineer approving 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 need not be at the jobsite, but a copy shall be made available to the Secretary upon request.

(c) *Design of support systems, shield systems, and other protective systems.* Designs of support systems shield systems, and other protective systems shall be selected and constructed by the employer or his designee and shall be in accordance with the requirements of paragraph (c)(1); or, in the alternative, paragraph (c)(2); or, in the alternative, paragraph (c)(3); or, in the alternative, paragraph (c)(4) as follows:

(1) *Option (1)—Designs using appendices A, C and D.* Designs for timber shoring in trenches shall be determined in accordance with the conditions and requirements set forth in appendices A and C to this subpart. Designs for aluminum hydraulic shoring shall be in accordance with paragraph (c)(2) of this section, but if manufacturer's tabulated data cannot be utilized, designs shall be in accordance with appendix D.

(2) *Option (2)—Designs Using Manufacturer's Tabulated Data.* (i) Design 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.

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

(iii) 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 the Secretary upon request.

(3) *Option (3)—Designs using other tabulated data.* (i) Designs of support systems, shield systems, or other protective systems shall be selected from and be in accordance with tabulated data, such as tables and charts.

(ii) The tabulated data shall be in written form and include all of the following:

(A) Identification of the parameters that affect the selection of a protective system drawn from such data;

(B) Identification of the limits of use of the data;

(C) Explanatory information as may be necessary to aid the user in making a correct selection of a protective system from the data.

(iii) 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 the Secretary upon request.

(4) *Option (4)—Design by a registered professional engineer.* (i) Support systems, shield systems, and other protective systems not utilizing Option 1, Option 2 or Option 3, above, shall be approved by a registered professional engineer.

(ii) Designs shall be in written form and shall include the following:

(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 approving the design.

(iii) 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 of the design shall be made available to the Secretary upon request.

(d) *Materials and equipment.* (1) Materials and equipment used for protective systems shall be free from damage or defects that might impair their proper function.

(2) 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.

(3) 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. 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 being returned to service.

(e) *Installation and removal of support—*(1) *General.* (i) Members of support systems shall be securely connected together to prevent sliding, falling, kickouts, or other predictable failure.

(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 system.

(iii) Individual members of support systems shall not be subjected to loads exceeding those which those members were designed to withstand.

(iv) Before temporary removal of individual members begins, 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.

(v) Removal shall begin at, and progress from, the bottom of the excavation. Members shall be released slowly so as to note any indication of possible failure of the remaining members of the structure or possible cave-in of the sides of the excavation.

(vi) Backfilling shall progress together with the removal of support systems from excavations.

(2) *Additional requirements for support systems for trench excavations.* (i) Excavation of material to a level no greater than 2 feet (.61 m) 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.

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

(f) *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.

(g) *Shield systems*—(1) *General.* (i) Shield systems shall not be subjected to loads exceeding those which the system was designed to withstand.

(ii) 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.

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

(iv) Employees shall not be allowed in shields when shields are being installed, removed, or moved vertically.

(2) *Additional requirement for shield systems used in trench excavations.* Excavations of earth material to a level not greater than 2 feet (.61 m) 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 or below the bottom of the shield.

Appendix A to Subpart P

Soil Classification

(a) *Scope and application*—(1) *Scope.* This appendix describes a method of classifying soil and rock deposits based on site and environmental conditions, and on the structure and composition of the earth deposits. The appendix contains definitions, sets forth requirements, and describes acceptable visual and manual tests for use in classifying soils.

(2) *Application.* This appendix applies when a sloping or benching system is designed in accordance with the requirements set forth in § 1926.652(b)(2) as a method of protection for employees from cave-ins. This appendix also applies when timber shoring for excavations is designed as a method of protection from cave-ins in accordance with appendix C to subpart P of part 1926, and when aluminum hydraulic shoring is designed in accordance with appendix D. This Appendix also applies if other protective systems are designed and selected for use from data prepared in accordance with the requirements set forth in § 1926.652(c), and the use of the data is predicated on the use of the soil classification system set forth in this appendix.

(b) *Definitions.* The definitions and examples given below are based on, in whole or in part, the following: American Society for Testing Materials (ASTM) Standards D653–85 and D2488; The Unified Soils Classification System, The U.S. Department of Agriculture (USDA) Textural Classification Scheme; and The National Bureau of Standards Report BSS–121.

Cemented soil means a soil in which the particles are held together by a chemical agent, such as calcium carbonate, such that a hand-size sample cannot be crushed into powder or individual soil particles by finger pressure.

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 sideslopes, and is plastic when moist. Cohesive soil is hard to break up when dry, and exhibits significant cohesion when submerged. Cohesive soils include clayey silt, sandy clay, silty clay, clay and organic clay.

Dry soil means soil that does not exhibit visible signs of moisture content.

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.

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.

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.

Moist soil means a condition in which a soil looks and feels damp. Moist cohesive soil can easily be shaped into a ball and rolled into small diameter threads before crumbling. Moist granular soil that contains some cohesive material will exhibit signs of cohesion between particles.

Plastic means a property of a soil which allows the soil to be deformed or molded without cracking, or appreciable volume change.

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 such as a pocket penetrometer or sheer vane.

Soil classification system means, for the purpose of this subpart, 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 environmental conditions of exposure.

Stable rock means natural solid mineral matter that can be excavated with vertical sides and remain intact while exposed.

Submerged soil means soil which is underwater or is free seeping.

Type A means cohesive soils with an unconfined compressive strength of 1.5 ton per square foot (tsf) (144 kPa) 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 soils such as caliche and hardpan are also considered Type A. However, no soil is Type A if:

(i) The soil is fissured; or

(ii) The soil is subject to vibration from heavy traffic, pile driving, or similar effects; or

(iii) The soil has been previously disturbed; or

(iv) 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

(v) The material is subject to other factors that would require it to be classified as a less stable material.

Type B means:

(i) Cohesive soil with an unconfined compressive strength greater than 0.5 tsf (48 kPa) but less than 1.5 tsf (144 kPa); or

(ii) Granular cohesionless soils including: angular gravel (similar to crushed rock), silt, silt loam, sandy loam and, in some cases, silty clay loam and sandy clay loam.

(iii) Previously disturbed soils except those which would otherwise be classed as Type C soil.

(iv) Soil that meets the unconfined compressive strength or cementation requirements for Type A, but is fissured or subject to vibration; or

(v) Dry rock that is not stable; or

(vi) 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.

Type C means:

(i) Cohesive soil with an unconfined compressive strength of 0.5 tsf (48 kPa) or less; or

(ii) Granular soils including gravel, sand, and loamy sand; or

(iii) Submerged soil or soil from which water is freely seeping; or

(iv) Submerged rock that is not stable, or

(v) Material in a sloped, layered system where the layers dip into the excavation or a slope of four horizontal to one vertical (4H:1V) or steeper.

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.

Wet soil means soil that contains significantly more moisture than moist soil, but in such a range of values that cohesive material will slump or begin to flow when vibrated. Granular material that would exhibit cohesive properties when moist will lose those cohesive properties when wet.

(c) *Requirements*—(1) *Classification of soil and rock deposits.* Each soil and rock deposit shall be classified by a competent person as Stable Rock, Type A, Type B, or Type C in accordance with the definitions set forth in paragraph (b) of this appendix.

(2) *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. Such analyses

shall be conducted by a competent person using tests described in paragraph (d) below, or in other recognized methods of soil classification and testing such as those adopted by the America Society for Testing Materials, or the U.S. Department of Agriculture textural classification system.

(3) *Visual and manual analyses.* The visual and manual analyses, such as those noted as being acceptable in paragraph (d) of this appendix, shall be designed and 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.

(4) *Layered systems.* In a layered system, the system shall be classified in accordance with its weakest layer. However, each layer may be classified individually where a more stable layer lies under a less stable layer.

(5) *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 as necessary to reflect the changed circumstances.

(d) *Acceptable visual and manual tests.*—(1) *Visual tests.* 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.

(i) 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 primarily of coarse-grained sand or gravel is granular material.

(ii) 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.

(iii) 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.

(iv) Observe the area adjacent to the excavation and the excavation itself for evidence of existing utility and other underground structures, and to identify previously disturbed soil.

(v) 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.

(vi) Observe the area adjacent to the excavation and the sides of the opened excavation for evidence of surface water, water seeping from the sides of the excavation, or the location of the level of the water table.

(vii) 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 tests.* 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.

(i) *Plasticity.* Mold a moist or wet sample of soil into a ball and attempt to roll it into threads as thin as ⅛-inch in diameter. Cohesive material can be successfully rolled into threads without crumbling. For example, if at least a two inch (50 mm) length of ⅛-inch thread can be held on one end without tearing, the soil is cohesive.

(ii) *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.

(iii) *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 American Society for Testing and Materials (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 be readily 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.

(iv) *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 shearvane.

(v) *Drying test.* The basic purpose of the drying test is to differentiate between cohesive material with fissures, unfissured cohesive material, and granular material. The procedure for the drying test involves drying a sample of soil that is approximately one inch thick (2.54 cm) and six inches (15.24 cm) in diameter until it is thoroughly dry:

(A) If the sample develops cracks as it dries, significant fissures are indicated.

(B) 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 a unfissured cohesive material and the unconfined compressive strength should be determined.

(C) If a sample breaks easily by hand, it is either a 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.

Appendix B to Subpart P

Sloping and Benching

(a) *Scope and application.* This appendix contains specifications for sloping and benching when used as methods of protecting employees working in excavations from cave-ins. The requirements of this appendix apply when the design of sloping and benching protective systems is to be performed in accordance with the requirements set forth in § 1926.652(b)(2).

(b) *Definitions.*

Actual slope means the slope to which an excavation face is excavated.

Distress means that the soil is in a condition where a cave-in is imminent or is likely to occur. Distress is evidenced by such phenomena as the development of fissures in the face of or adjacent to an open excavation; the subsidence of the edge of an excavation; the slumping of material from the face or the bulging or heaving of material from the bottom of an excavation; the spalling of material from the face of an excavation; and ravelling, i.e., small amounts of material such as pebbles or little clumps of material suddenly separating from the face of an excavation and trickling or rolling down into the excavation.

Maximum allowable slope means the steepest incline of an excavation face that is acceptable for the most favorable site conditions as protection against cave-ins, and is expressed as the ratio of horizontal distance to vertical rise (H:V).

Short term exposure means a period of time less than or equal to 24 hours that an excavation is open.

(c) *Requirements*—(1) *Soil classification.* Soil and rock deposits shall be classified in accordance with appendix A to subpart P of part 1926.

(2) *Maximum allowable slope.* The maximum allowable slope for a soil or rock deposit shall be determined from Table B–1 of this appendix.

(3) *Actual slope.* (i) The actual slope shall not be steeper than the maximum allowable slope.

(ii) 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 ½ horizontal to one vertical (½H:1V) less steep than the maximum allowable slope.

(iii) 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. Surcharge loads from adjacent structures shall be evaluated in accordance with § 1926.651(i).

(4) *Configurations.* Configurations of sloping and benching systems shall be in accordance with Figure B–1.

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 TYPE A [2] TYPE B TYPE C	VERTICAL (90°) 3/4 : 1 (53°) 1:1 (45°) 1½: 1 (34°)

NOTES:

1. Numbers shown in parentheses next to maximum allowable slopes are angles expressed in degrees from the horizontal. Angles have been rounded off.
2. A short-term maximum allowable slope of 1/2H:1V (63°) 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°).
3. Sloping or benching for excavations greater than 20 feet deep shall be designed by a registered professional engineer.

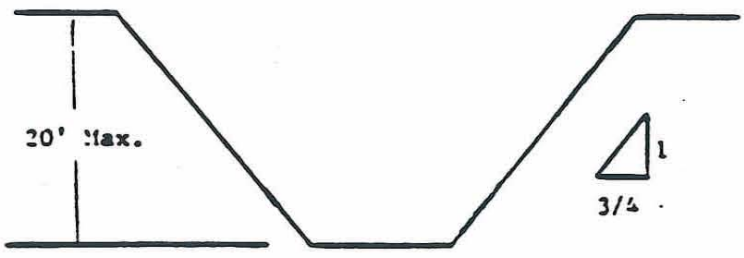
Figure B-1

Slope Configurations

(All slopes stated below are in the horizontal to vertical ratio)

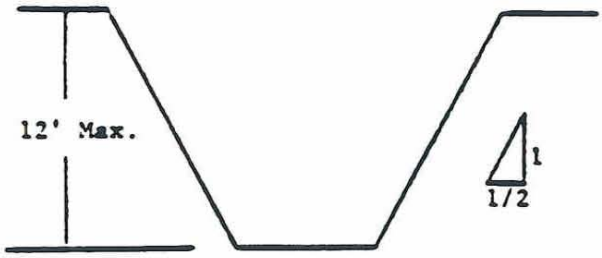
B-1.1 Excavations made in Type A soil.

1. All simple slope excavation 20 feet or less in depth shall have a maximum allowable slope of ¾:1.



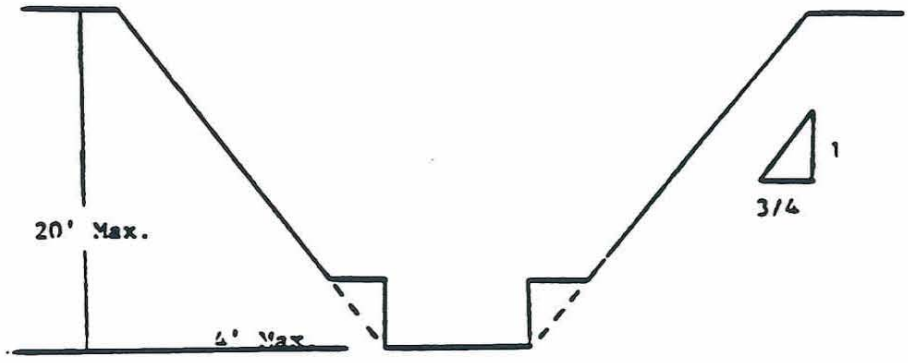
Simple Slope—General

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 ½:1.

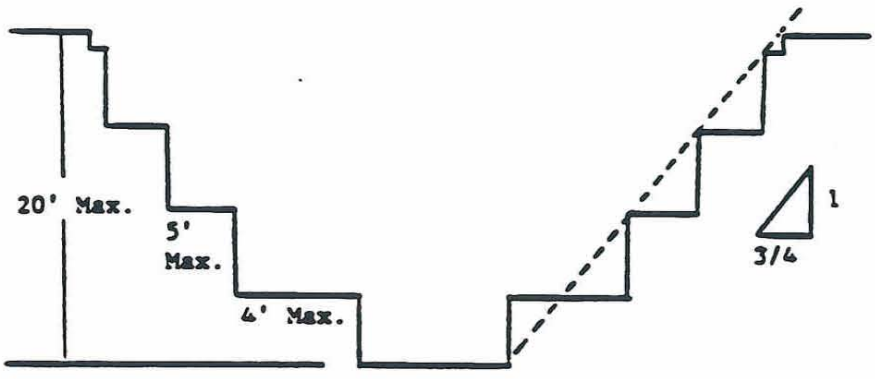


Simple Slope—Short Term

2. All benched excavations 20 feet or less in depth shall have a maximum allowable slope of ¾ to 1 and maximum bench dimensions as follows:

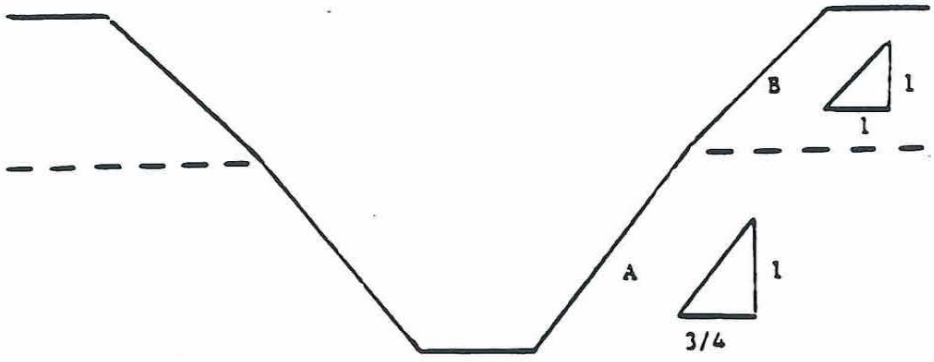


Simple Bench

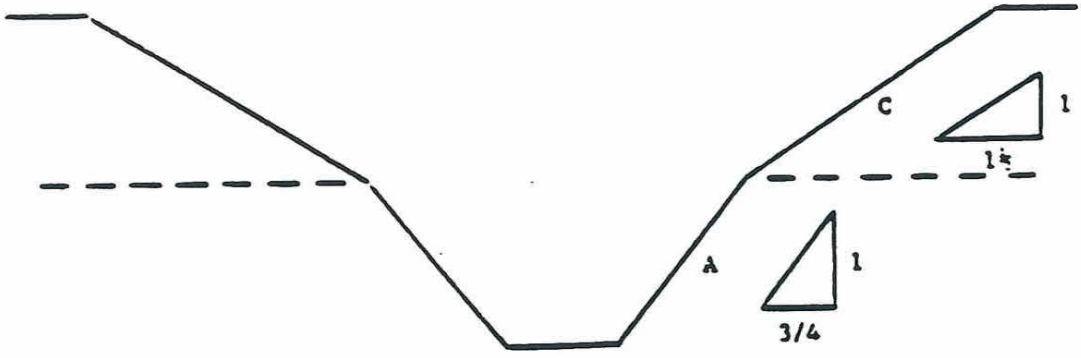


Multiple Bench

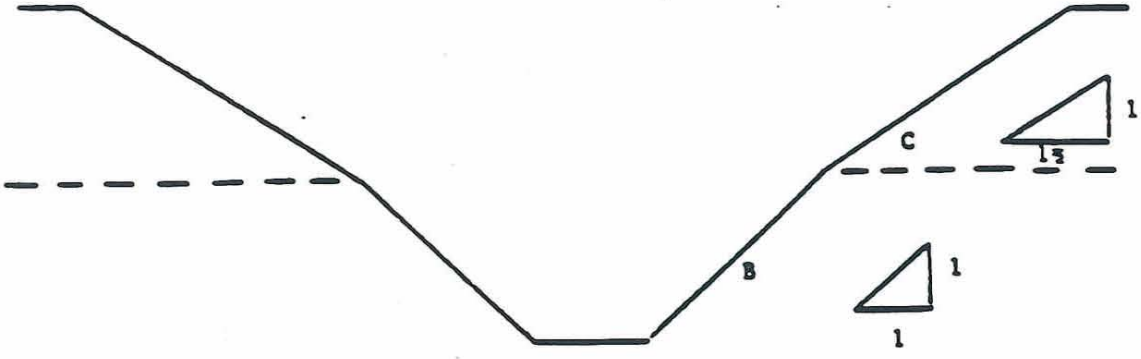
3. All excavations 8 feet or less in depth which have unsupported vertically sided lower portions shall have a maximum vertical side of 3½ feet.



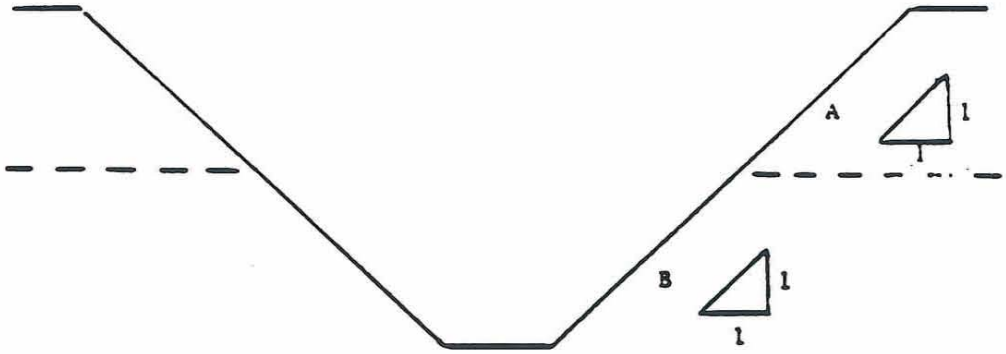
B OVER A



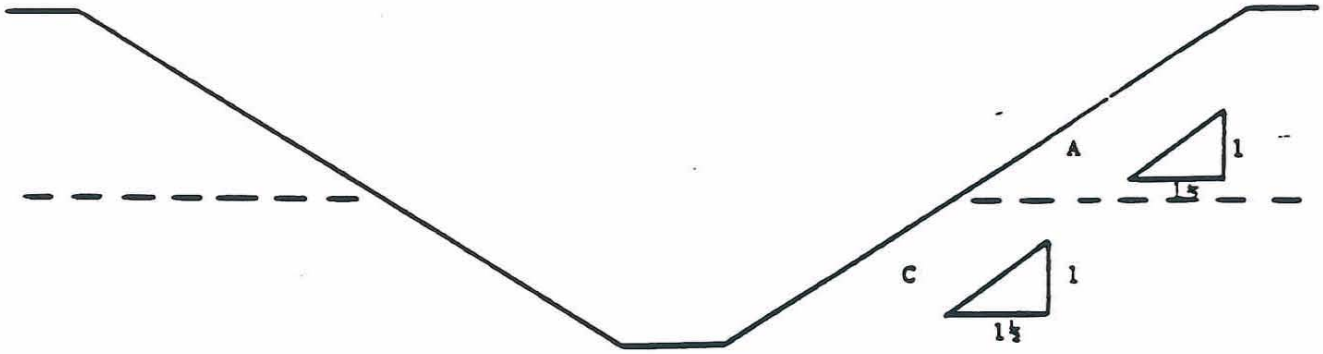
C OVER A



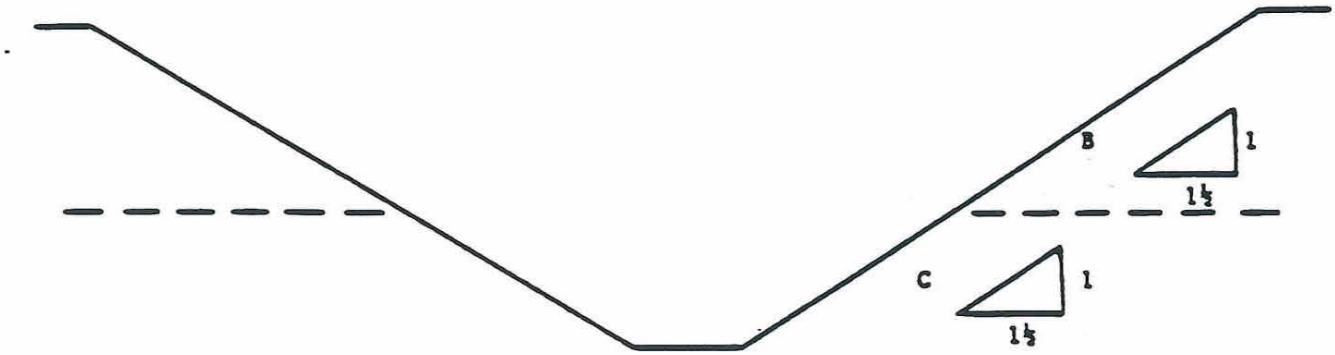
C OVER B



A OVER B



A OVER C



B OVER C

2. All other sloped excavations shall be in accordance with the other options permitted in § 1926.652(b).

Appendix C to Subpart P

Timber Shoring for Trenches

(a) *Scope.* This appendix contains information that can be used timber shoring is provided as a method of protection from cave-ins in trenches that do not exceed 20 feet (6.1 m) in depth. This appendix must be used when design of timber shoring protective systems is to be performed in accordance with § 1926.652(c)(1). Other timber shoring configurations; other systems of support such as hydraulic and pneumatic systems; and other protective systems such as sloping, benching, shielding, and freezing systems must be designed in accordance with the requirements set forth in § 1926.652(b) and § 1926.652(c).

(b) *Soil Classification.* In order to use the data presented in this appendix, the soil type or types in which the excavation is made must first be determined using the soil

classification method set forth in appendix A of subpart P of this part.

(c) *Presentation of Information.* Information is presented in several forms as follows:

(1) Information is presented in tabular form in Tables C–1.1, C–1.2, and C–1.3, and Tables C–2.1, C–2.2 and C–2.3 following paragraph (g) of the appendix. Each table presents the minimum sizes of timber members to use in a shoring system, and each table contains data only for the particular soil type in which the excavation or portion of the excavation is made. The data are arranged to allow the user the flexibility to select from among several acceptable configurations of members based on varying the horizontal spacing of the crossbraces. Stable rock is exempt from shoring requirements and therefore, no data are presented for this condition.

(2) Information concerning the basis of the tabular data and the limitations of the data is presented in paragraph (d) of this appendix, and on the tables themselves.

(3) Information explaining the use of the tabular data is presented in paragraph (e) of this appendix.

(4) Information illustrating the use of the tabular data is presented in paragraph (f) of this appendix.

(5) Miscellaneous notations regarding Tables C–1.1 through C–1.3 and Tables C–2.1 through C–2.3 are presented in paragraph (g) of this Appendix.

(d) *Basis and limitations of the data.*—(1) *Dimensions of timber members.* (i) The sizes of the timber members listed in Tables C–1.1 through C–1.3 are taken from the National Bureau of Standards (NBS) report, "Recommended Technical Provisions for Construction Practice in Shoring and Sloping of Trenches and Excavations." In addition, where NBS did not recommend specific sizes of members, member sizes are based on an analysis of the sizes required for use by existing codes and on empirical practice.

(ii) The required dimensions of the members listed in Tables C–1.1 through C–1.3 refer to actual dimensions and not nominal dimensions of the timber. Employers wanting to use nominal size shoring are directed to Tables C–2.1 through C–2.3, or have this choice under § 1926.652(c)(3), and are referred to The Corps of Engineers, The Bureau of Reclamation or data from other acceptable sources.

(2) *Limitation of application.* (i) It is not intended that the timber shoring specification apply to every situation that may be experienced in the field. These data were developed to apply to the situations that are most commonly experienced in current trenching practice. Shoring systems for use in situations that are not covered by the data in this appendix must be designed as specified in § 1926.652(c).

(ii) When any of the following conditions are present, the members specified in the tables are not considered adequate. Either an alternate timber shoring system must be designed or another type of protective system designed in accordance with § 1926.652.

(A) When loads imposed by structures or by stored material adjacent to the trench weigh in excess of the load imposed by a two-foot soil surcharge. The term "adjacent" as used here means the area within a horizontal distance from the edge of the trench equal to the depth of the trench.

(B) When vertical loads imposed on cross braces exceed a 240-pound gravity load distributed on a one-foot section of the center of the crossbrace.

(C) When surcharge loads are present from equipment weighing in excess of 20,000 pounds.

(D) When only the lower portion of a trench is shored and the remaining portion of the trench is sloped or benched unless: The sloped portion is sloped at an angle less steep than three horizontal to one vertical; or the members are selected from the tables for use at a depth which is determined from the top of the overall trench, and not from the toe of the sloped portion.

(e) *Use of Tables.* The members of the shoring system that are to be selected using this information are the cross braces, the uprights, and the wales, where wales are required. Minimum sizes of members are specified for use in different types of soil. There are six tables of information, two for each soil type. The soil type must first be determined in accordance with the soil classification system described in appendix A to subpart P of part 1926. Using the appropriate table, the selection of the size and spacing of the members is then made. The selection is based on the depth and width of the trench where the members are to be installed and, in most instances, the selection is also based on the horizontal spacing of the crossbraces. Instances where a choice of horizontal spacing of crossbracing is available, the horizontal spacing of the crossbraces must be chosen by the user before the size of any member can be determined. When the soil type, the width and depth of the trench, and the horizontal spacing of the crossbraces are known, the size and vertical spacing of the crossbraces, the size and vertical spacing of the wales, and the size and horizontal spacing of the uprights can be read from the appropriate table.

(f) *Examples to Illustrate the Use of Tables C–1.1 through C–1.3.*

(1) *Example 1.*

A trench dug in Type A soil is 13 feet deep and five feet wide.

From *Table C–1.1*, for acceptable arrangements of timber can be used.

Arrangement #1

Space 4×4 crossbraces at six feet horizontally and four feet vertically.

Wales are not required.

Space 3×8 uprights at six feet horizontally. This arrangement is commonly called "skip shoring."

Arrangement #2

Space 4×6 crossbraces at eight feet horizontally and four feet vertically.

Space 8×8 wales at four feet vertically.

Space 2×6 uprights at four feet horizontally.

Arrangement #3

Space 6×6 crossbraces at 10 feet horizontally and four feet vertically.

Space 8×10 wales at four feet vertically.

Space 2×6 uprights at five feet horizontally.

Arrangement #4

Space 6×6 crossbraces at 12 feet horizontally and four feet vertically.

Space 10×10 wales at four feet vertically.

Spaces 3×8 uprights at six feet horizontally.

(2) *Example 2.*

A trench dug in Type B soil in 13 feet deep and five feet wide. From Table C–1.2 three acceptable arrangements of members are listed.

Arrangement #1

Space 6×6 crossbraces at six feet horizontally and five feet vertically.

Space 8×8 wales at five feet vertically.

Space 2×6 uprights at two feet horizontally.

Arrangement #2

Space 6×8 crossbraces at eight feet horizontally and five feet vertically.

Space 10×10 wales at five feet vertically.

Space 2×6 uprights at two feet horizontally.

Arrangement #3

Space 8×8 crossbraces at 10 feet horizontally and five feet vertically.

Space 10×12 wales at five feet vertically.

Space 2×6 uprights at two feet vertically.

(3) *Example 3.*

A trench dug in Type C soil is 13 feet deep and five feet wide.

From Table C–1.3 two acceptable arrangements of members can be used.

Arrangement #1

Space 8×8 crossbraces at six feet horizontally and five feet vertically.

Space 10×12 wales at five feet vertically.

Position 2×6 uprights as closely together as possible.

If water must be retained use special tongue and groove uprights to form tight sheeting.

Arrangement #2

Space 8×10 crossbraces at eight feet horizontally and five feet vertically.

Space 12×12 wales at five feet vertically.

Position 2×6 uprights in a close sheeting configuration unless water pressure must be resisted. Tight sheeting must be used where water must be retained.

(4) *Example 4.*

A trench dug in Type C soil is 20 feet deep and 11 feet wide. The size and spacing of members for the section of trench that is over 15 feet in depth is determined using Table C–1.3. Only one arrangement of members is provided.

Space 8×10 crossbraces at six feet horizontally and five feet vertically.

Space 12×12 wales at five feet vertically.

Use 3×6 tight sheeting.

Use of Tables C–2.1 through C–2.3 would follow the same procedures.

(g) *Notes for all Tables.*

1. Member sizes at spacings other than indicated are to be determined as specified in § 1926.652(c), "Design of Protective Systems."

2. When conditions are saturated or submerged use Tight Sheeting. Tight Sheeting refers to the use of specially-edged timber planks (e.g., tongue and groove) at least three inches thick, steel sheet piling, or similar construction that when driven or placed in position provide a tight wall to resist the lateral pressure of water and to prevent the loss of backfill material. Close Sheeting refers to the placement of planks side-by-side allowing as little space as possible between them.

3. All spacing indicated is measured center to center.

4. Wales to be installed with greater dimension horizontal.

5. If the vertical distance from the center of the lowest crossbrace to the bottom of the trench exceeds two and one-half feet, uprights shall be firmly embedded or a mudsill shall be used. Where uprights are embedded, the vertical distance from the center of the lowest crossbrace to the bottom of the trench shall not exceed 36 inches. When mudsills are used, the vertical distance shall not exceed 42 inches. Mudsills are wales that are installed at the toe of the trench side.

6. Trench jacks may be used in lieu of or in combination with timber crossbraces.

7. Placement of crossbraces. When the vertical spacing of crossbraces is four feet, place the top crossbrace no more than two feet below the top of the trench. When the vertical spacing of crossbraces is five feet, place the top crossbrace no more than 2.5 feet below the top of the trench.

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TABLE C-1.1

TIMBER TRENCH SHORING -- MINIMUM TIMBER REQUIREMENTS *

SOIL TYPE A $P_a = 25 \times H + 72$ psf (2 ft Surcharge)

DEPTH OF TRENCH (FEET)	SIZE (ACTUAL) AND SPACING OF MEMBERS **													
	CROSS BRACES						WALES		UPRIGHTS					
	HORIZ. SPACING (FEET)	WIDTH OF TRENCH (FEET)					VERT. SPACING (FEET)	SIZE (IN)	VERT. 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	4X4	4X4	4X6	6X6	6X6	4	Not Req'd	---				2X6	
	UP TO 8	4X4	4X4	4X6	6X6	6X6	4	Not Req'd	---					2X8
	UP TO 10	4X6	4X6	4X6	6X6	6X6	4	8X8	4			2X6		
	UP TO 12	4X6	4X6	6X6	6X6	6X6	4	8X8	4				2X6	
10 TO 15	UP TO 6	4X4	4X4	4X6	6X6	6X6	4	Not Req'd	---				3X8	
	UP TO 8	4X6	4X6	6X6	6X6	6X6	4	8X8	4		2X6			
	UP TO 10	6X6	6X6	6X6	6X8	6X8	4	8X10	4			2X6		
	UP TO 12	6X6	6X6	6X6	6X8	6X8	4	10X10	4				3X8	
15 TO 20	UP TO 6	6X6	6X6	6X6	6X8	6X8	4	6X8	4	3X6				
	UP TO 8	6X6	6X6	6X6	6X8	6X8	4	8X8	4	3X6				
	UP TO 10	8X8	8X8	8X8	8X8	8X10	4	8X10	4	3X6				
	UP TO 12	8X8	8X8	8X8	8X8	8X10	4	10X10	4	3X6				
OVER 20	SEE NOTE 1													

* Mixed oak or equivalent with a bending strength not less than 850 psi.
** Manufactured members of equivalent strength may by substituted for wood.

TABLE C-1.2

TIMBER TRENCH SHORING -- MINIMUM TIMBER REQUIREMENTS *

SOIL TYPE B $P_a = 45 \times H + 72$ psf (2 ft. Surcharge)

DEPTH OF TRENCH (FEET)	SIZE (ACTUAL) AND SPACING OF MEMBERS**													
	CROSS BRACES							WALES		UPRIGHTS				
	HORIZ. SPACING (FEET)	WIDTH OF TRENCH (FEET)					VERT. SPACING (FEET)	SIZE (IN)	VERT. 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	4X6	4X6	6X6	6X6	6X6	5	6X8	5			2X6		
	UP TO 8	6X6	6X6	6X6	6X8	6X8	5	8X10	5			2X6		
	UP TO 10	6X6	6X6	6X6	6X8	6X8	5	10X10	5			2X6		
	See Note 1													
10 TO 15	UP TO 6	6X6	6X6	6X6	6X8	6X8	5	8X8	5		2X6			
	UP TO 8	6X8	6X8	6X8	8X8	8X8	5	10X10	5		2X6			
	UP TO 10	8X8	8X8	8X8	8X8	8X10	5	10X12	5		2X6			
	See Note 1													
15 TO 20	UP TO 6	6X8	6X8	6X8	8X8	8X8	5	8X10	5	3X6				
	UP TO 8	8X8	8X8	8X8	8X8	8X10	5	10X12	5	3X6				
	UP TO 10	8X10	8X10	8X10	8X10	10X10	5	12X12	5	3X6				
	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 by substituted for wood.

TABLE C-1.3

TIMBER TRENCH SHORING -- MINIMUM TIMBER REQUIREMENTS *

SOIL TYPE C P_a = 80 X H + 72 psf (2 ft. Surcharge)

DEPTH OF TRENCH (FEET)	SIZE (ACTUAL) AND SPACING OF MEMBERS**													
	CROSS BRACES									UPRIGHTS				
	HORIZ. SPACING (FEET)	WIDTH OF TRENCH (FEET)					VERT. SPACING (FEET)	SIZE (IN.)	VERT. SPACING (FEET)	MAXIMUM ALLOWABLE HORIZONTAL SPACING (FEET) (See Note 2)				
		UP TO 4	UP TO 6	UP TO 9	UP TO 12	UP TO 15				CLOSE				
5 TO 10	UP TO 6	6X8	6X8	6X8	8X8	8X8	5	8X10	5	2X6				
	UP TO 8	8X8	8X8	8X8	8X8	8X10	5	10X12	5	2X6				
	UP TO 10	8X10	8X10	8X10	8X10	10X10	5	12X12	5	2X6				
	See Note 1													
10 TO 15	UP TO 6	8X8	8X8	8X8	8X8	8X10	5	10X12	5	2X6				
	UP TO 8	8X10	8X10	8X10	8X10	10X10	5	12X12	5	2X6				
	See Note 1													
	See Note 1													
15 TO 20	UP TO 6	8X10	8X10	8X10	8X10	10X10	5	12X12	5	3X6				
	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.

TABLE C-2.2

TIMBER TRENCH SHORING -- MINIMUM TIMBER REQUIREMENTS *

SOIL TYPE B P_a = 45 X H + 72 psf (2 ft. Surcharge)

DEPTH OF TRENCH (FEET)	SIZE (S4S) AND SPACING OF MEMBERS **												
	CROSS BRACES						WALES		UPRIGHTS				
	HORIZ. SPACING (FEET)	WIDTH OF TRENCH (FEET)					VERT. SPACING (FEET)	SIZE (IN)	VERT. 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	4	6
5 TO 10	UP TO 6	4X6	4X6	4X6	6X6	6X6	5	6X8	5			3X12 4X8		4X12
	UP TO 8	4X6	4X6	6X6	6X6	6X6	5	8X8	5		3X8		4X8	
	UP TO 10	4X6	4X6	6X6	6X6	6X8	5	8X10	5			4X8		
	See Note 1													
10 TO 15	UP TO 6	6X6	6X6	6X6	6X8	6X8	5	8X8	5	3X6	4X10			
	UP TO 8	6X8	6X8	6X8	8X8	8X8	5	10X10	5	3X6	4X10			
	UP TO 10	6X8	6X8	8X8	8X8	8X8	5	10X12	5	3X6	4X10			
	See Note 1													
15 TO 20	UP TO 6	6X8	6X8	6X8	6X8	8X8	5	8X10	5	4X6				
	UP TO 8	6X8	6X8	6X8	8X8	8X8	5	10X12	5	4X6				
	UP TO 10	8X8	8X8	8X8	8X8	8X8	5	12X12	5	4X6				
	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.

Appendix D to Subpart P

Aluminum Hydraulic Shoring for Trenches

(a) *Scope.* This appendix contains information that can be used when aluminum hydraulic shoring is provided as a method of protection against cave-ins in trenches that do not exceed 20 feet (6.1m) in depth. This appendix must be used when design of the aluminum hydraulic protective system cannot be performed in accordance with § 1926.652(c)(2).

(b) *Soil Classification.* In order to use data presented in this appendix, the soil type or types in which the excavation is made must first be determined using the soil classification method set forth in appendix A of subpart P of part 1926.

(c) *Presentation of Information.* Information is presented in several forms as follows:

(1) Information is presented in tabular form in Tables D–1.1, D–1.2, D–1.3 and E–1.4. Each table presents the maximum vertical and horizontal spacings that may be used with various aluminum member sizes and various hydraulic cylinder sizes. Each table contains data only for the particular soil type in which the excavation or portion of the excavation is made. Tables D–1.1 and D–1.2 are for vertical shores in Types A and B soil. Tables D–1.3 and D1.4 are for horizontal waler systems in Types B and C soil.

(2) Information concerning the basis of the tabular data and the limitations of the data is presented in paragraph (d) of this appendix.

(3) Information explaining the use of the tabular data is presented in paragraph (e) of this appendix.

(4) Information illustrating the use of the tabular data is presented in paragraph (f) of this appendix.

(5) Miscellaneous notations (footnotes) regarding Table D–1.1 through D–1.4 are presented in paragraph (g) of this appendix.

(6) Figures, illustrating typical installations of hydraulic shoring, are included just prior to the Tables. The illustrations page is entitled "Aluminum Hydraulic Shoring; Typical Installations."

(d) *Basis and limitations of the data.*

(1) Vertical shore rails and horizontal wales are those that meet the Section Modulus requirements in the D–1 Tables. Aluminum material is 6061–T6 or material of equivalent strength and properties.

(2) Hydraulic cylinders specifications. (i) 2-inch cylinders shall be a minimum 2-inch inside diameter with a minimum safe working capacity of no less than 18,000 pounds axial compressive load at maximum extension. Maximum extension is to include full range of cylinder extensions as recommended by product manufaturer.

(ii) 3-inch cylinders shall be a minimum 3-inch inside diameter with a safe working capacity of not less than 30,000 pounds axial compressive load at extensions as recommended by product manufacturer.

(3) Limitation of application.

(i) It is not intended that the aluminum hydraulic specification apply to every situation that may be experienced in the field. These data were developed to apply to the situations that are most commonly experienced in current trenching practice. Shoring systems for use in situations that are not covered by the data in this appendix must be otherwise designed as specified in § 1926.652(c).

(ii) When any of the following conditions are present, the members specified in the Tables are not considered adequate. In this case, an alternative aluminum hydraulic shoring system or other type of protective system must be designed in accordance with § 1926.652.

(A) When vertical loads imposed on cross braces exceed a 100 Pound gravity load distributed on a one foot section of the center of the hydraulic cylinder.

(B) When surcharge loads are present from equipment weighing in excess of 20,000 pounds.

(C) When only the lower portion or a trench is shored and the remaining portion of the trench is sloped or benched unless: The sloped portion is sloped at an angle less steep than three horizontal to one vertical; or the members are selected from the tables for use at a depth which is determined from the top of the overall trench, and not from the toe of the sloped portion.

(e) *Use of Tables D–1.1, D–1.2, D–1.3 and D–1.4.* The members of the shoring system that are to be selected using this information are the hydraulic cylinders, and either the vertical shores or the horizontal wales. When a waler system is used the vertical timber sheeting to be used is also selected from these tables. The Tables D–1.1 and D–1.2 for vertical shores are used in Type A and B soils that do not require sheeting. Type B soils that may require sheeting, and Type C soils that always require sheeting are found in the horizontal wale Tables D–1.3 and D–1.4. The soil type must first be determined in accordance with the soil classification system described in appendix A to subpart P of part 1926. Using the appropriate table, the selection of the size and spacing of the members is made. The selection is based on the depth and width of the trench where the members are to be installed. In these tables the vertical spacing is held constant at four feet on center. The tables show the maximum horizontal spacing of cylinders allowed for each size of wale in the waler system tables, and in the vertical shore tables, the hydraulic cylinder horizontal spacing is the same as the vertical shore spacing.

(f) *Example to Illustrate the Use of the Tables:*

(1) Example 1:

A trench dug in Type A soil is 6 feet deep and 3 feet wide. From Table D–1.1: Find vertical shores and 2 inch diameter cylinders spaced 8 feet on center (o.c.) horizontally and 4 feet on center (o.c.) vertically. (See Figures 1 & 3 for typical installations.)

(2) Example 2:

A trench is dug in Type B soil that does not require sheeting, 13 feet deep and 5 feet wide. From Table D–1.2: Find vertical shores and 2 inch diameter cylinders spaced 6.5 feet o.c. horizontally and 4 feet o.c. vertically. (See Figures 1 & 3 for typical installations.)

(3) A trench is dug in Type B soil that does not require sheeting, but does experience some minor raveling of the trench face. The trench is 16 feet deep and 9 feet wide. From Table D–1.2: Find vertical shores and 2 inch diameter cylinder (with special oversleeves as designated by footnote *2) spaced 5.5 feet o.c. horizontally and 4 feet o.c. vertically, plywood (per footnote (g)(7) to the D–1 Table) should be used behind the shores. (See Figures 2 & 3 for typical installations.)

(4) Example 4: A trench is dug in previously disturbed Type B soil, with characteristics of a Type C soil, and will require sheeting. The trench is 18 feet deep and 12 feet wide. 8 foot horizontal spacing between cylinders is desired for working space. From Table D–1.3: Find horizontal wale with a section modulus of 14.0 spaced at 4 feet o.c. vertically and 3 inch diameter cylinder spaced at 9 feet maximum o.c. horizontally. 3×12 timber sheeting is required at close spacing vertically. (See Figure 4 for typical installation.)

(5) Example 5: A trench is dug in Type C soil, 9 feet deep and 4 feet wide. Horizontal cylinder spacing in excess of 6 feet is desired for working space. From Table D–1.4: Find horizontal wale with a section modulus of 7.0 and 2 inch diameter cylinders spaced at 6.5 feet o.c. horizontally. Or, find horizontal wale with a 14.0 section modulus and 3 inch diameter cylinder spaced at 10 feet o.c. horizontally. Both wales are spaced 4 feet o.c. vertically. 3×12 timber sheeting is required at close spacing vertically. (See Figure 4 for typical installation.)

(g) *Footnotes, and general notes, for Tables D–1.1, D–1.2, D–1.3, and D–1.4.*

(1) For applications other than those listed in the tables, refer to § 1926.652(c)(2) for use of manufacturer's tabulated data. For trench depths in excess of 20 feet, refer to § 1926.652(c)(2) and § 1926.652(c)(3).

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

(3) Hydraulic cylinders capacities. (i) 2 inch cylinders shall be a minimum 2-inch inside diameter with a safe working capacity of not less than 18,000 pounds axial compressive load at maximum extension. Maximum extension is to include full range of cylinder extensions as recommended by product manufacturer.

(ii) 3-inch cylinders shall be a minimum 3-inch inside diameter with a safe work capacity of not less than 30,000 pounds axial compressive load at maximum extension. Maximum extension is to include full range of cylinder extensions as recommended by product manufacturer.

(4) All spacing indicated is measured center to center.

(5) Vertical shoring rails shall have a minimum section modulus of 0.40 inch.

(6) When vertical shores are used, there must be a minimum of three shores spaced equally, horizontally, in a group.

(7) Plywood shall be 1.125 in. thick softwood or 0.75 inch. thick, 14 ply, arctic white birch (Finland form). Please note that plywood is not intended as a structural member, but only for prevention of local raveling (sloughing of the trench face) between shores.

ALUMINUM HYDRAULIC SHORING
TYPICAL INSTALLATIONS

FIGURE NO. 1
VERTICAL ALUMINUM HYDRAULIC SHORING (SPOT BRACING)

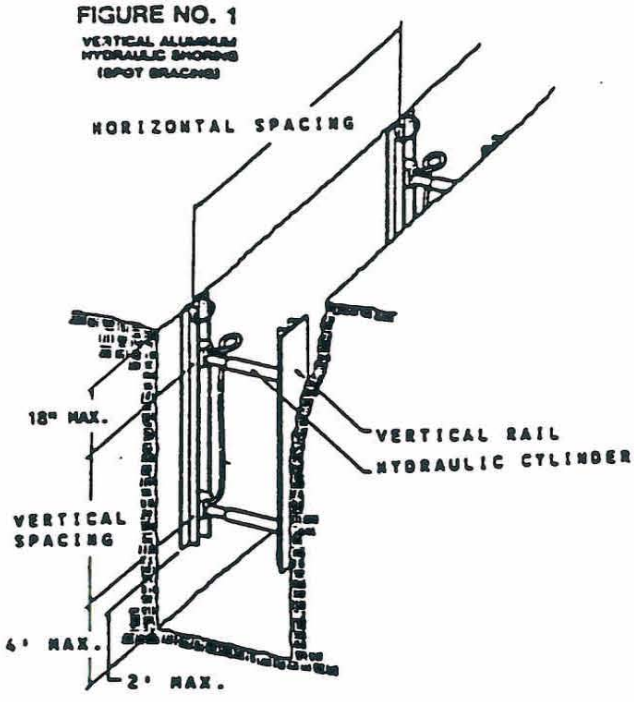

FIGURE NO. 2
VERTICAL ALUMINUM HYDRAULIC SHORING (WITH PLYWOOD)

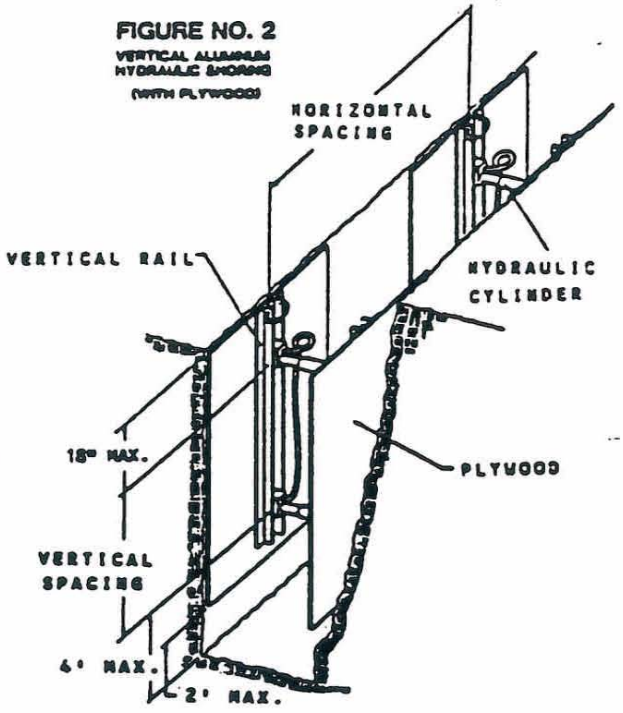

FIGURE NO. 3
VERTICAL ALUMINUM HYDRAULIC SHORING (STACKED)

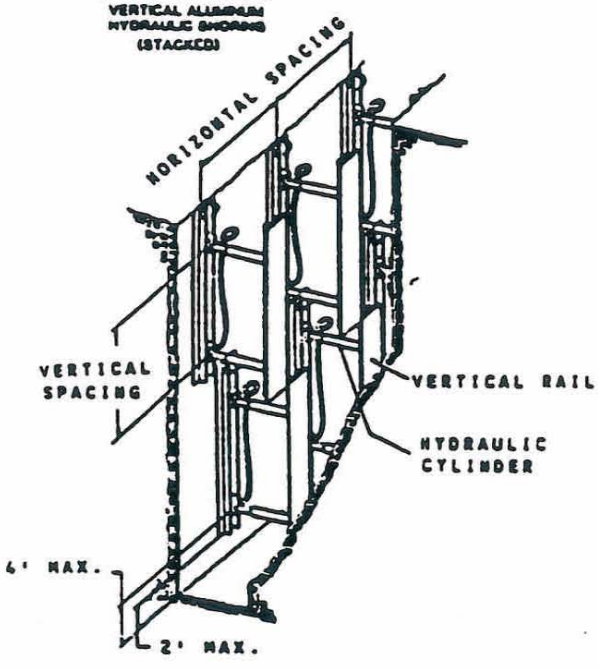

FIGURE NO. 4
ALUMINUM HYDRAULIC SHORING WALER SYSTEM (TYPICAL)

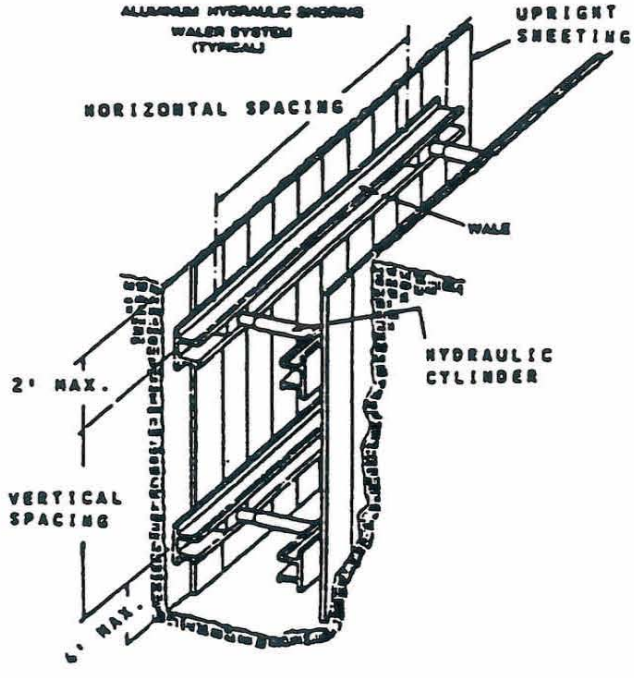

TABLE D - 1.1
ALUMINUM HYDRAULIC SHORING
VERTICAL SHORES
FOR SOIL TYPE A

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 DIAMETER	2 INCH DIAMETER NOTE (2)	3 INCH DIAMETER
OVER 10 UP TO 15	8				
OVER 15 UP TO 20	7				
OVER 20	NOTE (1)				

Footnotes to tables, and general notes on hydraulic shoring, are found in Appendix D, Item (g)

Note (1): See Appendix D, Item (g) (1)

Note (2): See Appendix D, Item (g) (2)

TABLE D - 1.2
ALUMINUM HYDRAULIC SHORING
VERTICAL SHORES
FOR SOIL TYPE B

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 DIAMETER	2 INCH DIAMETER NOTE (2)	3 INCH DIAMETER
OVER 10 UP TO 15	6.5				
OVER 15 UP TO 20	5.5				
OVER 20	NOTE (1)				

Footnotes to tables, and general notes on hydraulic shoring, are found in Appendix D, Item (g)
Note (1): See Appendix D, Item (g) (1)
Note (2): See Appendix D, Item (g) (2)

TABLE D - 1.3
ALUMINUM HYDRAULIC SHORING
WALER SYSTEMS
FOR SOIL TYPE B

DEPTH OF TRENCH (FEET)	WALES		HYDRAULIC CYLINDERS						TIMBER UPRIGHTS		
			WIDTH OF TRENCH (FEET)						MAX.HORIZ.SPACING (ON CENTER)		
	VERTICAL SPACING (FEET)	SECTION MODULUS (IN³) *	UP TO 8		OVER 8 UP TO 12		OVER 12 UP TO15		SOLID SHEET	2 FT.	3 FT.
			HORIZ. SPACING	CYLINDER DIAMETER	HORIZ. SPACING	CYLINDER DIAMETER	HORIZ. SPACING	CYLINDER DIAMETER			
OVER 5 UP TO 10	4	3.5	8.0	2 IN	8.0	2 IN NOTE(2)	8.0	3 IN	—	—	3x12
		7.0	9.0	2 IN	9.0	2 IN NOTE(2)	9.0	3 IN			
		14.0	12.0	3 IN	12.0	3 IN	12.0	3 IN			
OVER 10 UP TO 15	4	3.5	6.0	2 IN	6.0	2 IN NOTE(2)	6.0	3 IN	—	3x12	—
		7.0	8.0	3 IN	8.0	3 IN	8.0	3 IN			
		14.0	10.0	3 IN	10.0	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	3x12	—	—
		7.0	6.0	3 IN	6.0	3 IN	6.0	3 IN			
		14.0	9.0	3 IN	9.0	3 IN	9.0	3 IN			
OVER 20	NOTE (1)										

Footnotes to tables, and general notes on hydraulic shoring, are found in Appendix D, Item (g)

Notes (1): See Appendix D, item (g) (1)

Notes (2): See Appendix D, Item (g) (2)

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

TABLE D - 1.4
ALUMINUM HYDRAULIC SHORING
WALER SYSTEMS
FOR SOIL TYPE C

DEPTH OF TRENCH (FEET)	WALES		HYDRAULIC CYLINDERS						TIMBER UPRIGHTS		
			WIDTH OF TRENCH (FEET)						MAX.HORIZ SPACING (ON CENTER)		
	VERTICAL SPACING (FEET)	SECTION MODULUS (IN³) *	UP TO 8		OVER 8 UP TO 12		OVER 12 UP TO 15		SOLID SHEET	2 FT.	3 FT.
			HORIZ. SPACING	CYLINDER DIAMETER	HORIZ. SPACING	CYLINDER DIAMETER	HORIZ. SPACING	CYLINDER DIAMETER			
OVER 5 UP TO 10	4	3.5	6.0	2 IN	6.0	2 IN NOTE(2)	6.0	3 IN	3x12	—	—
		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	3x12	—	—
		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	3x12	—	—
		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)										

Footnotes to tables, and general notes on hydraulic shoring, are found in Appendix D, Item (g)

Notes (1): See Appendix D, item (g) (1)

Notes (2): See Appendix D, Item (g) (2)

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

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Appendix E to Subpart P—Alternatives to Timber Shoring

Figure 1. Aluminum Hydraulic Shoring

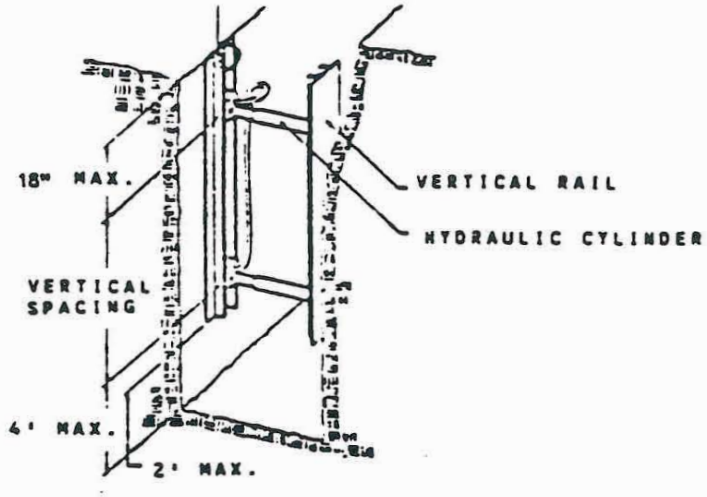
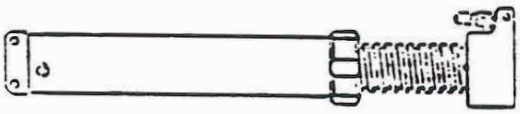


Figure 2. Pneumatic/hydraulic Shoring



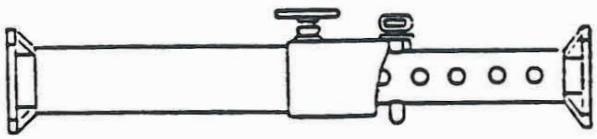


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Figure 3. Trench Jacks (Screw Jacks)

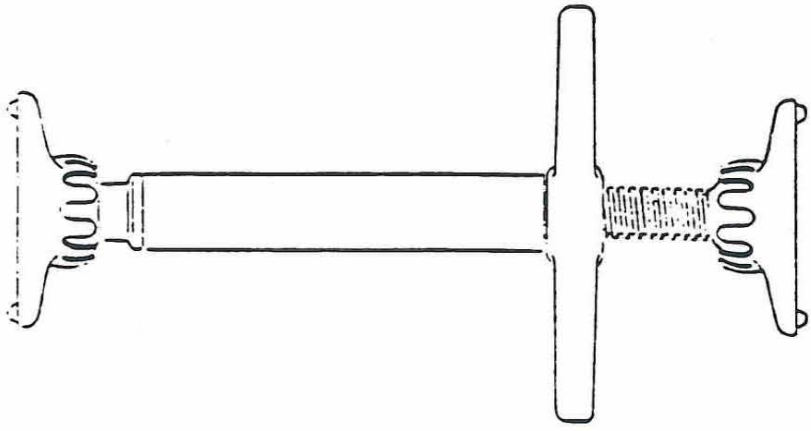
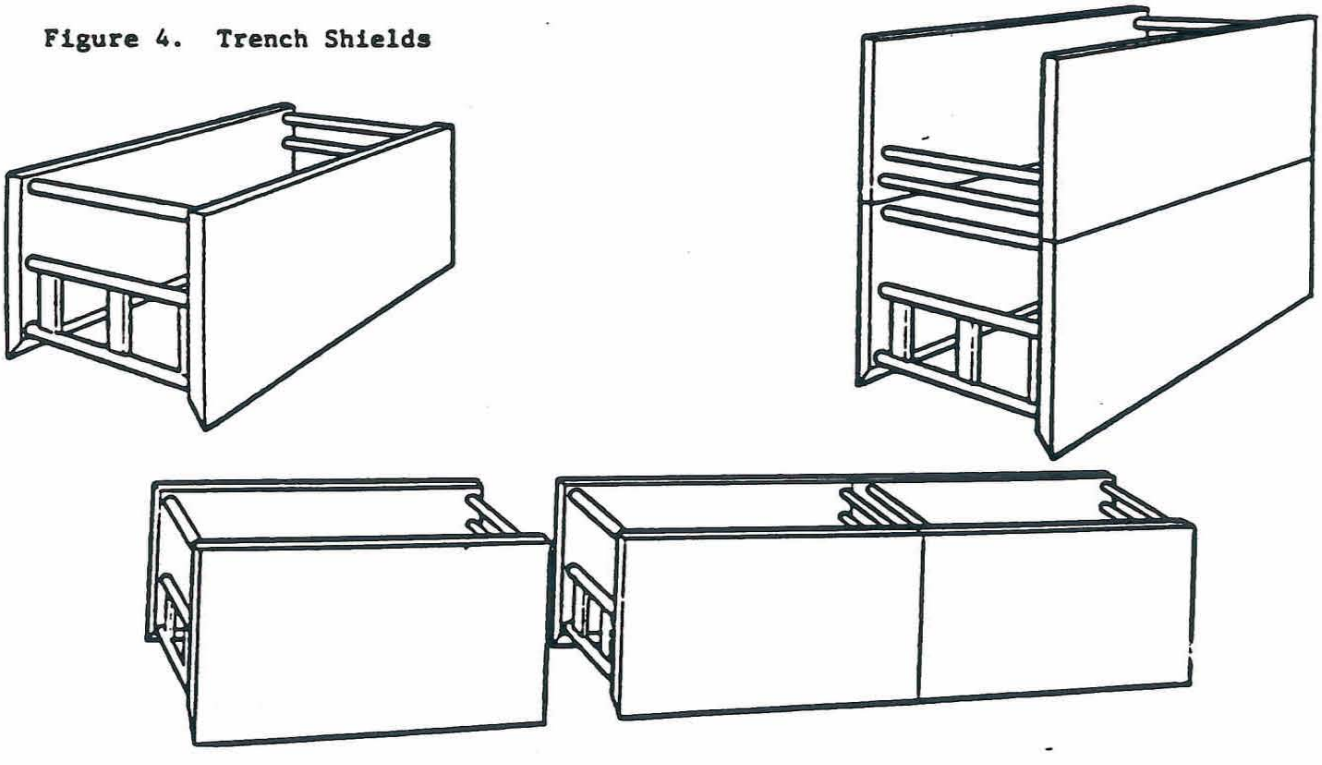


Figure 4. Trench Shields



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Appendix F to Subpart P—Selection of Protective Systems

The following figures are a graphic summary of the requirements contained in subpart P for excavations 20 feet or less in depth. Protective systems for use in excavations more than 20 feet in depth must be designed by a registered professional engineer in accordance with § 1926.652 (b) and (c).

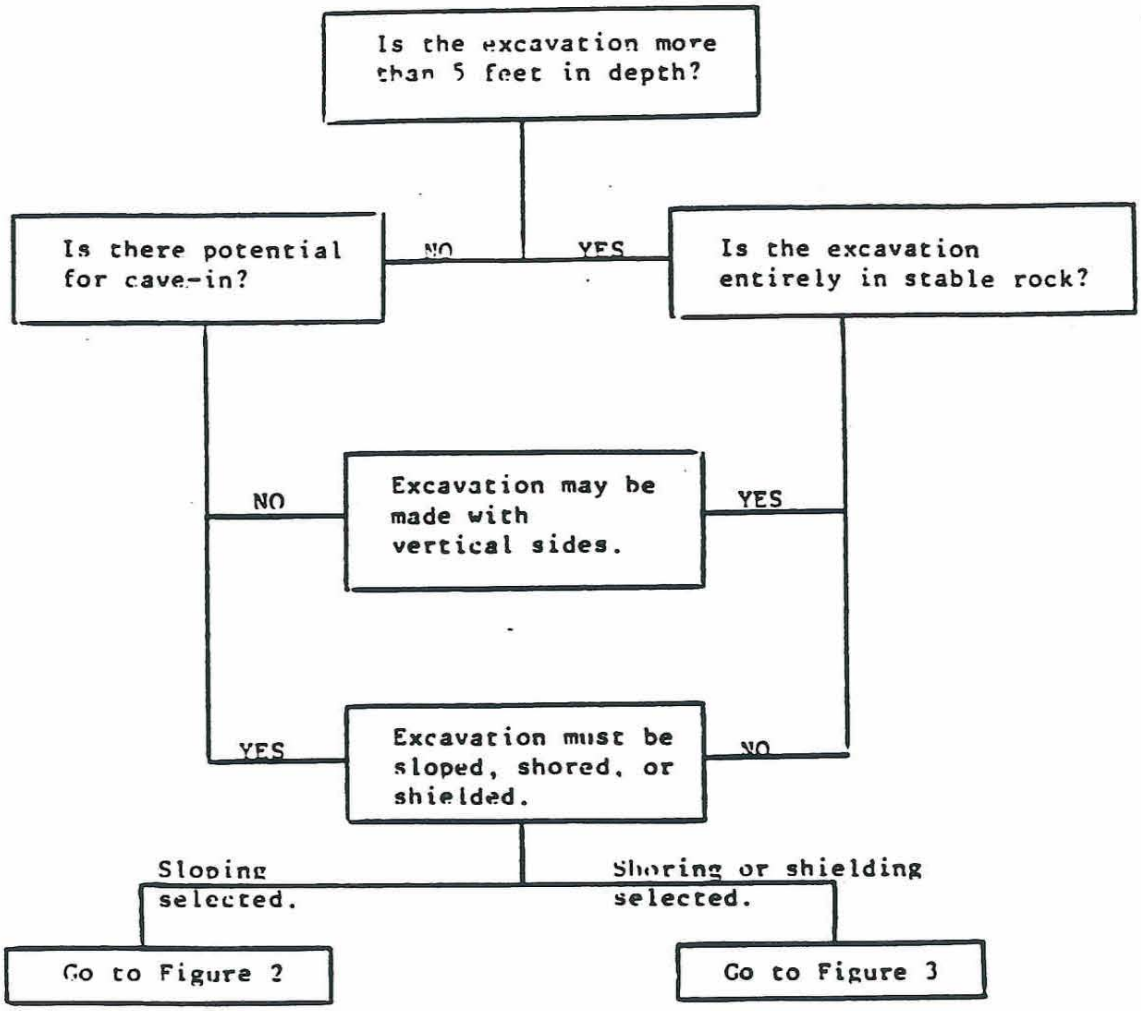

FIGURE 1 - PRELIMINARY DECISIONS

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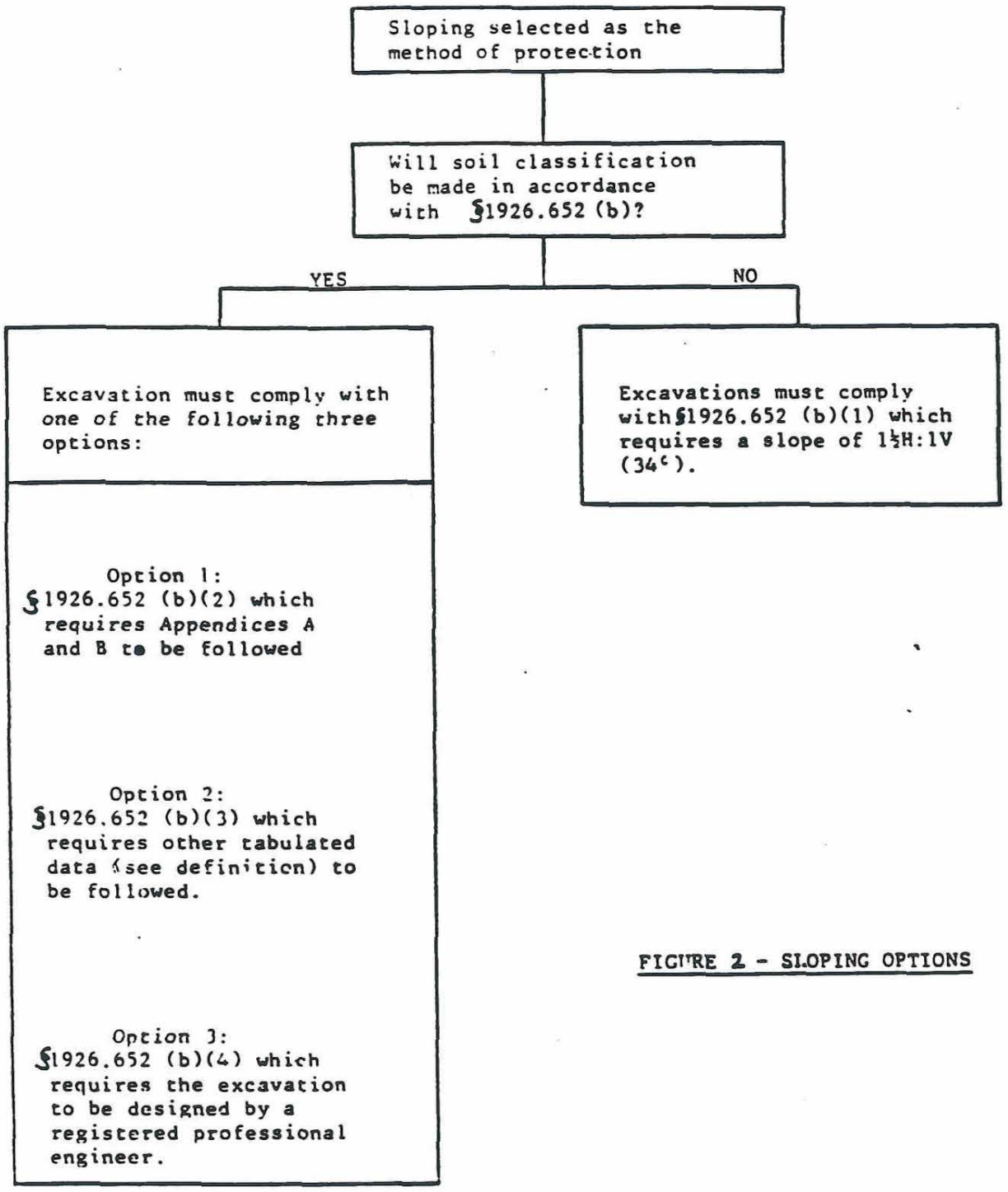


FIGURE 2 - SLOPING OPTIONS

EXCAVATION AND TRENCHING NOTIFICATION LOG

Date:______________ IT Project Number:________________

Profit Center:_________ OSHA Permit Required: YES____ NO____

Customer:_______________________ Project Manager:_______________

IT H & S Internal Permit Number:___________

Comments:____

****

Date:______________ IT Project Number:________________

Profit Center:_________ OSHA Permit Required: YES____ NO____

Customer:_______________________ Project Manager:_______________

IT H & S Internal Permit Number:___________

Comments:____

****

Date:______________ IT Project Number:________________

Profit Center:_________ OSHA Permit Required: YES____ NO____

Customer:_______________________ Project Manager:_______________

IT H & S Internal Permit Number:___________

Comments:____

****

Date:______________ IT Project Number:________________

Profit Center:_________ OSHA Permit Required: YES____ NO____

Customer:_______________________ Project Manager:_______________

IT H & S Internal Permit Number:___________

Comments:____

****

INTERNATIONAL TECHNOLOGY CORPORATION

EXCAVATION AND TRENCHING NOTIFICATION LOG

Date:______________ IT Project Number:________________

Profit Center:________ OSHA Permit Required: YES____ NO____

Customer:______________________ Project Manager:_______________

IT H & S Internal Permit Number:___________

Comments:____

****

Date:______________ IT Project Number:________________

Profit Center:________ OSHA Permit Required: YES____ NO____

Customer:______________________ Project Manager:_______________

IT H & S Internal Permit Number:___________

Comments:____

****

Date:______________ IT Project Number:________________

Profit Center:________ OSHA Permit Required: YES____ NO____

Customer:______________________ Project Manager:_______________

IT H & S Internal Permit Number:___________

Comments:____

****

Date:______________ IT Project Number:________________

Profit Center:________ OSHA Permit Required: YES____ NO____

Customer:______________________ Project Manager:_______________

IT H & S Internal Permit Number:___________

Comments:____

****

Form HS307.2

INTERNATIONAL TECHNOLOGY CORPORATION

TRENCH/EXCAVATION NOTIFICATION WORKSHEET

Project Number _____ Project Name _____

Customer's Name: _____

Specific Jobsite Location: _____

Nearest Major Cross Street: _____

City: _____ County: _____

Name and Title of Site Supervisor: _____

Starting Date: _____ Estimated Completion Date: _____

High Voltage Lines in Proximity: YES_____ NO_____ How Near_____

Depth Range (ft): ___ ___ (min max) Width Range(ft): ___ ___ (min max) Length(ft): _____

Project Description: _____

_____

Anticipated Soil Condition: Hard Compact___ Unstable___ Running___

Ground Protection Method: Shoring_____ Sloping____
Trench Shield_____ Alternate_____

ALL METHODS MUST MEET ACCEPTED ENGINEERING REQUIREMENTS.
PLANS MUST BE KEPT ON-SITE.

Describe Chemical Hazards at Site: _____

_____

Subcontractor's Name: _____

Equipment to be Used: _____

Design Engineer: _____ Project Supervisor: _____

Phone: ( ) _____

==========

Health & Safety Use Only

IT Permit Number: _____ Date Issued: _____ Expires: _____

Issued By: _____

CAL/OSHA Notification: Date: _____ By: _____

District Office: _____ Contact: _____

Form HS307.1

Appendix C

IT Procedure HS300
Permit-Required Confined Space

PROCEDURE

(subject) CONFINED SPACES

1.0 PURPOSE AND SUMMARY

This procedure describes the procedures for identifying and working within confined spaces throughout IT and for complying with OSHA regulations 29 CFR 1910.146. Additional requirements for special confined space applications can be found in the following procedures:

- HS301 Confined Spaces, Marine
- HS302 Confined Spaces, Leaded Product

Key provisions of this procedure include the following:

- Identification and posting of confined spaces at IT facilities.
- HASP requirements.
- Entry permit requirements for confined space entries.
- Testing and monitoring.
- Personal protective equipment, including lifelines and harnesses.
- Lighting.
- MSDS requirements.
- Rescue and emergency services and procedures.
- Communication between entrants and attendants.
- Duties of personnel.
- Training requirements.
- Entrant location tracking systems.
- Recordkeeping and retention.
- Annual program review.

2.0 TABLE OF CONTENTS

3.0 RESPONSIBILITY MATRIX

3.1 **Procedure Responsibility.** The Corporate Director, Health and Safety is responsible for the issuance, revision and maintenance of this procedure.

3.2 **Action/Approval Responsibilities.** The Responsibility Matrix is Attachment 1.

4.0 DEFINITIONS

4.1 **Acceptable entry conditions** means the conditions that must exist in a permit space to allow entry so that employees involved with a permit-required confined space entry can safely enter into and work within the space.

4.2 **Attendant** means an individual stationed outside one or more permit spaces who monitors the authorized entrants and who performs all attendant's duties assigned in the IT permit space program.

4.3 **Authorized entrant** means an employee who is authorized by IT to enter a permit space.

4.4 **Blanking or blinding** means the absolute closure of a pipe, line, or duct by the fastening of a solid plate (such as a spectacle blind or a skillet blind) that completely covers the bore and that is capable of withstanding the maximum pressure of the pipe, line, or duct with no leakage beyond the plate.

4.5 **Confined space** means a space that:

4.5.1 Is large enough and so configured that an employee can bodily enter and perform assigned work;

4.5.2 Has limited or restricted means for entry or exit (for example, tanks, vessels, silos, storage bins, hoppers, vaults, pits, and excavations are spaces that may have limited means of entry); and

4.5.3 Is not designed for continuous employee occupancy.

See also definition 4.21.

4.6 **Double block and bleed** means the closure of a line, duct, or pipe by closing and locking or tagging two in-line valves and by opening and locking or tagging a drain or vent valve in the line between the two closed valves.

4.7 **Emergency** means any occurrence (including any failure of hazard control or monitoring equipment) or event, internal or external, to the permit space that could endanger entrants.

4.8 **Engulfment** means the surrounding and effective capture of a person by a liquid or finely divided (flowable) solid substance that can be aspirated to cause death by filling or plugging the respiratory system or that can exert enough force on the body to cause death by strangulation, constriction, or crushing.

4.9 **Entry** means the action by which a person passes through an opening into a permit-required confined space. Entry includes ensuing work activities in that space and is considered to have occurred as soon as any part of the entrant's body breaks the plane of an opening into the space.

4.10 **Entry Permit** (Attachment 3) means the written or printed document that is provided by IT to allow and control entry into a permit space and that contains the information specified in Paragraph 4.1 of this section.

4.11 **Entry Supervisor** means the person (such as the supervisor, foreman, or crew chief) responsible for determining if acceptable entry conditions are present at a permit space where entry is planned, for authorizing entry and overseeing entry operations, and for terminating entry as required by this section.

4.12 **Hazardous atmosphere** means an atmosphere that may expose employees to the risk of death, incapacitation, impairment of ability to self-rescue (that is, escape unaided from a permit space), injury, or acute illness from one or more of the following causes:

4.12.1 Flammable gas, vapor, or mist in excess of 10 percent of its lower explosive limit (LEL);

4.12.2 Airborne combustible dust at a concentration that meets or exceeds its LEL;

NOTE: This concentration may be approximated as a condition in which the dust obscures vision at a distance of 5 feet (1.52 m) or less.

4.12.3 Atmospheric oxygen concentration below 20.0 percent or above 23.5 percent.

4.12.4 Atmospheric concentration of any substance for which a dose or a published exposure guideline is available (Permissible Exposure Limit, PEL, from OSHA, Threshold Limit Value, TLV, from ACGIH, and Recommended Exposure Limits, REL, from NIOSH), and which could result in employee exposure in excess of its dose or permissible exposure limit.

4.12.5 Any other atmospheric condition that is immediately dangerous to life or health.

4.13 **Hot work permit** means IT written authorization to perform hot operations (for example, riveting, welding, cutting, burning, and heating) capable of providing a source of ignition. This is a separate document from the entry permit.

4.14 **Immediately Dangerous to Life or Health (IDLH)** means any condition that poses an immediate or delayed threat to life or that would cause irreversible adverse health effects or that would interfere with an individual's ability to escape unaided from a permit space.

4.15 **Inerting** means the displacement of the atmosphere in a permit space by a noncombustible gas (such as nitrogen) to such an extent that the resulting atmosphere is noncombustible.

4.16 **Isolation** means the process by which a permit space is removed from service and completely protected against the release of energy and material into the space by such means as: blanking or blinding; misaligning or removing sections of lines, pipes, or ducts; a double block and bleed system; lockout or tagout of all sources of energy, including hydraulic or electric; blocking or disconnecting all mechanical linkages; or physically restraining moving parts.

4.17 **Line breaking** means the intentional opening of a pipe, line, or duct that is or has been carrying flammable, corrosive, or toxic material, an inert gas, or any fluid at a volume, pressure, or temperature capable of causing injury.

4.18 **Non-permit confined space** means a confined space that does not contain or, with respect to atmospheric hazards, have the potential to contain any hazard capable of causing death or serious physical harm.

4.19 **Oxygen deficient atmosphere** means an atmosphere containing less than 20.0 percent oxygen by volume.

4.20 **Oxygen-enriched atmosphere** means an atmosphere containing more than 23.5 percent oxygen by volume.

4.21 **Permit-Required Confined Space** (PRCS) means a confined space that has one or more of the following characteristics:

4.21.1 Contains or has a potential to contain a hazardous atmosphere;

4.21.2 Contains a material that has the potential for engulfing an entrant;

4.21.3 Has an internal configuration such that an entrant could be trapped or asphyxiated by inwardly converging walls or by a floor which slopes downward and tapers to a smaller cross-section; or

4.21.4 Contains any other recognized serious safety or health hazard.

4.22 **Prohibited condition** means any condition in a permit space that is not allowed by the permit during the period when entry is authorized.

4.23 **Rescue service** means the personnel designated to rescue employees from permit spaces.

4.24 **Retrieval system** means the equipment (including a retrieval line, chest or full-body harness, wristlets, if appropriate, and a lifting device or anchor) used for non-entry rescue of persons from permit spaces.

4.25 **Testing** means the process by which the hazards that may confront entrants of a permit space are identified and evaluated. Testing includes specifying the tests that are to be performed in the permit space.

5.0 TEXT

5.1 Scope and Applicability

This procedure contains the requirements for performing work in confined spaces throughout IT Corporation, specifically including construction.

5.2 Evaluate the Workplace

All facilities or project locations owned or operated by IT Corporation (including joint ventures) shall be evaluated to identify the presence of permit-required confined spaces. All such spaces shall be posted with a sign bearing the following or similar warning: "DANGER--PERMIT-REQUIRED CONFINED SPACE. DO NOT ENTER".

5.3 Non-Permit Confined Spaces

All confined spaces shall be initially considered permit-required confined spaces. Such spaces can be reclassified as non-permit confined spaces only under the following conditions:

5.3.1 Site-specific approval of an IT HS professional;

5.3.2 All contaminants, contaminated soils, and vessels containing contaminants have been removed;

5.3.3 All actual or potential atmospheric hazards have been eliminated, with testing verification;

5.3.4 Ventilation is not required to maintain control of atmospheric hazards;

5.3.5 All recognized hazards, including engulfment, within the confined space have been eliminated;

5.3.6 The confined space shall be re-evaluated (and reclassified to permit-required, if needed) whenever the use or configuration of the space changes in any way that might increase the hazards to the entrants. All entrants shall exit the space immediately when hazards are noted;

5.3.7 The entry supervisor shall make the certification that all hazards have been removed on the Entry Permit (Attachment 3); and

5.3.8 The Entry Permit (Attachment 3) shall be posted at the entrance to the confined space.

5.4 Permit-Required Confined Spaces

All confined space entries shall be considered permit-required until/unless the space meets the requirements in section 5.3.

5.4.1 **Procedures and Practices for Permit Space Entry**

Prior to beginning any confined space entry operation, a He: Plan (HASP) shall be developed and approved per IT Proced HS052 requirements. The HASP must specifically address areas:

- Specify acceptable entry conditions. IT requires th vapors shall not exceed 10.0 percent of the LEL and be between 20-23.5 percent by volume. Appropriate t action levels shall also be established (Level A or ID require Corporate HS approval).

- Confined space isolation procedures.

- Lockout, tagout, tryout and return to service procedur sources of hazardous energy at the specific project loc IT procedure HS315 Control of Hazardous Energy Sc

- Procedures and equipment for purging, inerting ventilating the space for the control of atmospl Continuous mechanical ventilation shall be used whe are in the PRCS.

- Procedures for inspecting, monitoring and testing the (to verify that acceptable conditions exist prior to and entry operation. This includes:

  - Specific atmospheric tests to be performed and tests (NOTE: Confined spaces shall be tested necessary to verify entrant safety, whenever op conditions change [e.g., temperature change agitation, etc.], and no less often than hourly.);

  - Specific testing equipment required;

  - For confined spaces that cannot be completely sewers, etc.), continuous testing with real-time instruments shall be required; and

  - Priority for atmospheric hazard testing sha combustible gases, then toxic gases/vapors.

- Personal Protective Equipment:

  - Protective suits, boots, and gloves - including s the material of construction.

  - Face, head, and foot protection.

- Specify chest or parachute harness with approved lifelines at least one-half inch in diameter and 2,000 pounds test and meeting ANSI A10.14 requirements. (NOTE: Wristlets may be used only when an IT HS professional finds that a harness presents a greater hazard to the employee and wristlets are the safest, most effective alternative.) All lifelines shall be secured to a mechanical device or fixed point outside the confined space. Mechanical extraction devices shall be used for all vertical entry permit spaces greater than five (5) feet deep.

- Respiratory protection, per IT procedure HS601.

- Material Safety Datasheets (MSDS) to be provided to the medical facility when treating injured/exposed entrants.

- Lighting equipment required to safely illuminate the work and provide emergency egress.

  NOTE: Lighting and electrical equipment shall be of the appropriate National Electrical Code (NEC) rating. Rating should be Class I, Division I unless the space specifically meets other rating class requirements.

- Protective barriers to be used to protect entrants from external pedestrian, vehicle or equipment hazards.

- Ingress and egress equipment such as ladders.

- Rescue and emergency services, procedures, equipment, and Exposure Control Plan (see IT Procedure HS512). The HASP must specify whether IT or another source will provide these services and equipment, and how to summon them. IT shall provide rescue services unless the client has a qualified rescue team in-plant which is available to IT and has been informed of the hazards of the confined space to be entered.

- Communications equipment to provide continuous communication between entrants and attendants. This can be done using the standard system of lifeline "tugs" below, so long as the attendants continuously hold the lifelines in their hands.

  Lifeline "Tug" Signals

  1 Tug = Are you OK?
  2 Tugs = Yes, I am OK.
  3 Tugs = Exit the confined space immediately.

Any other signal, or an unclear signal, shall require immediate exit of the PRCS.

Other standard hand signals are provided in Attachment 2.

An alternative system would be to provide all entrants and attendants with an air powered horn. Substituting horn blasts for tugs, equivalent signals to the lifeline "tug" signals, would be standard. Any other or uncertain signals require immediate exit.

If this is not practical or possible, powered communication equipment with the appropriate NEC rating shall be provided.

- Prescribe the number of attendants and other outside support personnel. Each confined space being entered shall have a minimum of one (1) dedicated attendant and one other support person (who may have other duties) within sight or call.

- Designate the duties of entrants, attendants, and entry supervisors as described below.

Duties of authorized entrants

- Know the hazards that may be faced during entry, including information on the mode, signs or symptoms, and consequences of the exposure.

- Communicate with the attendant as necessary to enable the attendant to monitor entrant status and to enable the attendant to alert entrants of the need to evacuate the space.

- Alert the attendant whenever:

  (1) The entrant recognizes any warning sign or symptom of exposure to a dangerous situation, or
  (2) The entrant detects a prohibited condition; and

- Exit from the permit space as quickly as possible whenever:

  (1) An order to evacuate is given by the attendant or the entry supervisor,
  (2) The entrant recognizes any warning sign or symptom of exposure to a dangerous situation,
  (3) The entrant detects a prohibited condition, or
  (4) An evacuation alarm is activated.

Duties of attendants

- Know the hazards that may be faced during entry, including

information on the mode, signs or symptoms, and consequences of the exposure.

- Is aware of possible behavioral effects of hazard exposure in authorized entrants.

- Continuously maintains an accurate count of authorized entrants in the permit space so that the means used to identify authorized entrants accurately identifies who is in the permit space.

- Remains outside the permit space during entry operations until relieved by another attendant.

- Communicates with authorized entrants as necessary to monitor entrant status and to alert entrants of the need to evacuate the space.

- Monitors activities inside and outside the space to determine if it is safe for entrants to remain in the space and orders the authorized entrants to evacuate the permit space immediately under any of the following conditions:

  (1) If the attendant detects a prohibited condition;
  (2) If the attendant detects the behavioral effects of hazard exposure in an authorized entrant;
  (3) If the attendant detects a situation outside the space that could endanger the authorized entrants; or
  (4) If the attendant cannot effectively and safely perform all prescribed duties.

- Summon rescue and other emergency services as soon as the attendant determines that authorized entrants may need assistance to escape from permit space hazards.

- Takes the following actions when unauthorized persons approach or enter a permit space while entry is underway:

  (1) Warn the unauthorized persons that they must stay away from the permit space;
  (2) Advise the unauthorized persons that they must exit immediately if they have entered the permit space; and
  (3) Inform the authorized entrants and the entry supervisor if unauthorized persons have entered the permit space.

- Performs non-entry rescues.

- Performs no duties that might interfere with the attendant's primary duty to monitor and protect the authorized entrants.

Duties of Entry Supervisors

- Knows the hazards that may be faced during entry, including information on the mode, signs or symptoms, and consequences of the exposure.

- Verifies, by checking that the appropriate entries have been made on the permit, that all tests specified by the permit have been conducted and that all procedures and equipment specified by the permit are in place before endorsing the permit and allowing entry to begin.

- Terminates the entry and cancels the permit as required.

- Verifies that rescue services are available and that the means for summoning them are operable.

- Removes unauthorized individuals who enter or who attempt to enter the permit space during entry operations.

- Determines, whenever responsibility for a permit space entry operation is transferred and at intervals dictated by the hazards and operations performed within the space, that entry operations remain consistent with terms of the entry permit and that acceptable entry conditions are maintained.

- Documents on the entry permit any incidents or circumstances requiring review of the confined space entry program. Such incidents include:

  (1) Unauthorized entry;
  (2) The detection of a condition/hazard not authorized by the permit;
  (3) The occurrence of an injury or near-miss during entry;
  (4) A change in use or configuration of the space; or
  (5) Employee complaints about the program.

- Prescribes procedures for coordination of entry when personnel from multiple employers will work simultaneously. IT subcontractors shall follow IT procedures.

5.4.2 **Permit System**

Before entry is authorized, the Entry Supervisor shall complete and sign an Entry Permit (Attachment 3) to document that all pre-entry requirements in

the approved HASP have been met and that acceptable entry conditions exist. The completed permit shall be posted at the primary entrance to the confined space.

All Entry Permits are valid for a maximum of one (1) work shift, and shall be cancelled by the Entry Supervisor when the shift ends, confined space operations are complete, or whenever a prohibited condition arises in or near the space. All confined spaces shall be securely closed or barricaded whenever the entry permit is cancelled.

Entry Permits must be completely executed and include the following information:

- Identify the permit space to be entered;
- Purpose of the entry;
- Date and duration of the permit;
- Authorized entrants by name;
- Authorized attendants by name;
- The name and signature of the Entry Supervisor originally authorizing entry;
- The name and signature of the current Entry Supervisor;
- The hazards of the permit space to be entered;
- Measures used to isolate the permit space and control hazards;
- Acceptable entry conditions;
- Time and results of periodic atmospheric tests with the initials of the tester;
- Available rescue services and equipment, and how to summon;
- Communication procedures;
- Personal protective equipment, testing equipment and communications equipment; and
- Any additional permits issued to authorize work in the permit space.

Supplemental information regarding the location of each entrant shall be provided as described below:

- The current entry status of all entrants shall be logged on the Field Activity Daily Log (FADL), with a new entry made whenever the entry status of an entrant changes.

- Each entrant shall securely affix a tag bearing their name to the outside lifeline fitting which is attached to a secure point.

5.4.3 **Training**

- General

Prior to assignment to confined space entry work, all employees shall receive training in the hazards of confined spaces, work practices to control these hazards, and duties to be performed. Employee proficiency shall be established by testing and/or practical demonstration.

The IT Training Department shall maintain training records to include employee name and signature, date of training, and signature of the trainer.

Basic training requirements shall include:

- Entrants/Attendants: Hazards & Protection or Hazards Protection Limited & Site Remediation & Confined Space Update (or equivalent). Note that H&P done prior to April 1993 requires Confined Space Update.

- Entry Supervisors and/or Personnel Conducting Atmospheric Testing: Qualified Person (or equivalent).

- Rescue Service Personnel: Personnel assigned to provide emergency entry and rescue services shall be trained annually in the proper use of personal protective and rescue equipment. Such training shall include a simulated rescue exercise. In addition, rescue personnel shall be trained in the hazards and proper work practices for handling blood or other potentially infectious materials while providing first aid or CPR, and comply with the other requirements of IT Procedure HS512. All rescue personnel shall have current training and certification for first-aid and CPR.

Equivalent training must be approved by the IT Training Department prior to assignment to entry duties.

Personnel assigned to attendant duties shall be trained in non-entry rescue procedures.

- Site-Specific

  Health and Safety Plan orientation and Tailgate Safety meetings will be used to provide site-specific training.

5.5 Retention of Inspection and Test Logs

A copy of all Entry Permits and other documents related directly to the PRCS entry (e.g., hot work permits, FADLs, etc.) shall be forwarded to the local or project HS Department.

5.6 Confined Space Entry Program Review

Annually in January, the HS professional responsible for each location performing confined space entry operations shall review all entry permits for incidents or problems occurring during entry. Incidents or problems include injuries, accidents, unauthorized entries, or any other event potentially indicating that improvements can be made in the confined space entry program. After review with appropriate operations personnel, recommendations for program

revision shall be forwarded to the Corporate HS office for review by the Corporate Safety Council.

6.0 EXCEPTION PROVISIONS

Variances to this procedure (HS300) may be requested in accordance with the requirements of IT Procedure HS013 Health and Safety Procedure Variance.

7.0 CROSS REFERENCES

HS013 Health and Safety Procedure Variance
HS052 Health and Safety Plans
HS301 Confined Spaces, Marine
HS302 Confined Spaces, Leaded Product
HS315 Control of Hazardous Energy Sources
HS512 Bloodborne Pathogens
HS601 Respiratory Protective Program

8.0 ATTACHMENTS

1. Responsibility Matrix
2. Hand Signals
3. Entry Permit

INTERNATIONAL TECHNOLOGY CORPORATION

CONFINED SPACES
Responsibility Matrix

ATTACHMENT 1

Action	Procedure Section	Local HS	Corp HS	Training Dept.	Location Manager	Entry Supv	Manager
Identify and post all PRCSs at IT facilities	5.2	X			X		
Develop HASP, including establishing acceptable entry conditions	5.4.1	X					X
Approve HASP prior to work:	5.4.1	X					X
If IDLH or Leval A:	5.4.1	X	X				X
Provide adequate supplies of required equipment (e.g., rescue, air testing) at location	5.4.1				X		
Train adequate personnel in each category	5.4.3				X		
Retain training records	5.4.3			X	X		
Complete HASP requirements for entry, execuitve entry permit, and test/monitor	5.4.1					X	
Cancel entry permits	5.4.2					X	
Reclassify PRCS as non-permit-required	5.3					X	
Retain documents	5.5	X					
Program review	5.6	X	X		X		

ATTACHMENT 2

HAND SIGNALS

- THE VERY NATURE OF OUR WORK REQUIRES THE USE OF PROTECTIVE CLOTHING THAT IN ITSELF MAY RESTRICT OUR ABILITY TO COMMUNICATE ORALLY.
- IN AS MUCH AS CERTAIN VITAL COMMUNICATIONS ARE NECESSARY FOR A SAFE EFFICIENT OPERATION, A LIMITED NUMBER OF HAND SIGNALS HAVE BEEN DEVISED TO HELP RESOLVE THIS PROBLEM.
- SIGNALS COVERING TWO CATEGORIES, THOSE FOR PERSONAL SAFETY AND FOR OPERATIONAL USE WILL BE DISCUSSED.

Personal Safety

- IMMEDIATE PERSONAL SAFETY PROBLEMS COULD INCLUDE BREATHING AIR SYSTEM MALFUNCTION, LIFELINES PROBLEMS AND GENERAL DISTRESS.

THE FOLLOWING SIGNALS WILL BE USED FOR ALL IT EMPLOYEES

- BREATHING AIR PROBLEMS

ONE HAND HOLDING THROAT INDICATES A BREATHING AIR PROBLEM

BOTH HANDS HOLDING THROAT INDICATES A SERIOUS BREATHING AIR PROBLEM, SUCH AS NO AIR , VAPORS GETTING THROUGH, ETC.

HAND SIGNALS (con't)

- LIFE LINE TEST

  ONE TUG ON EITHER END OF A LIFE LINE MUST BE ANSWERED BY TWO TUGS. IF A TUG IS NOT ANSWERED IT INDICATES A FOULED LINE MAN MUST BE REMOVED AND LINE CLEARED.

  THREE TUGS , OR A STEADY PULL ON THE LINE INDICATES THAT THE MAN SHOULD LEAVE THE CONTAMINATED AREA.

- GENERAL PROBLEM

BOTH HANDS RAISED ABOVE THE HEAD ARE INDICATIVE OF SOME TYPE OF PROBLEM WHICH MAY REQUIRES EXIT FROM THE AREA AND REMOVAL OF PROTECTIVE CLOTHING.

ONCE THE SIGNAL IS RECEIVED AND UNDERSTOOD, THE PROBLEM CAN POSSIBLY BE FURTHER CLARIFIED BY POINTING TO AFFECTED AREA.

HAND SIGNALS (con't)

INDEX FINDER TWIRLING IN AN UPWARD MOTION WHILE OPEN PALM COVERS THE FINGER: OPEN SLOWLY

INDEX FINDER TWIRLING IN A DOWNWARD MOTION WHILE OPEN PALM COVERS THE FINGER : CLOSE SLOWLY

WHILE OPENING OR CLOSING VALVES, VENTS, ETC., THE FOLLOWING CAN BE USED:

INDEX FINGER TWIRLING IN AN UPWARD MOTION: OPEN NORMALLY

INDEX FINGER TWIRLING IN A DOWNWARD MOTION: CLOSE NORMALLY

Operational Safety
HAND SIGNALS (con't)

1 HAND MADE INTO FIST WITH THUMB DOWN : CLOSE EMERGENCY

1 HAND MADE INTO FIST WITH THUMB UP: OPEN EMERGENCY

CHECKING FOR MATERIAL IN A VESSEL WHILE IN PROTECTIVE CLOTHING CAN BE ANSWERED AS FOLLOWS:

TWO HANDS CLASPED IN FIST WITH THUMBS POINTING UP: VESSEL HAS MATERIAL IN IT.

HAND SIGNALS (con't)
Operational Safety

CHECKING FOR MATERIAL IN A VESSEL WHILE IN PROTECTIVE CLOTHING CAN BE ANSWERED AS FOLLOWS:

UMPIRE SIGNALING RUNNER SAFE:
VESSEL EMPTY

HAND SIGNALS (con't)

SLASHING SIGNAL ACROSS THROAT:
CLOSE DOWN WHATEVER YOU ARE DOING--STOP

FIST IN PUMPING MOTION:
CLOSE DOWN WHATEVER YOU ARE DOING—STOP

ATTACHMENT 3

ENTRY PERMIT
PERMIT-REQUIRED CONFINED SPACE (PRCS)

Division/Location _____ Job No. _____
Customer _____ Address _____
Location of Job _____ Identity of PRCS _____
Describe Hazards of PRCS (Chemical, Physical) _____
_____
Chemical Introduced Into Space _____
_____
Purpose This Permit Authorized _____
_____

CHECKLIST	*YES*	*DOES NOT APPLY*
All lines leading to and from confined space have been blinded or disconnected		
Electrical service disconnected or locked out		
All grounding and bonding cables in place		
All lighting, fittings, power equipment, and extension cords are explosion-proof		
Ground Fault Circuit Indicator (GFCI) checked and functioning		
All ignition sources have been isolated		
All respiratory equipment and alarms checked and functional		
All safety harnesses and life lines checked		
All required PPE checked and in use		
All entrants are confined space trained		
All entrants are trained in the use, care, and limitations of respirators and PPE		
Attendant trained in emergency procedures		
Attendant(s) trained in rescue procedures		
Outside rescue service will be used and they have been notified of this entry		
Appropriate rescue equipment available and checked		
Ventilation system in use and effective		
Entrant(s) can achieve a gas-tight seal with respirator		
Entrant(s) are not wearing contact lenses		
All tests have been completed and indicate that entrance requirements have been met		
Appropriate warning signs have been posted and unauthorized personnel have been excluded from the PRCS and area		

IF THE ANSWER TO ANY OF THE ABOVE QUESTIONS IS NO, ENTRY IS NOT PERMITTED.

PERSONAL PROTECTIVE EQUIPMENT (Circle)

EYE/FACE
Chemical Goggles
Face Shield
Safety Glasses

EXTREMITIES
Hard Hat
Gloves (Material _____)
Hoods
Boots (Material _____)
Booties

BODY
Suit (Level____, Material_____)

RESPIRATORY
SCBA
Air Line
Egress System
Air Purifying (Cartridge_____)
Powered Air Purifying (Cartridge _____)

OTHER
Hearing Protection
Harness & Lifeline
Chest or Parachute

RESCUE EQUIPMENT
Mechanical Extraction Device
First Aid Kit
SCBA
Other (Specify) _____

NON-IT RESCUE TEAM
Instructions to Summon Rescue

COMMUNICATION
Lifeline "Tug" Signals (See HASP)
Air Powered Horn Signals (See HASP)
Other_____

OTHER PERMITS ISSUED FOR WORK IN PRCS: _____

OTHER HAZARD CONTROL PROCEDURES OR INSTRUCTIONS: _____

TEST DATA
Oxygen, Flammability and Toxic Contaminant(s)

Time	Percent Oxygen	Percent LEL	PEG	PEG	PEG	PEG	PEG	Initials	Comments

AUTHORIZED ENTRANTS

AUTHORIZED ATTENDANTS

RESCUE PERSONNEL

Diagram the confined space, indicate location of manways and ventilators. Indicate location(s) where tests conducted.

) (- Manway
∞ - Ventilator
X - Test Location

ACCEPTABLE ENTRY CONDITIONS

1) Entry Permit Completely Filled Out
2) Oxygen between 20-23.5%
3) Combustible Gases Below 10% LEL
4) Permissible Levels of Toxic Gases (List)

5) Other

PRCS SAFE FOR ENTRY

DATE/TIME ____/____ NAME ENTRY SUPERVISOR _____ SIGNATURE _____

CURRENT ENTRY SUPERVISOR (IF DIFFERENT) _____

ENTRY PERMIT EXPIRES DATE/TIME ____/____ (No longer than 1 shift)

ENTRY PERMIT CANCELLED

DATE/TIME ____/____ SIGNATURE _____

REASON (✓) _____ Work Complete _____ Authorized Conditions not met _____ Incident

DESCRIBE PROBLEMS DURING ENTRY AND RESOLUTION

RECLASSIFICATION TO NON-PERMIT-REQUIRED CONFINED SPACE
Describe hazard removal methods, without use of ventilation. _____

TESTING VERIFICATION SHOWN AT TIME _____ ON TEST DATA CHART ABOVE.

DATE/TIME ____/____ ENTRY SUPERVISOR SIGNATURE _____

REVIEWED BY _____ DATE _____

Appendix D

Entry Log

ENTRY LOG
SIGN-IN SHEET

Site:	Project No.:
Date:	Page No.: of

Name/Title	Company	Level of PPE	Time In	Time Out

DN/111193/EES/NABaaa.HSP

Appendix E

Tailgate Safety Meeting Form

TAILGATE SAFETY MEETING

Division/Subsidiary _____ Facility _____

Date _____ Time _____ Job Number _____

Customer _____ Address: _____

Specific Location _____

Type of Work _____

Chemicals Used _____

SAFETY TOPICS PRESENTED

Protective Clothing/Equipment _____

_____

Chemical Hazards _____

_____

Physical Hazards _____

_____

Emergency Procedures _____

_____

Hospital / Clinic _____ Phone ( ) _____ Paramedic Phone ( ) _____

Hospital Address _____

Special Equipment _____

_____

Other _____

_____

ATTENDEES

NAME PRINTED	SIGNATURE

Meeting conducted by:

_____ _____

NAME PRINTED SIGNATURE

Supervisor _____ Manager _____

36-8-85

Appendix F

Contractor Certification Form

IT SUBCONTRACTOR CERTIFICATION FORM

I, _____, as an agent of _____,
do hereby certify that the following employees have successfully completed a 40-hour training course which complies with the provisions of 29 CFR §1910.120. Each employee has successfully completed a medical examination which complies with the above regulation.

Individual copies of certification of successful completion of the required training and medical examination are attached for each employee.

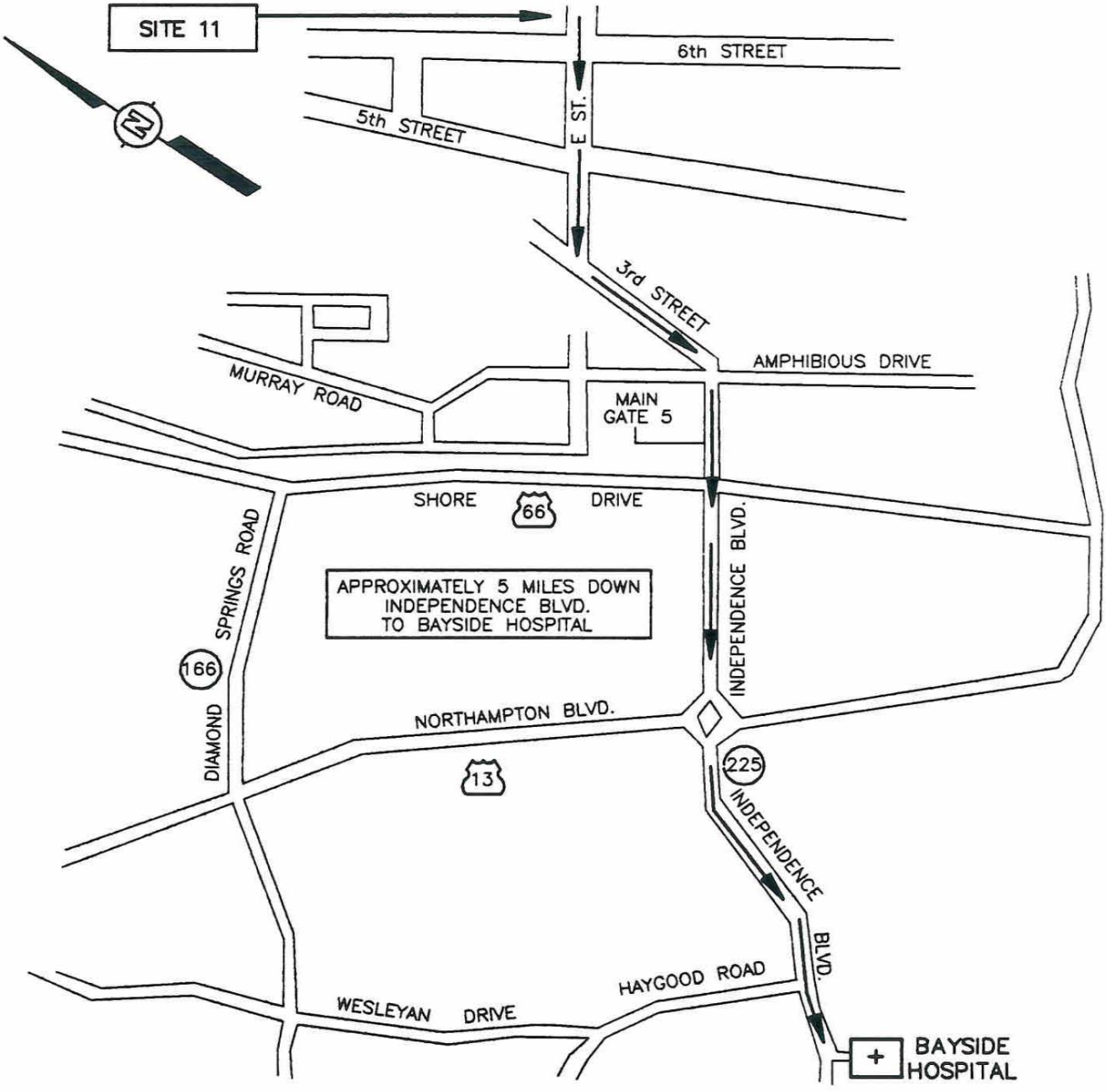
_____ _____

Signature/Title Date

Appendix G

Directions to Bayside Hospital

DRAWN BY	CHECKED BY	DRAWING NUMBER
NAM 11 NOV 93	APPROVED BY	305951-A1



ATTACHMENT G

DIRECTIONS TO BAYSIDE HOSPITAL

PREPARED FOR

NAVAL AMPHIBIOUS BASE
LITTLE CREEK, VIRGINIA

INTERNATIONAL TECHNOLOGY CORPORATION

132298

11-11-93
10:00 AM