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**U.S. EPA Region 9
Emergency and Rapid Response Services
Fort McDermitt Paiute Shoshone Indian Reservation Site
McDermitt, Nevada**

Health and Safety Plan

Contract No. EP-S9-12-01
EPA Task Order No. 9027
EQ Project No. 030303.0027

Environmental Quality Management, Inc.
6825 216th Street SW, Suite J
Lynnwood, Washington, 98036

April 2013



Title and Approval Sheet

U.S. EPA Region IX Emergency and Rapid Response Services Fort McDermitt Paiute Shoshone Indian Reservation Site McDermitt, Nevada

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INTRODUCTION AND SITE ENTRY REQUIREMENTS

This document describes the health and safety guidelines developed for the Fort McDermitt Paiute Shoshone Indian Reservation Site to protect on-site personnel, visitors and the public from physical harm and exposure to hazardous materials or wastes. The procedures and guidelines contained herein were based upon the best available information at the time of the plan's preparation. Specific requirements will be revised when new information is received or conditions change. A written amendment will document all changes made to the plan. Any amendments to this plan will be included in Attachment A. Where appropriate, specific OSHA standards or other guidance will be cited and applied.

All work practices and procedures implemented on site must be designated to minimize worker contact with hazardous materials and to reduce the possibility of physical injury. All work will be performed in accordance with applicable Federal 29 CFR 1910 Health and Safety Regulations and specifically 29 CFR 1910.120, Hazardous Operations and Emergency Response (HAZWOPER).

Daily Safety Meetings

Daily safety meetings will be held at the start of each shift per established worksite to ensure that all personnel understand site conditions and operating procedures, to ensure that personal protective equipment is being used correctly and to address worker health and safety concerns.

Site Safety Plan Acceptance/Acknowledgment

The FOSC or designated representative shall be responsible for informing all individuals entering the Exclusion Zone (EZ) or Contamination Reduction Zone (CRZ) of the contents of this plan and ensuring that each person signs the Site Safety Plan (SSP) Acknowledgement Form at the beginning of this plan. By signing the SSP Acknowledgement Form, an individual acknowledges that he/she recognized the potential hazards present on-site and the policies and procedures required minimizing exposure or adverse effects of these hazards.

1 SITE BACKGROUND AND SCOPE OF WORK

1.1 Roles and Responsibilities

Federal On-Scene Coordinator (FOSC):

The FOSC, Tom Dunkelman, as the representative of the U.S. EPA, is responsible for overall project administration and for coordinating health and safety standards for all individuals on-site at all times. All U.S. EPA and contractor's health and safety guidelines and requirements as well as all applicable OSHA standards shall be applied. The FOSC is responsible for ensuring health and safety of on-site visitors. However, each contractor (as an employer under OSHA) is also responsible for the health and safety of its employees. If there is any dispute with regards to health and safety, the following procedures shall be followed.

- ❖ Attempt to resolve the issue on-site; and,
- ❖ If the issue cannot be resolved, on-site personnel shall consult off-site health and safety personnel for assistance and the specific task operation in dispute shall be discontinued until the issue is resolved.

Deputy Program Manager (PM):

The Deputy Program Manager (DPM), Ron McManamy, is responsible for overall direction, coordination, technical consistency and review of the entire project contract. PM health and safety responsibilities are listed below:

- ❖ Emphasize importance of safety and hold supervision / site personnel accountable for safe performance.
- ❖ Enforce implementation and compliance with the SSP and established health and safety procedures.
- ❖ Provide resources and support to the Response Manager and SSO for effective completion of duties.
- ❖ Communicate with the OSC to evaluate and resolve any health and safety issues.

Response Manager (RM):

The RM, Brad Coury, is the primary field representative for the ERRS clean-up contractor, Environmental Quality Management, Inc. (EQ), has the responsibility for fulfilling the terms of the delivery order. EQ's RM for this response is Brad Coury. The RM must oversee the project and ensure that all technical, regulatory and safety requirements are met. It is the RM's responsibility to communicate with the FOSC, as frequently as required and at least daily, regarding site clean-up progress and the resolution of any issues. The following are the health and safety responsibilities of the RM:

- ❖ Review and approve the site-specific SSP.
- ❖ Prepare and organize project activities on-site.
- ❖ Provide operational / health and safety equipment for project operations.
- ❖ Emphasize importance of safety and hold site personnel accountable for safe job performance.

- ❖ Enforce implementation / compliance with the SSP and established health and safety procedures.
- ❖ Ensure immediate correction of identified unsafe work conditions and / or work practices.
- ❖ Monitor and evaluate health and safety performance of project operations.
- ❖ Ensuring the use of safe work practices by site personnel during work activities.
- ❖ Supervising various field operations and implementing safety procedures.

Field Team Members:

Field Team Members are responsible for the following:

- ❖ Understanding and complying with the Health and Safety Plan and any additional health and safety instructions.
- ❖ Observing the “**Buddy System**” during work activities.
- ❖ Promptly reporting all injuries or illnesses to the Project Manager and/or Health and Safety Officer.
- ❖ Immediately reporting any violations of the Health and Safety Plan to the Project Manager and/or Health and Safety Officer.
- ❖ Completing other duties as assigned by the Project Manager and/or Forman.

Subcontractors:

It is anticipated that the following subcontracting services will be required:

- ❖ Traffic Control
- ❖ Operated Dump Trucks
- ❖ Equipment
- ❖ Fuel

Superfund Technical Assessment and Response Team (START):

The START contractor is responsible for providing the FOSC with assistance and support in regards to all technical, regulatory and safety aspects of site activity. The START is also available to advise the FOSC on matters relating to sampling, air monitoring. START shall conduct the following activities during excavation, backfill, and creek restoration activities:

- ❖ Preparing a Site Safety Plan as it relates to the Sampling & Analysis for monitoring.
- ❖ Providing technical support to FOSC and the Emergency Response and Removal Service (ERRS) contractor as required. Documenting site activities and maintaining the official site file.
- ❖ Conducting site safety operations such as air monitoring.
- ❖ Evaluating regulations and standards.
- ❖ Collecting samples and conducting data validation and presenting data per FOSC request.
- ❖ Determining the extent of contamination per FOSC guidance.

- ❖ Recording sample locations using the Geographic Information System.
- ❖ Preparing the final report.

Site Safety Officer:

The ERRS and START Site Safety Officers will be assigned to the site on a full-time basis with functional responsibility for implementing the Site Safety Plan as it applies to ERRS and START personnel. The RM is the designated ERRS SSO. The Lead START Member is the designated START SSO unless otherwise appointed. Site Audits may be conducted by the ERRS Safety Manager, START personnel, and/or the U.S. EPA, as approved by the FOOSC. Specific duties included:

- ❖ Assume responsibility for health and safety of ERRS and/or START personnel.
- ❖ Document safety problems.
- ❖ Supervise decontamination of personnel and equipment.
- ❖ Ensure that monitoring equipment is calibrated / operational.
- ❖ Conduct personal air monitoring on all EQ employees as outlined in 29 CFR 1910.120(h)(4).
- ❖ Perform respirator fit tests.
- ❖ Inventory/inspect PPE prior to personnel site entries.
- ❖ Prepare summary letter of personal air sampling results.
- ❖ Select protective equipment levels based upon chemical properties, method of contact and air sample results.
- ❖ Prepare incident Report within 24 hours and Coordinate with Corporate Health and Safety Manager.
- ❖ Complete and maintain OSHA Log within 3 days of accident.
- ❖ Insure all ERRS and/or START personnel are fit for duty based on medical surveillance reports.
- ❖ Inspect first aid kits/fire extinguishers/SCBAs and other equipment and engineering controls.
Coordinate with Corporate Staff to for policy updates

All site employees are empowered to stop work if real or perceived unsafe conditions exist. It is the obligation of every worker to report potential or suspected unsafe or unhealthy conditions. Project success is largely dependent on individual participation and open communication regarding health and safety matters.

1.2 Key Personnel

U.S. EPA Region 9 On-Scene Coordinator (FOOSC)	Tom Dunkelman	775-687-9480
EQ Program Manager	Ron McManamy	206-276-1935
EQ Health & Safety Manager	John Kominsky	513-825-7500
EQ Site Response Manager / SSO	Brad Coury	425-686-0823

The Response Manager will ensure that all field personnel operating specialized equipment, such as Highway Dump Trucks, Track Skid Steers, Excavators, Compactors, and other support equipment, have demonstrated competency or have undertaken documented training.

1.3 Site Background

The McDermitt and Cordero Mercury Mine sites consist of several non-contiguous locations: the McDermitt Mine, the Cordero Mine, areas within the town of McDermitt where apparent mine waste has been used as fill, and areas of the Fort McDermitt Paiute Shoshone Reservation (the Reservation) where apparent mine waste has also been used as fill. The town of McDermitt is located roughly 70 miles north of Winnemucca, NV, along Highway 95. The Fort McDermitt Paiute Shoshone Indian Reservation is located 3.5 southeast of the town of McDermitt and the McDermitt and Cordero Mines are located 7.2 miles southwest of the town of McDermitt.

The Cordero Mine operated from the 1930s until 1970, and is located on land owned by the BLM and on private land. The adjacent McDermitt Mine was operated from 1973 until the late 1980s. The McDermitt Mine is located on private land. The McDermitt Mine was closed under a permit from the Nevada Division of Environmental Protection.

The EPA Site Assessment program conducted a Site Inspection in 1988 which recommended no further action. Upon request from the Fort McDermitt Paiute Shoshone Tribe, EPA Emergency Response conducted an additional site visit in November 2009. At that time, EPA was notified of the possibility that mine waste had been used as fill at locations within the town of McDermitt and on the Fort McDermitt Paiute Shoshone Reservation.

In September and October of 2010, EPA conducted sampling of areas of red-colored fill located in the town of McDermitt and on the Reservation. The town of McDermitt straddles the Nevada/Oregon border and numerous areas were identified which contained mercury and arsenic in soil at concentrations which exceeded the EPA Region 9 residential Soil Remediation Goals (SRGs). Two areas were identified on the Reservation which contained mercury and arsenic in soil at concentrations which exceeded the residential SRGs.

- ❖ Site Name: Fort McDermitt Paiute Shoshone Indian Reservation
- ❖ Site Location: McDermitt, NV
- ❖ County: Humboldt
- ❖ Elevation: 4,440 Feet
- ❖ Latitude: 41° 91' 35.61" N
- ❖ Longitude: 117° 70' 81.70" W

1.4 Scope of Work (Statement of Work)

EQ has been tasked by EPA Region 9 to perform the following scopes at the above location:

EQ shall provide all labor, equipment, tools, supplies, subcontracts and materials necessary residential yard remediation in and around McDermitt, Nevada. Described in greater detail below:



Temporary Best Management Practices (BMPs) will be employed throughout construction for control of erosion, fugitive dust, and storm water management, and to minimize and to avoid adverse impacts on wildlife and their habitats. Dust and particulate concentrations at the Site will be monitored with particulate monitors and the results used to modify work practices if particulate levels exceed the on-Site action level of 10 ppm and Site boundary action level of 3 ppm.

- ❖ Mobilize personnel and equipment to site.
- ❖ Site activities are expected to start around April, 2013.
- ❖ Set up command post on site.
- ❖ Set up decontamination and break areas.
- ❖ Utilize a utility locator to locate water, septic, power and communications at the properties.
- ❖ Using a BLM borrow pit, crush approximately 25,000 tons of soil to meet Type 2 Base Aggregate spec.
- ❖ Re-contour, backfill and compact 6 acres of McDermitt School parking lot.
- ❖ Excavate contaminated soils, backfill, compact and restore 40 residences, this includes; driveways, yard and right-of-ways Grade the large parking area at the McDermitt Combined School (and other properties as directed by the EPA OSC) in order to facilitate drainage. Cover the graded areas with a suitable amount fill and provide compaction.
- ❖ Transport contaminated soils to repository located at the Cordero/McDermitt mine.
- ❖ Provide necessary dust control measures during excavation and backfill operations.
- ❖ Complete all restoration to the satisfaction of the property owners.
- ❖ Completion of restoration operations and decon equipment.
- ❖ Return all access road to its post-remediation condition.
- ❖ Crush, screen and haul barrow material from various location
- ❖ Provide technical support to EPA OSC as necessary with any required plan developments and modifications.

2 SAFETY AND HEALTH HAZARDS

This Section serves to identify the potential hazards, independent of risk, and the control strategies to be applied. This information is further defined by task assignment in the corresponding THA listed in Attachment F.

Administrative and Engineering Controls are described below for these identified hazards. Section 3 will define the corresponding EQ training requirements by task responsibility.

2.1 EQ Work Task Organization

EQ work tasks to be completed during the response action are summarized into the following major tasks. Specific details for each task are described are below.

- Task 1: Pre-Excavation Preparation at the Residential Yards and City-Owned Property
- Task 2: Mobilization and Site Preparation
- Task 3: Dust Suppression as Required
- Task 4: Cleanup and Restoration at the Residential Yards and City-Owned Property
- Task 5: Equipment Decontamination and Site Demobilization
- Task 6: Post Repair/Cleanup Operations / Contract Required Reporting

Task 1: Pre-Excavation Preparation

- ❖ Prepare a written access agreement for each residential yard, the city-owned property, and the private properties, review the agreements with each respective property owner / tenant, and secure the required signatures.
- ❖ Locate utilities for both the yard cleanup and stockpile relocation operations.
- ❖ Prepare a detailed written Pre-Removal Property Assessment Agreement, w/photos, for each Parcel to be cleaned-up, review the agreement with the property owner / tenant, and secure the required signatures.
- ❖ Subcontract a licensed traffic control engineer to generate a Traffic Control Plan.

Task 2: Mobilization and Site Preparation

- ❖ Provide a Work Plan for proposed site activities.
- ❖ Provide a Site Specific Safety Plan for the proposed site work.
- ❖ Mobilize personnel and equipment to the Fort McDermitt Site
- ❖ Establish a command post with utilities and portable sanitary facilities.

Task 3: Dust Suppression as Required

- ❖ Conduct daily Tailgate H & S meetings prior to site activity.
- ❖ Delineate the “footprint” covered with ash and targeted for dust suppression.
- ❖ Utilize operated 4,000-gallon capacity water trucks equipped with spray bars, pumps, and hoses.

Task 4: Cleanup/Restoration Operations at Residential Yards and City-Owned Property

- ❖ Utilize caution tape, barricades, etc. to physically delineate all utilities; both above and below surface grade, and specific work areas; i.e. the Exclusion Zone, Contamination Reduction Zone, Support Zone. etc.



- ❖ Provide uninterrupted access to the homes for the residents.
- ❖ Conduct daily Tailgate H & S meetings prior to site activity.
- ❖ Utilize operated heavy equipment; i.e. mini-excavators, skid steers, etc., to repair impacted properties and access roads, excavate/remove impacted soil from all accessible areas and over-the-road dump trucks to transport excavation spoils to the a nearby mine located outside the town of McDermitt.
- ❖ Implement dust suppression / control measures.
- ❖ Implement surface water control measures.
- ❖ Implement noise control measures.
- ❖ Once cleanup operations are complete, tested and certified-clean backfill materials shall be imported, placed, and graded and the finish grade shall be restored to pre-removal conditions, as stipulated in the Pre-Removal Property Assessment Agreement.

Task 5: Equipment Decontamination and Site Demobilization.

- ❖ Decontaminate site equipment.
- ❖ Demobilize equipment and personnel from the site upon completion of site work.

Task 6: Post Cleanup Operations / Contract Required Reporting.

- ❖ Review Pre-Removal Property Assessment Agreement, w/photos, for each residential yard and city-owned property with the property owner / tenant, and secure the required signatures.
- ❖ Provide Final Cost Report.

Other tasks not identified in the work plan may be assigned by the FOSC, and the SSP will be amended as needed. If more information becomes available concerning the hazards of operations to be undertaken at the site, the requirements of the SSP may be modified by the SSO to accommodate for additional site hazard information.

2.2 Task Specific Hazards and Controls

Task-specific hazards and controls are to be addressed at daily safety meetings as each task is performed. The site work plan should be referenced for further details for each task. Each Task-Specific Safety Assessment is designed to develop awareness to the specific chemical and physical hazards for each task. It would be impractical to repeat in complete detail each control measure and SOP for each job task. Sources and hazards will be addressed for each job task with reference made to applicable control measures in this Section, Section 2.3 and SOPs. The tables in Section 2.3.2 and Attachment F should be posted in the break area and command post. When the Task-Specific Safety Assessments are discussed, additional hazards may need to be addressed and subsequently added to the respective Task Hazard Analysis in Attachment F.

2.3 Chemical Hazards

This list of chemical hazards should not be taken as a complete assessment of the hazards posed at the Fort McDermitt Paiute Shoshone Indian Reservation. The known and unknown chemical hazards at this site prevent a clear determination of the specific effects of discrete compounds. Therefore, personnel must be alert for symptoms of possible exposure such as unusual smells; stinging and burning eyes, nose and throat; skin irritation; as well as feeling extremely ill, depressed, sleepy or tired. Symptoms must be immediately reported to the RM.

2.3.1 Primary Chemical Hazards

The primary chemical hazards expected to be present at the Fort McDermitt Paiute Shoshone Indian Reservation include:

- Mercury
- Arsenic

A summary of the health effects and the OSHA permissible exposure limits (PELs) for the primary chemical hazards likely to be encountered during operations at the site are summarized in Figure 2-1. Applicable Material Safety Data Sheets (MSDSs) and supplemental chemical hazard information are provided in Attachment L.

Figure 2-1

PRIMARY CHEMICAL HAZARD INFORMATION

COMPOUND	OSHA EXPOSURE LIMITS	EXPOSURE ROUTE	HEALTH EFFECTS
Mercury	PEL = 0.025 mg/m ³ IDLH = 10 mg/m ³	Inhalation, ingestion, skin and/or eye contact	Weakness, insomnia, Facial pallor, Pal eye, abdominal pain, anemia, Hypotension, Kidney disease, Encephalopathy
Arsenic	PEL = 0.010 mg/m ³ IDLH = 5 mg/m ³	Inhalation, ingestion, skin and/or eye contact	Ulceration of nasal septum, Dermatitis, GI disturbances, Respiratory irritation, Hyperpig of skin.

2.3.2 Secondary Chemical Hazards

Secondary chemical hazards are typically introduced and/or generated by site activities, but are not considered to be primary chemical hazards for the site. For the Fort McDermitt Paiute Shoshone Indian Reservation, the secondary chemical hazards are expected to include:

- Diesel (heavy equipment operation)
- Gasoline (automobiles)
- Note: Gasoline and Diesel contains Benzene and Ethyl benzene
- Carbon Monoxide (heavy equipment operation)

A summary of the health effects and the OSHA permissible exposure limits (PELs) for the secondary chemical hazards likely to be encountered during operations at the site are summarized in Figure 2-2. Applicable Material Safety Data Sheets (MSDSs) and supplemental chemical hazard information are provided in Attachment L.

Figure 2-2
SECONDARY CHEMICAL HAZARD INFORMATION

COMPOUND	OSHA EXPOSURE LIMITS	EXPOSURE ROUTE	HEALTH EFFECTS
Gasoline	None	Inhalation, skin absorption, ingestion, skin and/or eye contact	Irritation eyes, skin, mucous membrane; dermatitis; headache, lassitude (weakness, exhaustion), blurred vision, dizziness, slurred speech, confusion, convulsions; chemical pneumonitis (aspiration liquid); possible liver, kidney damage; [potential carcinogen]
Diesel (as diesel exhaust)	None	Inhalation, skin and/or eye contact	Eye irritation, pulmonary function changes; [potential occupational carcinogen]
Benzene	OSHA PEL = 1 ppm OSHA STEL = 5 ppm NIOSH REL = 0.1 ppm NIOSH STEL = 1 ppm	Inhalation, skin absorption, ingestion, skin and/or eye contact.	Eye irritant; skin, nose, respiratory system; dizziness; headache, nausea, staggered gait; anorexia, lassitude (weakness, exhaustion); dermatitis; bone marrow depression; [potential occupational carcinogen].
Ethyl benzene	PEL = 100 ppm OSHA STEL = 100 ppm NIOSH REL = 100 ppm NIOSH STEL = 25 ppm	Inhalation, skin absorption, ingestion, skin and/or eye contact	Eye irritant, nose, respiratory system; headache, lassitude (weakness, exhaustion), dizziness, confusion, malaise (vague feeling of discomfort), drowsiness, unsteady gait; narcosis; defatting dermatitis; possible liver injury; reproductive effects
Carbon Monoxide	OSHA PEL = 50 ppm NIOSH REL = 35 ppm NIOSH C = 200 ppm	Inhalation, skin and/or eye contact (liquid).	Headache, tachypnea, nausea, lassitude (weakness, exhaustion), dizziness, confusion, hallucinations; cyanosis; depressed S-T segment of electrocardiogram, angina, syncope.

LEGEND:

- PEL: OSHA Permissible Exposure Limit (8-hr TWA)
- REL: Recommended Exposure Limit (NIOSH), based on a 10-hour TWA
- C: OSHA Ceiling Limit
- TWA: Time Weighted Average
- mg/m³: milligrams per cubic meter of air
- ppm: parts per million
- STEL: OSHA Short Term Exposure Limit (15 min TWA)
- ACGIH: American Conference of Governmental Industrial Hygienists
- TLV: Threshold Limitation Value
- NIOSH: National Institute for Occupational Safety and Health



2.3.3 Dust Hazards

A potential hazard exists from the generation of contaminated dust during work activities. Dust suppression/control measures will be implemented to minimize generation of fugitive dusts during work operations. Such measures are anticipated to be required except when wet/moist conditions exist at the site due to rainy weather conditions.

Generation of dust may occur at the site during the following activities:

- ❖ Movement of heavy equipment on unpaved surfaces.
- ❖ Soil Excavation.
- ❖ Soil Handling; i.e. loading for transport, offloading, surface spreading, etc.
- ❖ Strong wind events.
- ❖ Dust generating activities will require the following dust control measures.
- ❖ Water truck to moisten soil along the main access road, load-out areas and staging areas atop the tailings pile.
- ❖ Water truck to moisten soil in work areas prior to dust-generating work activities and periodically during the day to maintain effective dust control.
- ❖ Water truck and fire hose to be available on stand-by during all weather conditions.

2.4 Physical Hazards

The primary risk of exposure to physical hazards will be from noise, heat exposure, and being struck by equipment. Task-Specific Hazard Assessments and General Hazard Analysis are included in Attachment F; Task Hazard Analysis.

Physical Hazards

The primary physical hazards to be encountered during site activities include:

- ❖ Fire/Explosion
- ❖ Excavation Safety
- ❖ Heavy Equipment Operations
- ❖ Vehicle Traffic
- ❖ Electrical Equipment
- ❖ Noise Exposure
- ❖ Heat Stress / Cold Stress
- ❖ Fall Hazards

Miscellaneous Physical Hazards

Miscellaneous physical hazards and safety procedures to be followed will be discussed with personnel in daily safety meetings and may include discussion of the following topics:

- ❖ Material handling
- ❖ Safe lifting procedures

- ❖ Machinery operation
- ❖ Crushing & screening operations
- ❖ Elevated work surfaces
- ❖ Housekeeping
- ❖ Uneven terrain
- ❖ Slippery work surfaces
- ❖ Sharp objects
- ❖ Tripping hazards

2.5 Biological Hazards

2.5.1 Bloodborne Pathogens

The handling of victims during decontamination poses a risk of exposure for bloodborne pathogens such as hepatitis and HIV. Contaminated victims will often be present with trauma and open wounds. It will not be possible to properly dress burn wounds prior to decontamination. Other wounds may open during the decontamination process where mechanical decon measures or debridement are required. Typically, large percentages of blast victims are expected to require debridement for glass and construction debris. It is recognized that debridement will be applied by emergency medical staff but may be assisted by EQ staff as the residue may be radiologically contaminated.

All EQ staff conducting decontamination tasks will take Universal Precautions in accordance with OSHA 1910.1030 Bloodborne Pathogens.

2.5.2 Poisonous Insects, Snakes

Insect stings are another biological hazard that may be encountered. Personnel with known allergic reactions to insect stings should have their physician prescribed emergency sting-kits on-site and also inform the SSO of their allergy to insect bites/stings. West Nile virus (WNV) is a mosquito-borne virus that can cause encephalitis or meningitis via the bite of an infected mosquito. Measures to reduce the risk of insect bites and potential illness includes:

- ❖ The use of an insect repellent containing DEET (30 %). DEET is usually good for 4-5 hours of protection when working outdoors.
- ❖ Avoid prolonged or excessive use of DEET and use it sparingly to cover clothing. Always follow manufacturer's instructions.

Poisonous snakes and spiders are also biological hazards that may be encountered during certain times of the year. If bitten by any snake or spider, medical treatment should be obtained immediately.

2.5.3 Hanta Virus

Hanta virus, spread by the deer mouse, is found throughout North American, and is prevalent in Colorado. Exposures can lead to Hantavirus Pulmonary Syndrome (HPS) which is potentially fatal. The average time between contact with the virus and the onset of illness is two to three weeks. The initial symptoms look very much like the flu, including fever, muscle ache, cough, headache, nausea, and vomiting. They can progress to a fever and serious respiratory illness that



rapidly worsens. Mouse infestations can occur within the temporary Decontamination Station structures or storage areas. Measures to minimize the risk of HPS include:

- ❖ Always wear rubber gloves when cleaning up rodent carcasses and droppings.
- ❖ Wear a respirator that has a HEPA (P100) rating. Ordinary dust masks will not filter the virus!
- ❖ Before starting cleanup, thoroughly wet down the area with a 10 percent household bleach solution (3 tablespoons of bleach in one quart of water). Use only wet cleaning techniques, such as damp mopping. Avoid sweeping, vacuuming and other dry cleanup techniques.
- ❖ You should dispose of dead mice by dampening the body with the spray solution, picking it up with gloves, and placing it into a plastic bag. If possible, burn the bagged material. After cleanup, disinfect the entire area with a 10 percent bleach solution. Allow the area to dry thoroughly before entry or use.

3 PERSONNEL TRAINING

3.1 Initial OSHA Training

All EQ personnel will have received training as outlined in the **Figure 3–1**, prior to deployment.

Training Certification	Response Manager	HP & Decon Workers	Equipment Operators
OSHA HAZWOPER 1910.120(e) Technical Level Certification	Yes	Yes	Yes
NIMS ICS Training Certification	Yes	Yes	Yes
CPR / First Aid Certification	Yes	No	No
DOT 49 Subpart H, §172.700-172.704	Yes	Yes	Yes
Fire Extinguisher Training	Yes	Yes	Yes
HazCom: Right-to-know	Yes	Yes	Yes
Heat Stress Awareness	Yes	Yes	Yes
Heavy Equipment Operator	No	No	Yes
Respiratory Protection Training	Yes	Yes	Yes
Site Familiarization	Yes	Yes	Yes
Site Safety Orientation	Yes	Yes	Yes

Figure 3–1 Training Requirements

3.2 Site Specific Training

- a. All assigned personnel will receive site-specific training on routes of exposure and adverse health effects associated with the chemicals listed in Sections 2.3.1 and 2.3.2 (including MSDSs in Attachment L).
- b. At least one member of each work crew shall have training in the use of portable fire extinguishers in accordance with 29CFR 1910.157(g).
- c. In accordance with 29CFR 1910.120, all personnel newly assigned to hazardous waste work will receive 3 days of on the job training by an experienced supervisor.
- d. Each person entering the site shall sign a statement attesting to the fact that they have read and understand the Site Safety Plan (See SSP Acknowledgement Form included in Attachment C)

3.3 Annual Refresher

All field employees receive eight hours of refresher training on the above topics within the anniversary date of their initial 40-hour class.

3.4 First Aid/CPR

At least one individual on site will maintain valid and current CPR and First Aid Certification (Response Manager). Treatment will be limited to Good Samaritan/minor first aid. All traumatic/major first aid and cardiac problems will be referred to medical facilities.

3.5 Subcontractor Requirements

All subcontractors entering the Contamination Reduction Zone and Exclusion Zone will have adequate training satisfying 29 CFR 1910.120(e).



4 PERSONAL PROTECTIVE EQUIPMENT

The following is a brief description of the personal protective equipment (PPE), which may be required during various phases of the project. The U.S. EPA terminology for protective equipment will be used; Levels A, B, C and D.

Respiratory protective equipment shall be NIOSH-approved and use shall conform to OSHA 29 CFR 1910.134 Requirements. Each employer shall maintain a written respiratory protection program detailing selection, use, cleaning, maintenance and storage of respiratory protective equipment. The written Respiratory protection Program will be maintained at the local and regional offices.

4.1 PPE Requirements

Task 1: Pre-Excavation Preparation.....Level D

Level D for pre-excavation preparation activities where contact with contaminants is limited, if not non-existent.

Task 2: Mobilization and Site PreparationLevel D

Level D for mobilization/site preparation activities where contact with contaminants is unlikely.

Task 3: Dust Suppression as RequiredLevel D

Level D given that dust suppression / control measures is the focus of this Task and contact with contaminants; i.e. fugitive dust, is unlikely.

Task 4: Cleanup/Restoration Operations at the Residential Yards and City-Owned PropertyLevel D

Level D given that dust suppression / control measures is the focus of this Task and contact with contaminants; i.e. fugitive dust, is unlikely.

Task 5: Equipment Decontamination and Site DemobilizationLevel D

Level D for site activities where contact with contaminants is unlikely and dust control measures have been implemented to control airborne particulates.

Task 6: Post Cleanup Operations / Contract Required ReportingN/A

These reports shall be generated in office environments far removed from the site.

4.2 Level A

Level A protection shall be used when:

- ❖ An extremely hazardous substance requires the highest level of protection for skin, eyes and the respiratory system;
- ❖ Substances with a high degree of hazard to the skin are known or suspected;
- ❖ Chemical concentrations are known to be above IDLH levels; or,
- ❖ Biological hazards requiring Level A are known or suspected.

Level A protective equipment use is not anticipated during planned project activities.

4.3 Level B

Level B protection shall be used when:

- ❖ The substance(s) has been identified and requires a high level of respiratory protection but less skin protection;
- ❖ Concentrations of chemicals in the air are IDLH or above the maximum use limit of an APR with full-face mask;
- ❖ Oxygen deficient or potentially oxygen deficient atmospheres (<19.5%) are possible; and/or,
- ❖ Confined space entry may require Level B.
- ❖ Incomplete identification of gases and vapors, but not suspected to be harmful to skin or skin absorbable.

Level B protective equipment use is not anticipated during planned project activities.

4.4 Level C

Level C protection shall be used when:

- ❖ The same level of skin protection as Level B, but a lower level of respiratory protection is required;
- ❖ The types of air contaminants have been identified, concentrations measured, and an air-purifying respirator is available that can remove contaminants; or,
- ❖ The substance has adequate warning properties and all criteria for the use of APR respirators have been met.

Level C protective equipment at a minimum shall consist of the same equipment as Level B except the SAR will be substituted with a full face Air Purifying Respirator (APR) with Mercury HEPA cartridges.

Respiratory Protection:	Air Purifying Respirator (APR) with Organic Vapor/Acid Gas HEPA cartridges.
Chemical Resistant / Protective Coveralls:	Tyvek™
Inner Gloves	Latex or Nitrile;
Outer Chemical Gloves	Viton or PVA or Nitrile;
Outer Work Gloves	Cotton or leather;
Safety Boots	Steel-toe / Steel Shank;
Boot Covers (booties) or Rubber Over boots Robars;	
Hard Hat	Yes
Other:	Hearing protection as required for noisy operations.

4.5 Level D

Level D protection shall be used when:

- ❖ The atmosphere contains no known respiratory hazard; and,
- ❖ Work functions preclude splashes, immersion or the potential for unexpected inhalation of, or contact with, hazardous concentrations of harmful chemicals.

Level D protection equipment at a minimum shall consist of:

Protective Coveralls	As necessary;
Safety Shoes/Boots (type)	Steel-toe/Steel Shank;
Boot Covers (booties)	Latex or Robars;
Work Gloves	Cotton;
Hard Hat	Yes;
Face Shield	As necessary;
Safety Glasses	Yes

Modifications: Hearing protection as required by noisy operations. Polytyvek™ coveralls and Viton, Nitrile or PVA gloves when working and the possibility of a splash exists.

Specific operating procedures for PPE and Respiratory Protection are provided in Attachment D.

4.6 Decisions to Upgrade/Downgrade PPE

- a. All decisions to downgrade from Level B to C or C to D must be accompanied by air monitoring results. The ERRS Safety Managers must be advised of on-site decisions to downgrade. All decisions must be documented with an Amendment to the SSP.
- b. The following conditions will necessitate reevaluation of PPE use.
 1. Commencement of a new work activity not previously identified
 2. Change of job tasks during a work phase
 3. Change of season/weather
 4. Contaminants other than those identified in Safety Plan
 5. Change in ambient levels of contaminants
 6. Change in work that affects degree of chemical contact
- c. Action Levels (See Section 6.0)

5 MEDICAL SURVEILLANCE

5.1 Pre-Employment Physical

Pre-employment and periodic update medical examinations are required for persons working at hazardous waste sites.

All physicals must be completed and documented prior to assignment to the site.

All physical exams will be conducted following parameters established by the respective employee's Corporate Physicians.

EQ and all permanent team subcontractors must adhere to the Drug Free Workplace Act of 1988.

5.2 Site Specific Physical Examination

Site-specific physical examination is required for planned project activities. A current Fitness for Duty statement will be kept on site for all personnel.

5.3 Annual Physical Exam

A medical examination must have been completed within a 12-month period prior to on-site activity and repeated annually.

5.4 Accidental/Suspected Exposure Physical

Following any accidental or suspected uncontrolled exposure to site contaminants, personnel should be scheduled for a special physical examination. In the event of such suspected exposure, an Injury Report shall be completed and sent to the Deputy Program Manager and Corporate Health and Safety Director within 24 hours. John Kominsky is acting Corporate Health and Safety Director at (513) 825-7500, email, (TValli@eqm.com).

The physical examination will be specific for the contaminants and the associated target organs or physiological system.

Exposure to blood/body fluids requires adherence to 29 CFR 1910.1030 (Bloodborne Pathogens).

Questions regarding the type of physical can be directed to the employer's Director of Health and Safety or their Corporate Physician.

5.5 Contractor Physical Examination Requirements

All subcontractors entering the Contamination Reduction Zone (CRZ) or Exclusion Zone (EZ) will have adequate medical surveillance satisfying 29 CFR 1910.120(f).

5.6 Site Documentation

All personnel on-site must have the following documentation available on site or to the site within 24 hours of request:

- ❖ Copy of 40-Hour HAZWOPER 1910.120(e) Training certificate
- ❖ Copy of Manager's/Supervisor's 8-Hour HAZWOPER certificate (if applicable)
- ❖ Copy of 8-Hour Annual Refresher (if > 12 months since 40-hour)
- ❖ Respirator Fit Test Record
- ❖ Medical Fitness For Duty Release (if applicable)
- ❖ Worksite Exposure Documentation (if applicable)

6 AIR MONITORING AND ACTION LEVELS

According to 29 CFR 1910.120 (h) air monitoring may be used to identify and quantify airborne levels of hazardous substances and health hazards in order to determine the appropriate level of employee protection needed on-site. An air monitoring program will be finalized and implemented upon the request of the OSC when conditions are justified.

6.1 Routine Air Monitoring Requirements

Air monitoring will be conducted when

- ❖ Upon initial entry to rule out IDLH conditions;
- ❖ When the possibility of an IDLH condition or flammable atmosphere has developed;
- ❖ When work begins on a different portion of the site;
- ❖ Contaminants other than those previously identified are being handled;
- ❖ A different type of operation is initiated;
- ❖ Employees are handling leaking drums or containers or working in areas with obvious liquid contamination; and,
- ❖ During confined space work.

Air monitoring will consist at a minimum of the criteria listed below. All air monitoring data will be documented and submitted to the FOSC and available in the command post site files for review by all interested persons. Air monitoring instruments will be calibrated and maintained in accordance with the manufacturer's specifications. Calibration and maintenance performed will be entered on the provided EQ form(s).

This project does not require entry into the EZ thus air monitoring activities will be directed to determination of exposure to workers in the CRZ.

6.2 Site Specific Air Monitoring Requirements

Monitoring will be completed to determine personnel exposures to chemical contaminate and physical agents during various project activities. The SSO and/or other responsible party (e.g., START contractor) will be responsible for completing monitoring activities during field operations where there is potential exposure to airborne dust and other airborne contaminants above PELs/TLVs. The following table summarizes site air requirements.

Figure 6-1 summarizes site air requirements:

Figure 6-2 Action Level Worksheet:

Instrument	Compounds To Detect	Frequency	Comments/ Action Level
Other: Mini Data Ram & High Volume Sampler	Dust particulates Respirable Dust	During excavation Operations if dusty conditions	>5.0 mg/m ³ Level "C" PPE >0.5 mg/m ³ Resp dust Level "C" PPE Particulates, Total = 15 mg/m ³ Particulates, Respirable Fraction = 5 mg/m ³ (See Action Level Worksheet) Figure 6.2 Arsenic = 33 mg/m ³ Mercury = 250 mg/m ³

Other: Lumex		Enclosed Spaces or new areas	>1,000 ng/m ³ : Leave area and consult SSO 12,500 ng/m ³ : PPE upgrade to APR w/Mersorb P1000 cartridges
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6.3 Noise Monitoring

Operation of equipment and machinery at the site may generate excessive noise levels and will require use of hearing protection (e.g., foam ear plugs) by site personnel whenever noise exposures exceed 85 decibels on the A-weighted scale (dBA). Noise exposure in excess of 85 dBA will be assumed to be present whenever voice must be raised to be heard in normal conversation at three feet apart and whenever working in immediate areas of operating heavy equipment, generators, compressors and similar equipment. Should it become necessary to determine if hearing protection is required for certain operations, a type II sound level meter/audio dosimeter will be used to determine noise exposure levels.

6.4 Heat/Cold Stress Monitoring

Heat stress monitoring for the site will begin when temperature exceed 80 F. Heat stress monitoring for personnel working in permeable clothing, such as cotton or synthetic work clothes, will be conducted in accordance with The American Conference of Governmental Industrial Hygienists' (ACGIH) Threshold Limit Values for heat stress. The SSO will be responsible for verifying the work/rest schedules; calculating WBGT using a black globe thermometer, a natural wet bulb thermometer, and a dry bulb thermometer (or WBGT monitor); notifying workers of results; and documenting results.

The SSO will also monitor workers wearing impermeable or semi-impermeable clothing for physiological results by the following checks:

- ❖ Heart rate. Count the radial pulse during a 30-second period as early as possible in the rest period.
- ❖ If the heart rate exceeds 110 beats per minute at the beginning of the rest period, shorten the next work cycle by one-third and keep the rest period the same. If the heart rate still exceeds 110 beats per minute at the next rest period, shorten the following work cycle by one-third.
- ❖ Oral temperature. Use a clinical thermometer (3 minutes under the tongue) or similar device to measure the oral temperature at the end of the work period (before drinking).
- ❖ If oral temperature exceeds 99.6°F (37.6°C), shorten the next work cycle by one-third without changing the rest period.
- ❖ If oral temperature still exceeds 99.6°F (37.6°C) at the beginning of the next rest period, shorten the following work cycle by one-third.
- ❖ Do not permit a worker to wear a semi permeable or impermeable garment when his/her oral temperature exceeds 100.6°F (38.1°C).
- ❖ Body water loss (if possible). Measure weight on a scale accurate to ± 0.25 lb at the beginning and end of each workday to see if enough fluids are being taken to prevent dehydration. Weights should be taken while the employee wears similar clothing or, ideally, is nude. *The body water loss should not exceed 1.5 percent total body weight loss in a workday.*

Initially, the frequency of physiological monitoring depends on the air temperature adjusted for solar radiation and the level of physical work.

Cold stress monitoring will be completed IAW ACGIH TLVs for cold stress.

Dust Action Limit Calculations - McDermitt Removal Action

Maximum Detected Contaminant Concentrations

Analyte	OSHA PEL (mg/m3)	Maximum Site Concentration Based on Sample Data (mg/kg)	DataRAM Action Level Based on Sample Data (mg/m3)	DataRAM Action Level Based on Sample Data for full face air-purifying respirator w/ protection factor of 50 ⁴ (mg/m3)
Antimony	0.5		#DIV/0!	#DIV/0!
Arsenic	0.01	150	33	1667
Barium	0.5		#DIV/0!	#DIV/0!
Beryllium	0.002		#DIV/0!	#DIV/0!
Cadmium	0.005		#DIV/0!	#DIV/0!
Chromium metal	0.5		#DIV/0!	#DIV/0!
Chromium (II & III)	0.5		#DIV/0!	#DIV/0!
Chromium VI ¹	0.005		#DIV/0!	#DIV/0!
Cobalt	0.02		#DIV/0!	#DIV/0!
Copper	1		#DIV/0!	#DIV/0!
Cyanide ²	5		#DIV/0!	#DIV/0!
Lead	0.05		#DIV/0!	#DIV/0!
Mercury	0.1	200	250	12500
Molybdenum	15		#DIV/0!	#DIV/0!
Nickel	1		#DIV/0!	#DIV/0!
Selenium	0.2		#DIV/0!	#DIV/0!
Silver	0.01		#DIV/0!	#DIV/0!
Thallium	0.1		#DIV/0!	#DIV/0!
Vanadium	0.05		#DIV/0!	#DIV/0!
Zinc	5		#DIV/0!	#DIV/0!

Constants and conversions

Safety Factor
Protection Factor

2
1

Conversions
milligrams per kg
ug (micrograms) to mg

1000000 mg/kg
1000 ug/mg

Verify PEL before using calculations!!

7 SITE CONTROL AND STANDARD OPERATING PROCEDURES

7.1 Work Zones

The primary purpose for site controls is to establish the hazardous area perimeter, to reduce migration of contaminants into clean areas and to prevent access or exposure to hazardous materials by unauthorized persons. At the end of each workday, the site will be secured or guarded, to prevent unauthorized entry.

7.1.1 Support Zone

This uncontaminated Support Zone (SZ) or clean zone will be the area outside the Exclusion Zone (EZ) and CRZ and within the geographic perimeters of the deployment area. This area is used for staging of materials, parking of vehicles, office facilities, sanitation facilities, and receipt of deliveries. Personnel entering this zone may include delivery personnel, visitors, security guards, etc., who will not necessarily be permitted in the EZ.

All personnel arriving in the SZ will upon arrival, report to the command post and sign the site entry/exit log. There will be one controlled entry/exit point from the clean zone to the CRZ. The location of the SZ will be established prior to site activity no later than upon mobilization by the RM and/or FOSC.

7.1.2 Contamination Reduction Zone

The CRZ will provide the location for deployment of the Decontamination Stations. All civilians, Responders and equipment must exit the Exclusion Zone via the CRZ area. A separate decontamination area will be established for heavy equipment.

7.1.3 Exclusion Zone

The Exclusion Zone (EZ) will be the "hot-zone" or contaminated area inside the site perimeter. Entry to and exit from this zone will be made through a designated point and all personnel will be required to sign the hot zone entry/exit log located at the decontamination area. Appropriate warning signs to identify the Exclusion Zone should be posted (i.e. "DANGER - AUTHORIZED PERSONNEL ONLY", "PROTECTIVE EQUIPMENT REQUIRED BEYOND THIS POINT", etc.) When exiting from the Exclusion Zone must be accompanied by personnel and equipment decontamination as described in Section 9.0. The EZ will be identified by caution tape and signage and will include the areas of the building where hazardous waste operations are being conducted. General Safety Rules for Exclusion Zone include:

- a. wear the appropriate level of PPE defined in the SSP
- b. do not remove any PPE or break the integrity to pick, scratch or touch parts of your body
- c. no smoking, eating or drinking
- d. no horseplay
- e. no matches or lighters in this zone
- f. implement the communication and line of sight system

A map of the work zones for this site is provided in Attachment B.

7.2 General Field Safety Rules

- ❖ All visitors must be sent to the command post and referred to the FOSC.

- ❖ It is EPA policy to practice administrative hazard control for all site areas by restricting entrance to EZ to essential personnel and by using operational SOPs.
- ❖ Whenever possible, avoid contact with contaminated (or potentially contaminated) surfaces. Walk around (not through) puddles and discolored surfaces. Do not kneel on the ground or set equipment on the ground. Stay away from any waste drums unless necessary. Protect equipment from contamination by bagging.
- ❖ Eating, drinking, or smoking is permitted only in designated areas in the SZ.
- ❖ Beards or other facial hair that interfere with respirator fit will preclude admission to the EZ.
- ❖ Hands and face must be thoroughly cleaned upon leaving the CRZ.
- ❖ All equipment must be decontaminated or discarded upon exit from the EZ, as determined by the FOSC or designate.
- ❖ All personnel exiting the EZ must go through the decontamination procedures as described in the Work Plan.
- ❖ Safety Equipment described in Section 4.0 will be required for all field personnel in the EZ.
- ❖ Personnel will only travel in vehicles where individual seats for each occupant are provided. Seat belts will be worn as required.
- ❖ Fire extinguishers will be available on site and in all areas with increased fire danger such as the refueling area.
- ❖ A minimum of two personnel will always be on site whenever heavy equipment is operated. Only necessary personnel need to be on or around heavy equipment.
- ❖ Employees will not interfere with or tamper in any way with air monitoring equipment.
- ❖ Backhoes or other equipment with booms shall not be operated within 10 feet of any electrical conductor.
- ❖ Visitors are not allowed in the CRZ without authorization and not without appropriate levels of PPE as determined by site safety personnel.
- ❖ Security will be maintained at the site by closing all gates during normal work hours. The FOSC will assume responsibility for personnel entering site. Site will be locked up in the evening and patrolled by a guard service.
- ❖ EPA FOSC will allow only those individuals authorized to enter the site. If unauthorized members of the public are found on site, contact security immediately and do not leave the individual unattended.
- ❖ Visitors are not allowed in the work areas without authorization and not without appropriate levels of PPE as determined by site safety personnel. Access to the properties is restricted to the EPA and authorized representatives. All persons must sign in at the onsite EQ office trailer and receive authorization to enter the site.
- ❖ Buddy System
 1. The buddy system is mandatory at any time that personnel are working in the Exclusion Zone, remote areas, on tanks, or when conditions present a risk to personnel.



2. A buddy system requires at least two trained/experienced people who work as a team and maintain at a minimum audible and/or visual contact while operating in the Exclusion Zone.

❖ Communication Procedures

1. Radios will be used for onsite communications and Channel **1 and 2** will be the designated channel.
2. The crews should remain in constant radio or visual contact while on site.
3. The site evacuation signal will be three (3) blasts on the air or vehicle horn.

8 DECONTAMINATION PROCEDURES

In general, everything that enters the EZ at this site must either be decontaminated or properly discarded upon exit from the EZ. All personnel, including any state and local officials, must enter and exit the EZ through the decontamination area. Prior to demobilization, contaminated equipment will be decontaminated and inspected by the FOSC or FOSC designate before it is moved into the SZ. Any material that is generated by decontamination procedures will be stored in a designated area until disposal arrangements are made. It is anticipated that dry decontamination practices will be implemented during site activities.

All personnel must be documented on the "HOT ZONE ENTRY/EXIT LOG" when entering and exiting the Exclusion Zone.

NOTE: Should conditions warrant the implementation of a wet decontaminated line, the decontamination solution for this site is soap, Alconox™, and water. Decontamination solution will be changed daily (at a minimum) and collected and stored on-site until disposal arrangements are finalized.

8.1 Procedures for Equipment Decontamination

Following decontamination and prior to exit from the hot zone, the FOSC or a designated alternate, shall be responsible for insuring that items have been sufficiently decontaminated. This inspection shall be included in the site log. Equipment decontamination will be decontaminated and released from the site if survey measurements meet cleanup criteria as directed by the FOSC.

8.2 Procedure for Personnel Decontamination

This decontamination procedure applies to personnel at this site wearing Level C/D protection. These are the minimum acceptable requirements:

Station 1: Equipment Drop

Deposit equipment used on-site (tools, sampling devices and monitoring instruments, radios, etc.) on plastic drop cloths. These items must be decontaminated or discarded as waste prior to removal from the CRZ.

Station 2: Outer Boot and Outer Glove Wash and Rinse

Scrub outer boots, outer gloves and/or splash suit with decontamination solution or detergent water. Rinse off using water.

Station 3: Outer Boot and Glove Removal

Remove outer boots (if disposable) and gloves. If outer boots are disposable, deposit in disposal container. If non-disposable, store in a clean dry place.

Station 4: Tank Change

If person leaves Exclusion Zone to change air tank, this is the last step in the decontamination procedure. Air tank is exchanged, new out gloves and boot covers donned, joints taped and person returns to hot zone.

Station 5: Outer Garment Removal

If applicable, remove SCBA back-pack and remain on air as long as possible. Remove chemical resistant outer garments and deposit in container lined with plastic. Decontaminate or dispose of splash suits as necessary.

Station 6: Respiratory Protection Removal

Remove hard-hat, face-piece, and if applicable, deposit SCBA on a clean surface. APR cartridges will be discarded as appropriate. Wash and rinse respirator at least daily. Wipe off and store respiratory gear in a clean, dry location. (See Attachment D)

Station 7: Inner Glove Removal

Remove inner gloves. Deposit in container for disposal.

Station 8: Field Wash

Thoroughly wash hands and face with soap and water. Shower as soon as possible.

Eating, drinking, chewing gum/tobacco, smoking, or any practice that increases the probability of hand to mouth transfer and/or ingestion of materials is prohibited in any areas where the possibility of contamination exists and is permitted only in the designated break area. Personnel will not wear or bring dirty/decontaminated clothing into the break areas.

8.3 Emergency Decontamination Steps

If emergency decontamination is required the following steps will be carried out. Move the victim only if it is safe to do so. Decontaminate the victim only to the extent as to allow safe removal of the victim without further injury. Any blood contaminated material or body fluid will be bagged, labeled Biohazard and accompany the individual to the hospital.

8.4 Required Decontamination Equipment

Tables, chairs, trashcans and liners, scrub brushes, buckets, brooms, scrapers, soap and cleaning supplies will be provided for use during decontamination.

8.5 Disposition of Decontamination Wastes

All equipment and solvents used for decontamination shall be decontaminated or disposed of with the established waste streams. A sketch of the decontamination area for this site is provided in Attachment B

9 HAZARD COMMUNICATION PROGRAM

Each contractor will be responsible for maintaining a copy of their Hazard Communication Program and MSDS' on site.

9.1 Material Safety Data Sheets

- ❖ MSDS' will be maintained at the onsite EQ office trailer in the Health and Safety Binder.
- ❖ MSDS' will be available to all employees for review during the work shift.
- ❖ See the EQ Health and Safety Binder.

9.2 Container Labeling

All containers received on site will be inspected by the contractor using the material to ensure the following:

- ❖ all containers clearly labeled, and legible;
- ❖ in English;
- ❖ appropriate hazard warning;
- ❖ contact information of manufacturer.

9.3 Hazardous Chemical List

The following hazardous chemicals are inventoried and may be used at the site i.e. gasoline, this list includes hazardous chemicals utilized by the contractor during operations, NOT chemical hazards associated with clean-up/remediation; i.e.:

- ❖ Gasoline
- ❖ Diesel Fuel #2
- ❖ Marking Paint

9.4 Employee Training and Information

Prior to starting work, each employee will attend a health and safety orientation and will receive information and training on the following:

- ❖ An overview of the requirements contained in the Hazard Communication Standard
- ❖ Hazardous chemicals present at the site
- ❖ The location and availability of the written Hazard Communication Program
- ❖ Physical and health effects of the hazardous chemicals
- ❖ Methods of preventing or eliminating exposure
- ❖ Emergency procedures to follow if exposed
- ❖ How to read labels and review MSDS' to obtain information
- ❖ Location of MSDS file and location of hazardous chemical list

Reference the on-site EQ Health and Safety Binder for the Hazard Communication Program and applicable MSDS.

10 EMERGENCIES/ACCIDENTS/INJURIES

It is essential that site personnel be prepared in the event of an emergency. Emergencies can take many forms; illnesses or injuries, chemical exposure, fires, explosions, spills, leaks, releases of harmful contaminants, or sudden changes in the weather. The following sections outline the general procedures for emergencies. Emergency information should be posted as appropriate.

10.1 Emergency Contacts

❖ Fire:		911
❖ Emergency		911
❖ Police:		911
❖ Poison Control:		1-800-876-4766
❖ Ambulance:		911
❖ Emergency		911
❖ U.S. EPA Region 9 FOSC	Tom Dunkelman	775-687-9480
❖ EQ Regional Office (Seattle)	Ron McManamy	425-673-2900
❖ EQ Response Manager	Brad Coury	425-686-0823
❖ EQ Corporate H&S	John. Kominsky, CIH, CSP	513-825-7500

A list of Medical Facilities are presented in Figure 10-1

Decon Station	Medical	Fire	Police
Fort McDermitt Paiute Shoshone Indian Reservation	Humboldt General Hospital 188 East Haskell Street Winnemucca, NV 89445 (775) 623-5222	Emergencies Dial 911	Emergencies Dial 911
100 Oliveria St. McDermitt, NV 89421	McDermitt Emergency Service 19 Olavarria Street McDermitt, NV 89421 (775) 532-8530		

Figure 10–1 Medical Facility

NOTE: Maps and directions to the hospital will be posted in the Command Post office and Decontamination Area, as well as following this section of the Health and Safety Plan.

10.2 Emergency Equipment Available On-Site

Communications Equipment

- ❖ Telephones; Cellular: EQ / EPA / START Personnel and at the Office Trailer
- ❖ Two-Way Radios: EQ / EPA / START Personnel and at the Office Trailer



- ❖ Emergency Alarms/Horns: EQ / EPA / START Office Trailer, CRZ, EZ, and any Vehicle and most Heavy Equipment onsite.

Medical Equipment

- ❖ First Aid Kits: EQ / EPA / START Office Trailer and CRZ
- ❖ Eye Wash Station: EQ / EPA / START Office Trailer and CRZ

Firefighting Equipment

- ❖ Fire Extinguishers: EQ / EPA / START Office Trailer, CRZ, and any Heavy Equipment or Dump Truck onsite
- ❖ Spill or Leak Equipment
- ❖ Pads and dry absorbent: Onsite Storage Container located adjacent to the EQ / EPA / START Office Trailer

10.3 Accident Reporting/Investigation

See **Attachment E** for proper procedures.

11 EMERGENCY RESPONSE CONTINGENCY PLAN

11.1 Project Personnel Responsibilities during Emergencies

Federal On-Scene Coordinator (FOSC)

As the administrator of the project, the FOSC has primary responsibility for responding to and correcting emergency situations. The FOSC will:

- ❖ Take appropriate measures to protect personnel including: withdrawal from the EZ, total evacuation and securing of the site or upgrading or downgrading the level of protective clothing and respiratory protection.
- ❖ Take appropriate measures to protect the public and the environment including isolating and securing the site, preventing runoff to surface waters and ending or controlling the emergency to the extent possible.
- ❖ Ensure that appropriate Federal, State and local agencies are informed, and emergency response plans are coordinated. In the event of fire or explosion, the local fire department should be summoned immediately. In the event of an air release of toxic materials, the local authorities should be informed in order to assess the need for evacuation. In the event of a spill, sanitary districts and drinking water systems may need to be alerted.
- ❖ Ensure that appropriate decon treatment or testing for exposed or injured personnel is obtained.
- ❖ Determine the cause of the incident and make recommendations to prevent the recurrence.
- ❖ Ensure that all required reports have been prepared.

Response Manager (RM)

The RM must immediately take appropriate measures to protect site personnel and report emergency situations to the FOSC, assist the FOSC as necessary in responding to and mitigating the emergency situation. Once emergency situation has been addressed the RM will call the PM to initiate reporting requirements.

Superfund Technical Assessment and Response Team (START)

The START must immediately report emergency situations to the FOSC, take appropriate measures to protect site personnel and assist the FOSC as necessary.

11.2 Medical Emergencies

Any person who becomes ill or injured in the Exclusion Zone must be decontaminated to the maximum extent possible when practical. If the injury or illness is minor, full decontamination should be completed and first aid administered prior to transport. If the patient's condition is life threatening then no decontamination will be required. First aid should be administered while awaiting an ambulance or paramedics. All injuries and illnesses must immediately be reported to the FOSC.

If the first aid provided to an injured person presents the possibility of exposure to blood or other body fluids or potentially infectious material, the care giver must wear surgical type impermeable gloves. The exposure must be reported to the FOSC, the individual's supervisor, and the Site Safety Officer within 24 hours of exposure, naming the injured person(s) and the person(s) administering first aid. Hepatitis B vaccination and treatment must be offered to



exposed individuals within 24 hours or as soon as possible after exposure. Exposed individuals may decline the vaccination and treatment but must do so by means of a signed statement.

Any person transporting an injured/exposed person to a clinic or hospital for treatment should take with them directions to the hospital and information on their exposure. Any vehicle used to transport contaminated personnel, will be cleaned or decontaminated as necessary.

11.3 Fire or Explosion

In the event of a fire or explosion, the local fire department should be summoned immediately. Upon their arrival the FOSC or designated alternate will advise the fire commander of the location, nature and identification of the hazardous materials on-site.

If it is safe to do so, site personnel may:

- ❖ Use firefighting equipment available on site.
- ❖ Remove or isolate flammable or other hazardous materials which may contribute to the fire.

11.4 Spills, Leaks or Releases

In the event of a spill or a leak, site personnel will:

- ❖ Locate the source of the spillage and stop the flow if it can be done safely.
- ❖ Begin containment and recovery of the spilled materials.

11.5 Evacuation Routes and Resources

Evacuation routes have been established by work area locations for this site. All buildings and outside work areas have been provided with designated exit points. Evacuation should be conducted immediately, without regard for equipment under conditions of extreme emergency. Evacuation routes will be established before site work begins.

- ❖ Evacuation notification will be three blasts on an air horn, vehicle horn, or by verbal communication via radio.
- ❖ Keep upwind of smoke, vapors or spill location.
- ❖ If evacuation is not via the decontamination corridor, site personnel should remove contaminated clothing once they are in a location of safety and leave it near the Exclusion Zone or in a safe place.
- ❖ The FOSC will conduct a head count to insure all personnel have been evacuated safely.
- ❖ In the event that emergency site evacuation is necessary, all personnel are to:
 - ❖ Escape the emergency situation;
 - ❖ Decontaminate to the maximum extent practical; and,
 - ❖ Meet at the EQ / EPA / START Office Trailer.
- ❖ In the event that the EQ / EPA / START Office Trailer is no longer in a safe zone to meet a secondary gathering point will be designated during the Tailgate safety meeting the first day of operations at each of the 4 respective locations; the Smelter site, the yard on Hill Street, the yards on Sweet Pea Lane, and the small tailings pile.

11.6 Adverse Weather Reaction Plan

Adverse weather can take many forms. Severe thunder and lightning storms, winter storms, hail, freezing rain, flash floods and hurricanes are a few examples. Sudden changes in the weather, extreme weather conditions, and natural disasters can create a number of hazards. Generally, adverse weather can create hazards due to slips, trips and falls, generation of airborne debris, electrical shock, etc. Natural disasters can create many secondary hazards such as release of hazardous materials into the environment, structure failure and fires.

In the event of impending adverse weather, continuous monitoring will provide current information regarding impending adverse weather. In addition, monitoring of weather broadcasts and television broadcasts will provide information on current weather conditions. The terms "hurricane watch" and "hurricane warning" may be used during the broadcasts. The former term means that conditions are favorable for their development although none have actually been sighted. The latter term means that a hurricane has been visually sighted. Additional weather terminology includes:

- ❖ **Weather Watch**—severe t-storm, flash flood, winter storm, "Conditions are favorable for the development/occurrence of hazardous weather."
- ❖ **Weather Warning**—by county issuance
- ❖ **Severe T-storm**—winds > 50 mph an/or 1/4" hail stones sighted or predicted by radar
- ❖ **Flash Flood**—sighted or indicated by radar

Information provided by the emergency and weather radio broadcasts will be used to determine whether and actions need to be taken by project personnel. The EPA FOSC in conjunction with the RM and RSO will decide what operations, if any, are safe to perform based on existing and anticipated weather conditions, and shall notify personnel when to stop operations and seek shelter.

Obviously, the best protection against most severe weather episodes and natural disasters is to seek shelter before a storm hits. When notification is given that severe weather (particularly tornados) is approaching an area where project personnel are located, begin to secure the site. If experiencing a severe weather the EPA FOSC will decide whether to stop work activities and have affected personnel seek shelter.

At the site, workers in personal protective equipment will be instructed to: 1) leave the site, doff protective clothing and seek shelter (if adequate advance warning is given); 2) remain inside shelter and sit away from any windows; and 3) lie down and curl up. All other field personnel should exit the trailers and seek shelter until the weather improves. Do not seek shelter under the trailers under any circumstances. If no warning is provided, personnel should leave the trailers and lie face down in low-lying grassy areas away from the trailers.



ATTACHMENT A
SITE SAFETY PLAN AMENDMENTS



ATTACHMENT B
SITE MAPS



McDermitt, NV

Google earth

Image © 2013 DigitalGlobe
© 2013 Google
Image USDA Farm Service Agency

Google earth

miles
km



FORT MCDERMITT SERVICE
MCDERMITT EMERGENCY SERVICE

0

[Edit This Information](#)

I don't want my information listed!

Address:

19 OLAVARRIA

Mc Dermitt, Nevada 89421

USA

Phone: (775) 532-8530

Website: No information provided.

Mailing Address

P.O. BOX 297

MC DERMITT, NEVADA 89421

USA

Classification:

Ambulance Services



I Want To Find

Our Services

Patients & Visitors

Find a Provider

For Community

About Us

CEO Message

Mission and Values

History of HGH

Board of Directors

Administrative Staff

Feedback

Phone Directory

Contact Us

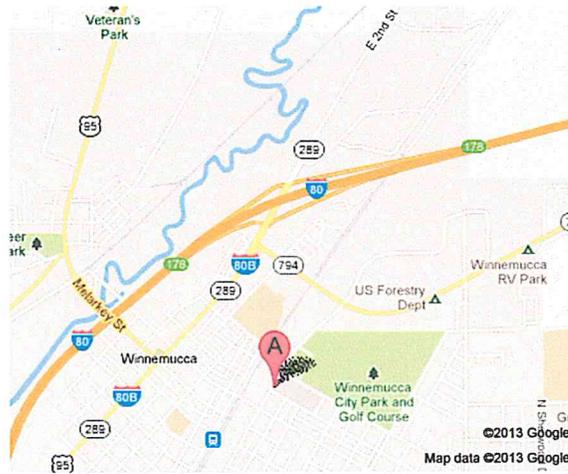
About Us - Contact Us



Contact Humboldt General Hospital

Humboldt General Hospital
118 East Haskell Street
Winnemucca, Nevada 89445

Phone: 775.623.5222



View Larger Map



What's New?

Find out what's new at Humboldt General Hospital.



Ask a Question

Need Help? Send us your question for a quick answer.



Rising Stars

Check out our staff's accomplishments.

Comments or Questions?

Name

Email

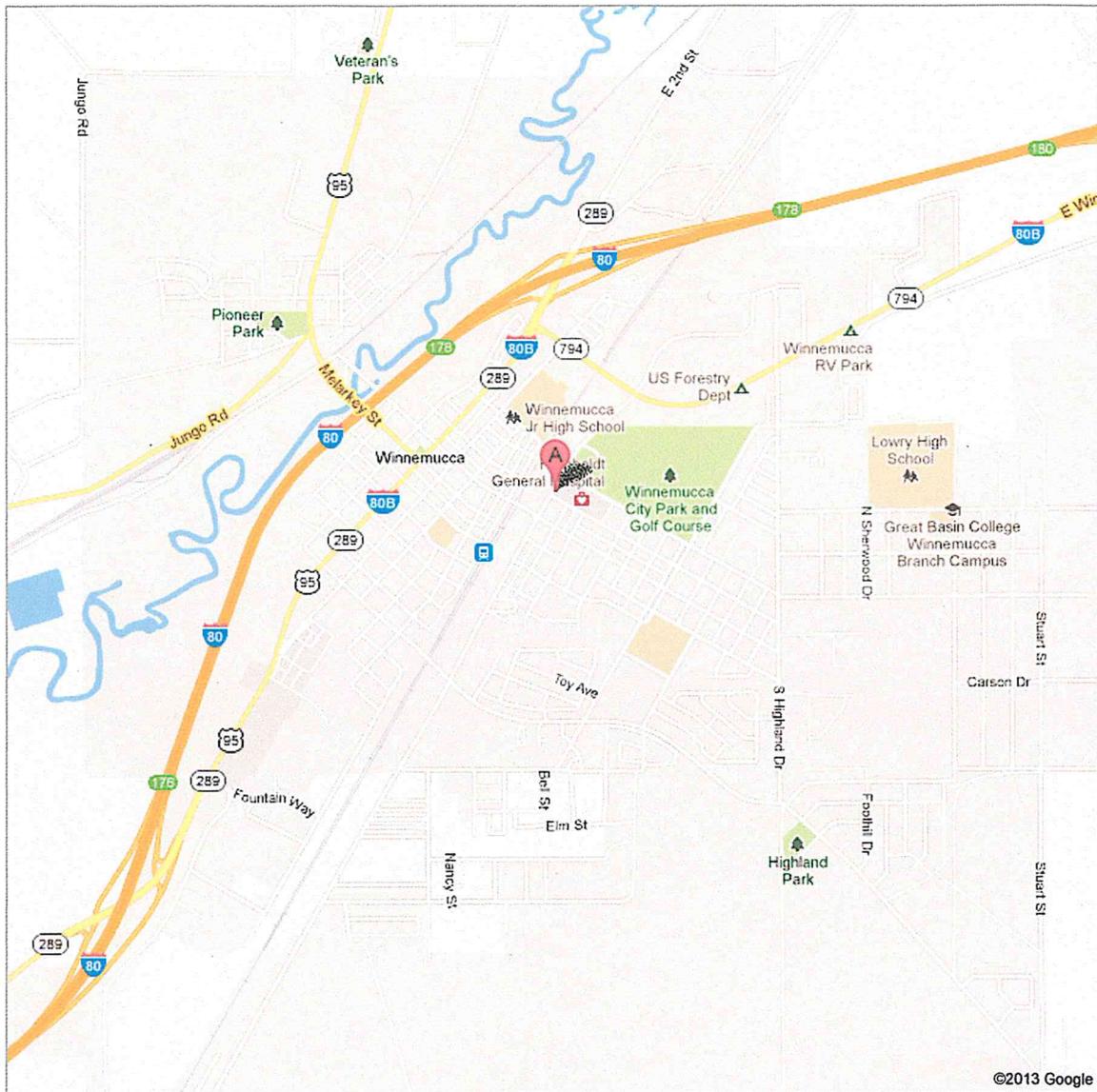
Comments or Questions

Submit



Address **118 E Haskell St**
Winnemucca, NV 89445

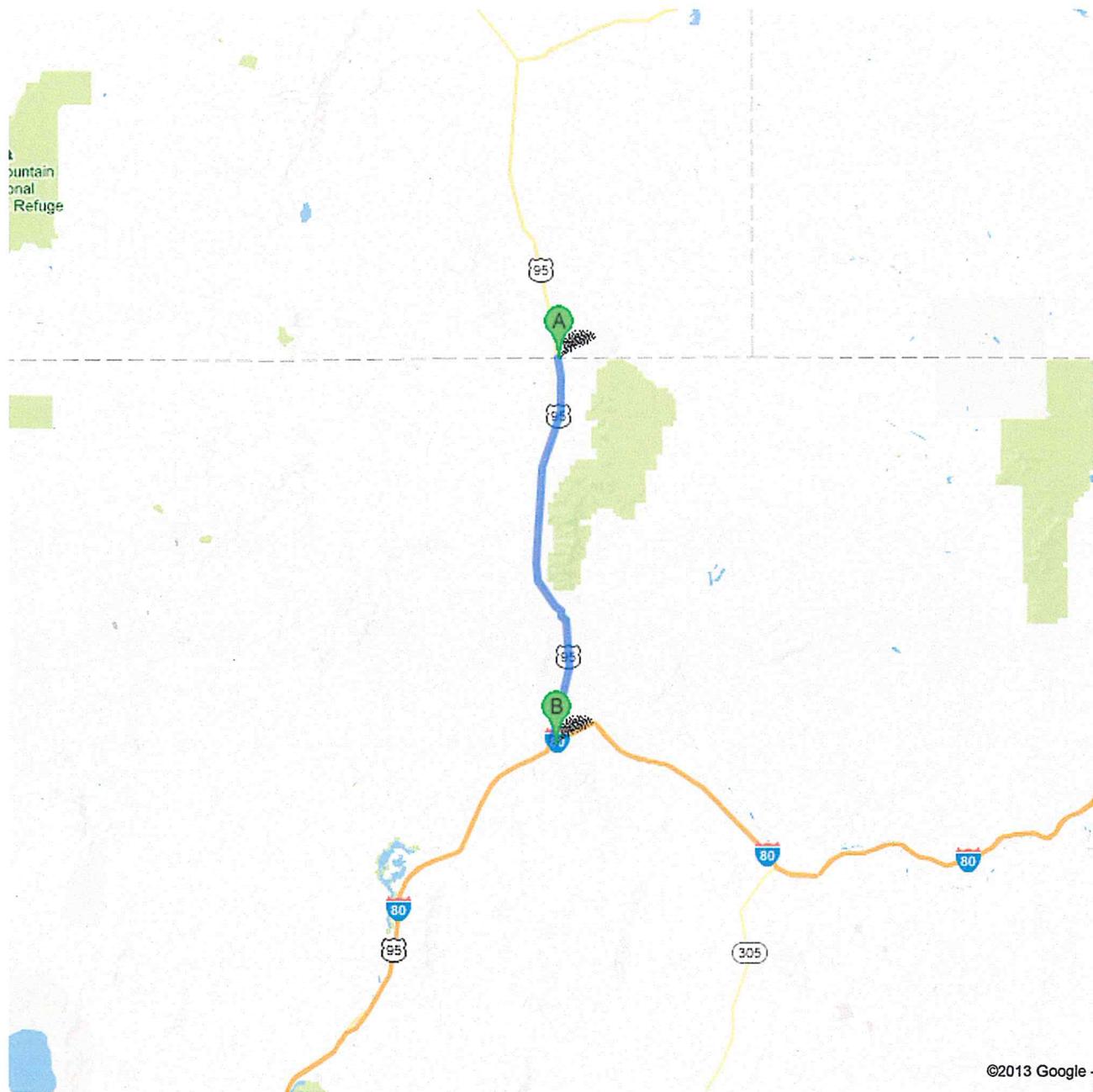
Humboldt General Hospital



©2013 Google



**Directions to 118 E Haskell St, Winnemucca,
NV 89445**
74.5 mi – about 1 hour 11 mins
Site Directions to Humbolt General Hospital



 **McDermitt Combined School**
100 Olavarria St, McDermitt, NV 89421

1.  Head north on **Olavarria St/Villa Reilla** toward **Stateline Rd**
Entering Oregon go 305 ft
total 305 ft
2.  Turn left onto **Stateline Rd**
Entering Nevada go 377 ft
total 0.1 mi
3.  Turn left onto **US-95 S/I O North Hwy**
Continue to follow US-95 S
About 1 hour 8 mins go 73.8 mi
total 73.9 mi
4.  Turn left onto **W Winnemucca Blvd** go 358 ft
total 74.0 mi
5.  Turn right onto **S Bridge St**
About 2 mins go 0.4 mi
total 74.4 mi
6.  Turn left onto **E Haskell St**
Destination will be on the right go 449 ft
total 74.5 mi

 **118 E Haskell St, Winnemucca, NV 89445**

These directions are for planning purposes only. You may find that construction projects, traffic, weather, or other events may cause conditions to differ from the map results, and you should plan your route accordingly. You must obey all signs or notices regarding your route.

Map data ©2013 Google

Directions weren't right? Please find your route on maps.google.com and click "Report a problem" at the bottom left.



ATTACHMENT C
SITE SAFETY PLAN
ACKNOWLEDGMENT FORM



ATTACHMENT D
PERSONAL PROTECTIVE EQUIPMENT AND
RESPIRATORY PROTECTION SOPs

- Neither facial hair nor eyeglass temple bars may interfere with the face-to-respirator seal. Beards are never permitted when respirators are worn.

Failure to meet any one of these requirements shall be considered a failure to meet all of the listed requirements and prohibits the individual from hazardous waste site activities. In addition, all employees must follow manufacturer's procedures for inspecting, donning, cleaning, and storing respirators.

2.1 Medical Clearance Certification

Employees performing activities at sites requiring respirator use must have current medical clearance to wear the appropriate respirator. Clearance is achieved by enrolling the employee in the EQ Health Monitoring Program prior to assignment on site. Medical evaluation is then required annually.

2.1.1 Health Monitoring

EQ utilizes a Health Monitoring Program designed to determine each employee's health status and fitness (including the ability to utilize respiratory protection) to work on hazardous waste sites.

Project Managers are required to notify the Health and Safety Manager prior to hazardous investigative activities. The Health and Safety Manager will then consult with EQ's Occupational Health Physician if any special health monitoring procedures are necessary.

2.1.2 Enrollment in Health Monitoring Program

According to company policy, the following EQ employees are required to be enrolled in the Health Monitoring Program:

1. All field personnel, including:
 - engineers
 - technicians
 - geologists/hydrogeologists
 - tank testers
 - drillers
 - laborers
2. EQ service groups involved in field work.
3. Health and Safety Managers.

4. Any employee who may wear a respirator for any part of 30 days or more during a year, as per OSHA 29 CFR 1910.134.
5. Any other employee who may be at risk of exposure to hazardous substances for any part of 30 days or more during a year, as per OSHA 29 CFR 1910.120.

2.1.3 Levels of Clearance

A physician may designate the following four levels of respirator clearance:

- | | |
|-----------|--|
| Level I | Full respirator use including half-face, full-face, and/or SCBA/SAR in any work situation. |
| Level II | Limited respirator use on a temporary basis (restrictions to be specified). |
| Level III | Limited respirator use, half-face or full-face air-purifying respirators - OK, no SCBA, no heavy lifting (over 35 lbs), modified work/rest schedule. |
| Level IV | No respirator use; other work restrictions may be specified. |

Employees may only perform work on sites where their level of medical certification and the level of protection are consistent.

2.2 Special Restrictions

2.2.1 Facial Hair

Facial hair such as stubble, moustaches, sideburns, beards, low hairlines, and bangs which pass between the face and sealing surface of the respirator will produce a break in the face-to-respirator seal and allow the introduction of contaminants into the breathing zone. Therefore, persons with these hair conditions shall not be permitted to wear respirators until the hair is removed. At the time of fit-testing, the Health and Safety Manager will determine if other types of protection are feasible. If this is not possible, the employee shall not be assigned to sites requiring respiratory protection.

2.2.2 *Corrective Lenses*

When wearing respirators, employees who normally wear corrective lenses are required to wear special corrective spectacles or goggles that do not interfere with the respirator seal. The wearer is responsible for obtaining his/her own prescription and for notifying the Health and Safety Manager, who will obtain special corrective lenses that fit into the respirator face mask. Information regarding suppliers may be obtained from the Corporate Health and Safety Director.

2.2.3 *Contact Lenses*

OSHA [29 CFR 910.134(e)(5)(ii)] prohibits the wearing of contact lenses in contaminated atmospheres. Beyond this regulation, EQ does not permit contact lens use when a respirator is worn.

This restriction has been mandated for the following reasons. First, work in a contaminated environment precludes the ability to adjust a contact lens without inadvertently inhaling the contaminant and/or transferring the contaminant on the gloves to the eyes. Second, the dehumidified and pressurized air used in SCBAs and SARs may dry or irritate the eyes, thereby making a contact lens more likely to dislodge. Lastly, loss of a lens could lead to confusion and decrease visual acuity in a potentially dangerous environment.

2.3 **Respirator Training**

2.3.1 *Content*

Initial respirator training is the responsibility of the Health and Safety Manager. This training will be conducted during the 40-hour initial training program for field personnel. Additional respirator training will be provided during the annual refresher course. Training will include:

- Proper use and limitation of respirators
- Reasons for respirator use
- Selection of respirators and cartridges
- Inspection of respirators
- Donning the respirator
- Maintenance and storage
- Fit-testing (includes handling of various respirators and a long period of wear in normal air)
- Health monitoring
- Special situations - Confined space, heat, cold, lighting, etc.

For field personnel, respirator training does not end with this general course. Prior to entering a new site, the Project Manager or his/her designee will brief each employee regarding the potential hazards of the site, the level of protection required, and any special situations to be considered.

2.4 Respirator Usage

Respirators, like any other equipment, are considered company property and will be treated with the same level of respect and care afforded all equipment.

Respirators will be used only for the job activities and areas specified in the Site Safety Plan.

2.4.1 Air-Purifying Respirators

The type of respirator and cartridge will be specified in the Site Safety Plan. Wearers must check the match between the Site Safety Plan's description of the type of cartridge to be used and the information printed on the cartridge. The new cartridge should be checked to assure its quality. Do not use cartridges that rattle, have a peculiar odor, or are damp.

Cartridges will be replaced at least daily. If more frequent replacement is indicated, direction will be given by the Health and Safety Manager or Site Safety Officer.

Cartridges must be replaced when resistance builds and causes breathing to become somewhat labored or when breakthrough occurs. Breakthrough may take the form of odors; tastes; burning sensations in the eyes, nose, throat, or skin; irritation; headache; confusion; or drowsiness. Breakthrough is accelerated by breathing very humid or misty air. This may require the changing of cartridges several times a day. Report any signs of breakthrough immediately to the Site Safety Officer for respiratory protection re-evaluation and/or cartridge replacement.

Used cartridges are considered hazardous waste if exposed to substances deemed "hazardous waste" by the Environmental Protection Agency (EPA), and must be disposed of properly. Cartridges must never be left on a stored respirator.

2.4.2 Use of SCBA or SAR

SCBA or SAR will only be used in those areas and for those job functions specified in the site safety plans. If SAR's are used, an in-line escape bottle must be attached. Prior to using the SCBA or SAR, the employee will be briefed by the Health and Safety Manager (or designee) regarding its use, the potential hazards present in the work area, and the consequences of failing to maintain proper respiratory protection.

All air cylinders will be filled with Grade D breathing air. Before cylinders are filled, written certification will be obtained from the vendor stating that the air in the cylinders is Grade D breathing air.

The "Buddy System" will be in effect whenever SCBA or SAR is utilized. Workers will perform their jobs in pairs and will maintain a line of sight or radio contact with the decontamination area at all times. One or more individuals with SCBA ready to don will stand by in the decontamination area to assist in the event of an emergency.

Employees will monitor each other for indications of exposure, injury, or illness. If a change in status occurs or when a warning alarm sounds (indicating that low levels of breathing air remain in the tank), both workers will stop working and proceed with caution to the decontamination area for assistance.

2.5 Respirator Selection

During the Respiratory Protection Training Program, the wearer shall be allowed to select the most comfortable air-purifying respirator from an array of sizes and materials, after instruction regarding the types and uses of air-purifying, SCBA, and airline respirators. Wearers shall be shown how to don a respirator, how it should be positioned on the face, how to set strap tension, and how to assess a "comfortable respirator."

The SCBA or SAR is to be used when the very highest level of respiratory protection is necessary, such as when the contamination levels are at the Immediately Dangerous to Life and Health (IDLH) level.

SAR or airlines must include an in-line escape cylinder of at least 5 minutes. Airlines may not be longer than 300 feet, and may not be used when the line is likely to be severed or entangled.

2.6 Respirator Inspection

The wearer must inspect respirators for completeness prior to each use. All inspections will be recorded on the Respirator Inspection Log.

For air-purifying respirators, inspect the unit to be used for completeness (harness, inhalation valves, exhalation valve, exhalation valve cover, lens, lens cover, spectacles [when required], and appropriate cartridges and/or filters).

Also check the tightness of the connections. Inspect the respirator for wear such as cracks, breaks, excessive dirt, warping, frayed harness, and lens cover abrasion.

For SCBAs, inspect the breathing tube and the check valve. Stretch the breathing tube and inspect it for deterioration, discoloration, pinholes, cuts, or other signs of wear. Also inspect the connector at the end of the breathing tube. The threads should be in good condition, and the "O" ring or rubber gasket should be intact, pliable, and clean.

Check the neck of the air cylinder for the hydrostatic test date. Composite bottles (aluminum wrapped in fiberglass) must be tested every 3 years, and steel bottles every 5 years. After placing the bottle in the backpack, check the stability of the cylinder and integrity of the straps.

For SARs, inspect the breathing tube as was done for SCBAs. Airlines should be inspected for deterioration, discoloration, swelling, holes, or cuts. If a Cascade System is used, the compressed gas cylinders must be inspected as was done for SCBAs. Cylinder caps should be screwed down completely when the cylinders are not in use.

Any deficiencies must be reported to the Project Manager/Site Safety Officer and corrected prior to use. Any respirator that does not pass the inspection is unacceptable for use. It must be clearly marked "Out of Service - Do Not Use" and sent for repair.

2.7 Donning the Respirator

2.7.1 Procedure

- Inspect the respirator.
- Loosen all harness strap adjustments.

NOTE: If a hood is worn, wearing it under the straps will protect scalp hair from pulling, but be sure the edges of the hood do not break the face-to-respirator seal.

- Place chin in chin cup and draw evenly back on strap adjustments. (Bottom two straps first, then two top straps, and finally center top strap.)
- Check to determine that the respirator is centered evenly on the face and that the straps are not uncomfortably tight.

2.7.2 Negative- and Positive-Pressure Testing

- Check for leaks and/or proper facial seal.
 - a. **Negative-Pressure Test:** Cover cartridge air ports with the palms of both hands and attempt to pull air into the mask (breathe in) through inhalation ports. For SCBA or SAR, cover the hole at the end of the breathing tube. The mask should collapse slightly while the breath is held for about 10 seconds.
 - b. **Positive-Pressure Test:** Cover the exhalation valve with the palm of your hand and attempt to exhale (do not forcefully blow). The mask should bulge slightly with the positive pressure created inside. Maintain this pressure for about 10 seconds while monitoring for air intake around the face-to-respirator seal.
 - c. If pressure is not maintained, check and/or readjust the faceplate and straps. Make sure the palms are covering all of the cartridge air ports and/or breathing tube hole. Repeat Steps a and b.
- Persistent leaks or improper face seals must be reported to the Project Manager/Site Safety Officer for correction prior to respirator use.

2.8 Respirator Maintenance

Respirators must be cleaned after each use by using the manufacturer's cleaner/sanitizer or by hand washing with a mild disinfectant solution followed by a thorough rinse and air drying. The wearer shall be responsible for thoroughly cleaning and disinfecting the respirator after each day of use to ensure that proper respiratory protection is maintained. If respirators are not used over an

extended period, they shall be cleaned and inspected monthly. Respirator inspection to verify operating condition and maintenance is an integral part of the Respiratory Protection Program. Properly trained personnel will replace or repair respiratory protective equipment using parts designed for that specific respirator. EQ employees shall not make adjustments, repairs, or replacement of components beyond the manufacturer's recommendation or the employee's level of qualification. The Health and Safety Manager or designee must do a weekly pressure check and must inspect all SCBAs on a monthly basis using the manufacturer's recommended procedures. THIS IS IN ADDITION TO THE INSPECTIONS DONE BEFORE EACH USE. SCBA ducting, admission valves, or regulators will be repaired only by persons qualified to do so. Records of inspection of SCBA units will be maintained in accordance with 29 CFR 1910.134.

2.8.1 Air-Purifying Respirator/Cleaning and Disinfection

Respirators which are routinely used will be cleaned and disinfected after each use. In the absence of the manufacturer's recommendations, the following procedures will be utilized:

1. Remove all cartridges (canisters) and filters plus gaskets and seals not permanently affixed to their seats.
2. Loosen harness adjustment straps.
3. Remove exhalation valve cover.
4. Remove inhalation and exhalation valves.
5. Remove protective faceshield cover.
6. Wash facepiece either in a cleaner/sanitizer powder mixed with warm water or a mild soap/disinfectant solution, preferably in a water temperature of about 120° F. Wash components separately from facepiece. Heavy soil may be removed from the facepiece surface using a medium-soft handbrush. Do not use isopropyl alcohol or any disinfectant containing isopropyl alcohol. It will break down the rubber parts on the respirators.
7. Remove all parts from the wash solution and rinse twice in clean, warm water.
8. Air dry all parts in a designated clean area.

9. Gently pat dry facepieces, valves, and seats to remove any remaining soap residue, water, or other foreign material with a clean, damp, lint-free cloth.
10. Inspect all respirator parts, and replace as needed.
11. Reassemble respirator.

2.8.2 *Air-Purifying Respirator/Storage*

Respirators will be stored in plastic bags in a designated location which offers protection from dust, sunlight, extreme cold, heat, damaging chemicals, and excessive moisture. NEVER STORE RESPIRATORS WITH ADJUSTMENT STRAPS OVER THE FRONT OF THE FACEPIECE.

2.8.3 *SCBA and SAR/Cleaning and Disinfection*

SCBA units must be cleaned after each day of use. Decontaminate by sponging off the tank, back-pack harness, and regulator. Never allow cleaning solution to enter the regulator. (Do not dunk, soak, or hose off.) Only those specifically trained to disassemble the regulator may do so.

Airlines also require cleaning once they are removed to the decontamination area. This is important not only for prevention of cross-contamination, but to avoid premature wearing of the lines due to chemical action. Brightly colored sleeves are available for airlines to protect them from excessive contamination, wear, and to identify personnel.

2.8.4 *Procedure for Storing SCBAs*

1. Refill, clean, and inspect the cylinder.
2. Check to ensure the cylinder valve is closed.
3. Connect high-pressure hose tightly to the cylinder.
4. Release any pressure remaining in the high-pressure hose or regulator.
5. Check to ensure the bypass valve is closed.
6. Check to ensure the mainline valve is closed.
7. Place the cylinder in the backpack assembly.

8. Place assembled cylinder and harness in proper container.
9. Loosen straps and lay them flat.
10. Check clean facepiece and place in plastic bag with straps collapsed at the back of the respirator. NEVER STORE FACEPIECE WITH THE STRAPS FORWARD OVER THE LENS.
11. Place facepiece in container with cylinder/backpack assembly and close container.
12. Store unit in a designated area protected from dust, sunlight, extreme heat or cold, excessive moisture, or damaging chemicals.

2.8.5 Storage of SAR Systems

Once dry, airlines must be carefully coiled and stored in a designated area protected from dust, sunlight, extreme heat or cold, excessive moisture, or damaging chemicals. Compressed gas cylinders must be stored upright and securely chained with the caps in place.

2.9 Fit-Testing

The Health and Safety Manager or designee is responsible for fit-testing, the purpose of which is to establish and document proper respirator fit. Qualitative respirator fit-testing using established protocols is conducted annually, generally at the training program, or more frequently if conditions arise that affect the face-to-respirator seal. Changes in an employee's facial features (weight loss or gain), illnesses relative to potential respiratory exposures, and employee complaints involving respirator usage will be the criteria used to establish the need for additional respirator fit-testing.

2.10 Fit-Testing Protocols

Qualitative fit-testing may be accomplished by using isoamyl acetate (banana oil) or stannic oxychloride (irritant smoke). Protocols must be followed closely to assure proper protection when employees are exposed to chemicals in the field. Testing must be documented.

NOTE: If using banana oil, perform "odor threshold screening" before respirator selection.

2.10.1 Respirator Selection Prior to Testing

1. The wearer shall be allowed to select the most comfortable respirator from an array of sizes and materials.
2. The wearer shall be shown how to don a respirator, how it should be positioned on the face, how to set strap tension, and how to assess a "comfortable respirator." (This does not constitute formal training on respirator use - review only.)
3. The wearer should be instructed that he/she is being asked to select the respirator which provides the most comfortable fit. Each respirator represents a different size and shape and, if fit properly, will provide adequate protection.
4. The wearer shall hold each facepiece to his/her face and eliminate those which are clearly not giving a comfortable fit.
5. The most comfortable facepiece is donned by the employee and worn approximately 5 minutes to assess comfort. If the wearer is not familiar with respirator usage, he/she shall be instructed how to don the respirators, to adjust straps, and to remove the respirator several times. Assessment of comfort shall be based on the following points:
 - a. Proper chin placement
 - b. Strap tension
 - c. Adequate time for assessment.
6. The wearer shall be instructed to properly "seat" his/her respirator by rapidly moving his/her head (side to side, and up and down) and taking a few deep breaths.
7. The wearer shall conduct both positive- and negative-pressure fit checks in accordance with ANSI Z-88.2-1980.
8. The wearer is now ready for respirator fit testing.
9. After testing, if there is any question relative to respirator fit or comfort, respirator selection and fit testing shall be repeated.

2.10.2 Odor Threshold Screening (for Banana Oil)

1. When testing with isoamyl acetate (also called isopentyl acetate or banana oil), the ability to smell the substance must be determined prior to the actual fit-test.
2. In a well-ventilated area away from the test room, the subjects will be asked to close their eyes. The ampule of banana oil will then be broken and allowed to vaporize for one minute.
3. The ampule will then be held within 2 inches of the wearer's face and moved from one side to the other.
4. The wearer will then be asked to identify the odor.
5. If the wear is unable to correctly identify the banana oil odor, the irritant smoke test must be used.
6. If the wearer correctly identifies the banana oil odor, he may proceed to respirator selection and fit-testing.

2.10.3 Fit-Test Using Isoamyl Acetate (Banana Oil)

1. The fit test chamber shall be substantially similar to a clear 55-gallon drum liner suspended inverted over a 2-foot-diameter frame so that the top of the chamber is about 6 inches above the wearer's head. The inside top center of the chamber shall have a small hook attached.
2. Each respirator used for the fitting and fit-testing shall be equipped with organic vapor cartridges or offer protection against organic vapors. The cartridges or masks shall be changed at least weekly.
3. After selecting, donning, and properly adjusting a respirator himself/herself, the wearer shall wear it to the fit-testing room. This room shall be separate from the room used for odor threshold screening and respirator selection, and shall be well ventilated, as by an exhaust fan or lab hood, to prevent general room contamination.
4. A copy of the following test exercises shall be taped to the inside of the test chamber.

Test Exercises

- a. Normal breathing.

- b. Deep breathing. Be certain breaths are deep and regular.
 - c. Turning head from side to side. Be certain movement is complete. alert the wearer not to bump the respirator on the shoulders. Have the wearer inhale when his head is at either side.
 - d. Nodding head up and down. Be certain motions are complete and made about every second. Alert the wearer not to bump the respirator on the chest. Have the wearer inhale when his head is in the fully up position.
 - e. Talking. Talk aloud and slowly for several minutes. Reading will result in a wide range of facial movements, and thus be useful to satisfy this requirement.
5. Each wearer shall wear his/her respirator for at least 10 minutes before starting the fit-test.
 6. Upon entering the test chamber, the wearer shall be give a 6-inch by 5- inch piece of paper towel or other porous absorbent single-ply material, folded in half and wetted with three-quarters of 1 cc of pure isoamyl acetate (IAA). The wearer shall hang the wet towel on the hook at the top of the chamber.
 7. Allow 2 minutes for the IAA test concentration to be reached before starting the fit test exercises. This would be an appropriate time to talk with the wearer; to explain the fit test, the importance of his/her cooperation, and the purpose for the head exercises; or to demonstrate some of the exercises.
 8. Each exercise described in No. 4 above shall be performed for at least 1 minute.
 9. If at any time during the test the wearer detects the banana-like odor of IAA, he/she shall quickly exit from the test chamber and leave the test area to avoid olfactory fatigue.
 10. Upon returning to the selection room, the wearer shall remove the respirator, repeat the odor sensitivity test, select and put on another respirator, return to the test chamber, etc. The process continues until a respirator that fits well has been found. Should the odor sensitivity test be failed, the subject shall wait about 5 minutes before retesting. Odor sensitivity will usually have returned by this time.

11. Wearers will be fitted with a full-face and/or half-mask respirator at the discretion of the Health and Safety Manager. When a respirator is found that passes the test, its efficiency shall be demonstrated for the subject by having him break the face seal and take a breath before exiting the chamber.
12. When the wearer leaves the chamber, he/she shall remove the saturated towel and return it to the test conductor. To keep the area from becoming contaminated, the used towels shall be kept in a self-sealing bag to prevent significant IAA concentration build-up in the test chamber from subsequent tests.
13. Persons who have successfully passed this fit-test may be assigned the use of the tested respirator in atmospheres with up to 10 times the PEL. In other words, this IAA protocol may be used to assign a protection factor no higher than 10.

NOTE: Ampules of isoamyl acetate (banana oil) may also be used instead of the towel wetted with IAA. The procedure is the same except the tester must hold or suspend the broken ampule within the chamber.

2.10.4 Respirator Fit-Testing (Irritant Smoke)

NOTE: This procedure will only be performed by the Health and Safety Manager or his/her designee.

1. The fit test chamber shall be a 55-gallon drum liner suspended in such a manner to allow the wearer's head and shoulders to be covered by the liner.
2. The respirator to be used shall be equipped with NIOSH-approved cartridges for particulate contamination.
3. The testing procedure shall be explained to the wearer and will include how the test is performed, possible reactions to irritant smoke, and action to be taken in the event of respirator leakage.
4. The wearer shall properly don the respirator and perform both the positive- and negative-pressure respirator fit checks.
5. Break both ends of the ventilation smoke tube containing stannic oxychloride. Attach a short piece of polyethylene tubing to one end of the tube and the pressure bulb to the other.

6. Place the wearer in the previously mentioned test chamber and explain that he/she should remove the test chamber immediately if he/she has any difficulty breathing or feels that contaminants are entering the mask at any point during the testing procedure.
7. The respirator fit testing with irritant smoke shall proceed as follows:

Test Exercises

- a. Direct 6 to 10 puffs of irritant smoke toward the wearer and around the respirator seal at a distance of 1-inch, instructing the wearer to breathe normally. Note the number of squeezes and any reaction.
 - b. Direct 6 to 10 puffs of irritant smoke toward the wearer and around the respirator seal at a distance of 1 inch, instructing the subject to perform head nodding motions while taking even, deep breaths. Note the number of squeezes and results.
 - c. Direct 6 to 10 puffs of irritant smoke toward the wearer at a 1 inch distance and around the respirator seal of the mask, instructing the wearer to move his/her head forward and backward and from side to side while breathing normally. (Caution the subject not to touch canisters to the chest or shoulders as this may break the face-to- respirator seal.) Note the number of squeezes and results.
 - d. Direct 6 to 10 puffs of irritant smoke toward the wearer and around the respirator seal at a distance of 1 inch, instructing the wearer to perform a head nodding motion while counting backwards from 100. Note the number of squeezes and results.
8. Note the total number of squeezes applied, whether or not a seal was obtained, the type of cartridge used, and the type and size of the respirator used.
 9. If, during the testing process, irritant smoke produces an involuntary reaction (cough) on the part of the wearer, the test shall be voided, the respirator shall be rejected, and another respirator shall be selected to repeat the testing process.
 10. Tests 1 through 4 of this protocol shall be performed in an area with ventilation adequate to prevent general contamination of the testing

area by the testing agent. At the completion of the test, the subject will be instructed to briefly crack the mask seal to be sure he/she can smell the irritant smoke.

11. Respirators successfully tested by the protocol may be used in contaminated atmospheres up to 10 times the PEL. In other words, this protocol may be used to assign protection factors not exceeding 10.

2.11 Recordkeeping

In addition to the Respiratory Protection Program Plan and operating procedures, the following documentation will be maintained:

- Medical Clearance Certification for Respirator Usage (each employee)
- Respiratory Protection Training (each employee)
- Respirator Fit Testing (each employee)
- Respirator Equipment Inspections and Maintenance Actions
- Program Effectiveness Inspections and Evaluations

2.12 Work Area Surveillance

Many variables may affect the need for respiratory protection. Upgrading of respiratory protection will be based on appropriate surveillance of the work area conditions and the degree of employee exposure or stress. Air monitoring will be conducted at all hazardous waste investigation/clean-up sites. The nature and frequency of the monitoring will depend upon the activity being performed and the known or suspected hazards present. Each Site Safety Plan will include a specific air monitoring protocol.

The Health and Safety Manager will be responsible for monitoring the frequency of surveillance, the results of surveillance, and the level of protection needed. The Project Manager/Site Safety Officer will be responsible for enforcing the use of respiratory protection, personal protective equipment, and air monitoring protocols as written in the Site Safety Plan.

2.13 Program Effectiveness

The Project Manager or designee will frequently evaluate respirator practices to determine whether respirators are being utilized properly. Periodic consultation with wearers will be conducted to evaluate the following: levels of discomfort, resistance to breathing, interference with vision, communication and job function, fatigue, and confidence in the respirator's effectiveness.

To maintain the program's effectiveness, the Health and Safety Manager and the Corporate Health and Safety Director will annually review information gathered during such evaluations along with measurements of hazard levels in the work area and the medical surveillance of users. The Corporate Health and Safety Director will make all major policy decisions regarding the Respiratory Protection Program.

**ENVIRONMENTAL QUALITY MANAGEMENT, INC.
RESPIRATORY PROTECTION PROGRAM**

EMPLOYEE TRAINING

Employee: _____ Date: _____

SSN: _____ Job Title: _____

Location: _____ Region: _____

I have received instruction in the following topics during the EQ Respiratory Protection Training Program:

- A. Proper use and limitation of respirators
- B. Reasons for respirator use
- C. Selection of respirators and cartridges
- D. Inspection of respirators
- E. Maintenance and storage
- F. Donning the respirator
- G. Fit-testing (includes handling of various respirators and a long period of wear in normal air)
- H. Health Monitoring
- I. Air monitoring
- J. Special situations - Confined space, heat, cold, lighting, etc.

Employee Signature

Date

Trainer

Hours of Training: _____

ENVIRONMENTAL QUALITY MANAGEMENT, INC.
RESPIRATORY PROTECTION PROGRAM

QUALITATIVE FIT-TESTING

Employee: _____ Date: _____

Job title: _____ SSN: _____

Location: _____ Region: _____

Test/Hood Enclosure Used: _____

Type of respirator: _____ Size: _____

_____ Negative Pressure Test

_____ Positive Pressure Test

Type of cartridge: _____ Seal obtained: _____

Type of testing material: (Circle one)

Isoamyl Acetate (banana oil) or Stannic Oxychloride (Irritant Fume)

Method 1: Banana Oil Fit-Testing

Odor Threshold: Correctly identified Yes _____ No _____

<u>Activity</u>	<u>Reaction</u>	
normal breathing	Yes _____	No _____
deep breathing	Yes _____	No _____
turning head	Yes _____	No _____
nodding head	Yes _____	No _____
talking	Yes _____	No _____

Method 2: Irritant Smoke Fit-Testing

<u>No. of squeezes</u>	<u>Activity</u>	<u>Reaction</u>	
_____	normal breathing	Yes _____	No _____
_____	motion/deep breathing	Yes _____	No _____
_____	nodding/turning head	Yes _____	No _____
_____	motion/talking	Yes _____	No _____
_____	TOTAL squeezes		

Employee signature: _____ Date: _____

Testing Performed by: _____ Date: _____

ENVIRONMENTAL QUALITY MANAGEMENT, INC.
RESPIRATORY PROTECTION PROGRAM

RESPIRATOR DEFECT RECORD

Location: _____ Region: _____ Date: _____

Type of respirator: _____ No. _____

Defects Found:

- A. Facepiece _____
- B. Inhalation Valve _____
- C. Exhalation Valve Assembly _____
- D. Headbands _____
- E. Cartridge Holder _____
- F. Cartridge/Canister _____
- G. Filter _____
- H. Harness Assembly _____
- I. Hose Assembly _____
- J. Speaking Diaphragm _____
- K. Gaskets _____
- L. Connections _____
- M. Other Defects: _____

Outcome: _____ Date: _____

Signature: _____



ATTACHMENT E
ACCIDENT REPORTING/INVESTIGATION



- ❖ All injuries or accidents must be reported to the Response Manager or Site Safety Officer immediately.

- ❖ Notify ASAP the EQ PM and Health & Safety Manager via telephone and Provide Report within 24 hours.

- ❖ The Response Manager will conduct an immediate investigation of the accident and document all results on the Supervisor's Accident Investigation Report and State Worker's Compensation Form if applicable.

- ❖ The Response Manager will assign a supervisory individual to accompany all injured personnel to the clinic.

Note: Reference the following example of an Injury Report.



Environmental Quality Management, Inc. Employee's Injury/Illness Report



- ☞ Complete and submit with Supervisor's Injury/Illness Report to Corporate Health and Safety.
- ☞ Complete electronic form or print legibly.

Section 1 – Injured/Ill Worker Information			
NAME (<i>last, first, MI</i>):		AGE:	GENDER (<i>M/F</i>):
SOCIAL SECURITY NUMBER (<i>last 4 digits</i>): XXX-XX-	EQ ID NUMBER (<i>4 digit</i>):	HIRE DATE (<i>mm/dd/yyyy</i>):	
EMPLOYER:	JOB TITLE/CLASSIFICATION:		
HOME ADDRESS (<i>number and street, city, state, zip</i>):		HOME PHONE (<i>include area code</i>):	
SUPERVISOR NAME (<i>last, first, MI</i>):			
Section 2 - Incident Information			
INCIDENT DATE (<i>mm/dd/yyyy</i>):	INCIDENT TIME (<i>military</i>):	TIME REPORTED (<i>military</i>):	SHIFT START/END TIME (<i>military</i>):
BODY PART(S) AFFECTED:	NATURE OF INJURY/ILLNESS (<i>e.g., strain, laceration, dislocation, heat stress, burn, bite</i>):		
DESCRIPTION OF INJURY/ILLNESS (<i>describe in detail the events leading to cause of injury/illness</i>):			
HOW COULD INJURY/ILLNESS BEEN PREVENTED?			
SIGNATURE:		DATE (<i>mm/dd/yyyy</i>):	



Environmental Quality Management, Inc. Supervisor's Injury/Illness Report



- ☞ Complete Sections 1-6 and submit to Corporate Health and Safety within 48 hours of the injury/illness.
- ☞ Complete electronic form or print legibly.
- ☞ Complete every item and insert N/A for those that do not apply.
- ☞ Complete a separate report for each injured/ill person.

Section 1 – Injured/Ill Worker Information			
NAME (last, first, MI):		AGE:	GENDER (M/F):
SOCIAL SECURITY NUMBER (last 4 digits): XXX-XX-	EQ ID NUMBER (4 digit):	EMPLOYEE TYPE: <input type="checkbox"/> FULL-TIME <input type="checkbox"/> PART-TIME <input type="checkbox"/> TEMPORARY	HIRE DATE (mm/dd/yyyy):
EMPLOYER:	JOB TITLE/CLASSIFICATION:		
HOME ADDRESS (number and street, city, state, zip):		HOME PHONE (include area code):	
SUPERVISOR NAME (last, first, MI):			
Section 2 - Incident Information			
INCIDENT DATE (mm/dd/yyyy):	INCIDENT TIME (military):	TIME REPORTED (military):	SHIFT START/END TIME (military):
INCIDENT REPORTED TO (last, first):			
EQ PROJECT NAME:		EQ PROJECT NUMBER:	
PROJECT ADDRESS (number and street, city, state, zip):			
EXACT LOCATION OF INCIDENT:			
ACTIVITY AT TIME OF INCIDENT:			
BODY PART(S) AFFECTED:		NATURE OF INJURY/ILLNESS (e.g., strain, laceration, dislocation, heat stress, burn, bite):	
SOURCE OF INJURY/ILLNESS (specific object or substance):			
DESCRIPTION OF INJURY/ILLNESS (describe in detail the events leading to cause of injury/illness):			



Training:					
EMPLOYEE TRAINED TO PERFORM ACTIVITY/TASK? <input type="checkbox"/> YES <input type="checkbox"/> No			TYPE OF TRAINING:		
Casual Factor(s):					
		YES	NO		
DESIGN - Was design of tools, equipment, worksite a factor?		<input type="checkbox"/>	<input type="checkbox"/>	ENVIRONMENTAL FACTORS – Did heat, cold, rain, snow, ice, fog, sun glare, lightning, dust, etc. contribute to the incident?	
INSPECTION/MAINTENANCE – Did inadequate or improperly maintained tools, equipment or worksite create or worsen the hazard?		<input type="checkbox"/>	<input type="checkbox"/>	CHEMICAL AND PHYSICAL AGENT FACTORS – Did exposure to chemical agents, such as dust, fumes, mists, vapors or physical agents such as noise, radiation, etc. contribute to incident?	
PERSON'S PHYSICAL CONDITION – In your opinion was the physical condition of the person or overexertion a factor?		<input type="checkbox"/>	<input type="checkbox"/>	OFFICE FACTORS – Did office setting such as lifting furniture, carrying, stooping, etc. contribute to incident?	
Casual Factor(s) continued:					
OPERATING PROCEDURES – Did the lack of or inadequacy within established Work Plans, HASPs, SSHPs, SOPs, etc. contribute to incident?		<input type="checkbox"/>	<input type="checkbox"/>	SUPPORT FACTORS – Were inappropriate tools, equipment and/or personnel resources provided to properly perform activity/task?	
JOB PRACTICES – Were any job health/safety practices not followed when incident occurred?		<input type="checkbox"/>	<input type="checkbox"/>	PERSONAL PROTECTIVE EQUIPMENT – Did the improper selection, use or maintenance of personal protective equipment contribute to incident?	
HUMAN FACTORS – Did the task require reach, strength, endurance, agility, etc. at or beyond the capabilities of the employee?		<input type="checkbox"/>	<input type="checkbox"/>	DRUGS/ALCOHOL – In your opinion did drugs (prescription, OTC, illicit) or alcohol contribute to incident?	
DIRECT CAUSE (single factor which most directly lead to injury/illness):					
INDIRECT CAUSE(S) (factors which contributed to but did not directly initiate injury/illness):					
FIRST-AID PROVIDER (last, first, MI) AND EMPLOYER:			BLOOD-BORNE PATHOGEN EXPOSURE: <input type="checkbox"/> YES <input type="checkbox"/> NO		IF YES, NAME (last, first, MI):
Section 3 - Witness Information (include statements)					
WITNESS #1: NAME (last, first, MI):			JOB TITLE/DESCRIPTION:		
EMPLOYER:			SUPERVISOR NAME (last, first, MI):		
WITNESS #2: NAME (last, first, MI):			JOB TITLE/DESCRIPTION:		
EMPLOYER:			SUPERVISOR NAME (last, first, MI):		
ADDITIONAL WITNESSES (List additional witnesses and details on a separate sheet and attach.): <input type="checkbox"/> YES <input type="checkbox"/> NO					
Section 4 - Corrective Actions					
CORRECTIVE ACTION(S) TAKEN/ANTICIPATED/RECOMMENDED TO PREVENT RE-OCCURRENCE:					
CA BEGIN DATE (mm/dd/yyyy):			CA COMPLETION DATE (mm/dd/yyyy):		



Section 5 - Report Preparer		
NAME (<i>last, first, MI</i>):	SIGNATURE:	
JOB TITLE:	EMPLOYER:	DATE OF REPORT (<i>mm/dd/yyyy</i>):
Section 6 - Management Review		
<input type="checkbox"/> ACCEPTED <input type="checkbox"/> ACTION REQUIRED (<i>provide detail</i>) <input type="checkbox"/> PROGRAM IMPROVEMENTS REQUIRED (<i>provide detail</i>)		
REQUIRED ACTION/IMPROVEMENTS:		
NAME (<i>last, first, MI</i>):	SIGNATURE:	
JOB TITLE:	DATE (<i>mm/dd/yyyy</i>):	
Section 7 - Corporate Health & Safety Review		
<input type="checkbox"/> CONCUR <input type="checkbox"/> NON CONCUR		
ADDITIONAL ACTIONS/COMMENTS:		
OSHA Classification:		
<input type="checkbox"/> INCIDENT ONLY <input type="checkbox"/> FIRST AID <input type="checkbox"/> REMAINED AT WORK (<i>Restriction/Transfer</i>) <input type="checkbox"/> REMAINED AT WORK (<i>Other</i>)		
NAME (<i>last, first, MI</i>):	SIGNATURE:	
JOB TITLE:	DATE (<i>mm/dd/yyyy</i>):	

Environmental Quality Management, Inc. Injury/Illness Report – Witness Statement



- ☞ Complete and submit with Supervisor’s Injury/Illness Report to Corporate Health and Safety.
- ☞ Complete electronic form or print legibly.

Witness Statement		
NAME (last, first, MI):	SOCIAL SECURITY NUMBER (last 4 digits): XXX-XX-	EQ ID NUMBER (4 digit):
EMPLOYER:	JOB TITLE/CLASSIFICATION:	
ACCOUNT OF INJURY/ILLNESS (describe in detail the events leading to cause of injury/illness):		
SIGNATURE:	DATE (mm/dd/yyyy):	

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ATTACHMENT F
TASK HAZARD ANALYSIS

FIGURE F-1; Page 1 of 2

TASK Nos. 1– 3, 5 & 6: PRE-EXCAVATION PREPARATION, MOBILIZATION and SITE PREPARATION, DUST SUPPRESSION, CLEANUP/RESTORATION, & EQUIPMENT DECONTAMINATION and SITE DEMOBILIZATION
TASK-SPECIFIC SAFETY ASSESSMENT

PERSONAL PROTECTIVE EQUIPMENT: Level D			
HAZARD	SOURCES	CONTROL MEASURES	REF.
Muscle strain	Lifting heavy equipment and bending	Use proper lifting techniques. Use mechanical devices for handling materials greater than 60 pounds when possible. Use buddy system.	Sec. 2.4 & 7.2
Slip, trip, and fall	Debris and oily/wet surfaces	Use caution, use buddy system, flag or mark hazards, good housekeeping.	Sec. 2.4 & 7.2
Chemical exposure	Contaminated soils	Limit set up operations to only "clean" areas. Perform air monitoring to assure proper PPE is utilized (may upgrade to Level C).	Sec. 2.3, 2.3.1, 2.3.2, 4.0 & 6.0
Biological hazards	Snakes, ticks, vermin, spiders, etc.	Hazard recognition training, use buddy system, use caution, and avoid vermin and areas where they may exist.	Sec. 2.5
Electrocution	Energized utilities	Use qualified electrician during site set up, properly ground hand tools, GFCI on electrical lines which are not a part of permanent wiring.	Sec. 2.4
Traffic control/struck by vehicle	Adjacent roads and site traffic	Barricade work areas to deter traffic from personnel. If work is to be performed near traffic area, Utilize traffic spotter during loading and unloading equipment.	Sec. 2.4, Att. K
Heat stress	Weather conditions, physical activity, and wet clothing	Take breaks as necessary when wearing Tyveks. Use buddy system. Maintain dry clothing inventory. Monitor weather forecasts and dress appropriately. Provide sufficient drinking water. SSO monitoring of workers.	Sec. 2.4 & 6.4
Slip, trip, and fall	Debris, tanks, drums, slick surfaces	Use caution while walking. Maintain a clear waste handling area. Maintain good housekeeping. Clean-up spills as soon as they occur.	Sec 2.4 & 7.2
Chemical exposure	Contaminated soils	Wear appropriate PPE at all times.	Sec. 2.3, 2.3.1, 2.3.2, 4.0 & 6.0

FIGURE F-1; Page 2 of 2

TASK Nos. 4: CLEANUP/RESTORATION OPERATIONS at the RESIDENTIAL YARDS and CITY-OWNED PROPERTY

TASK-SPECIFIC SAFETY ASSESSMENT

PERSONAL PROTECTIVE EQUIPMENT: Level D			
HAZARD	SOURCES	CONTROL MEASURES	REF.
Collision, crush trauma, struck by equipment	Automobiles, heavy equipment (fork lifts)	Use flaggers and traffic barricades to control public traffic. Make eye contact with heavy equipment operators and vice versa; do not pass under overhead loads. Keep unnecessary personnel away. Use backup alarms on equipment. Use a spotter as necessary. Delineate work area with physical barrier.	Sec. 2.4, Att. H Att. I Att. K
Dust	Contaminated soil	Wear appropriate PPE at all times. Use a water truck to keep soils wet and to control dust levels. Monitor airborne lead levels with a portable air monitoring instrument.	Sec. 2.3.3
Confined Space	Working in tank spaces	Before personnel are allowed to enter work space, evaluate to determine whether or not it is a Permit-Required Confined Space. Follow all appropriate confined space regulations and protocols. Use Buddy System.	Sec. 12
Fire	Sparks from tools in presence of flammable liquids/vapors	Use non-spark tools; use remote opening procedures if necessary. Eliminate sources of ignition from the work area. Prohibit smoking. Provide ABC fire extinguishers in all work areas, flammable storage areas and generator and compressor locations. Store flammable liquids in well-ventilated areas. Post "NO SMOKING" signs. Store all compressed gas cylinders upright and put caps in place when not in use. Separate flammables and oxidizers by 20 feet.	Sec 2.4 & 11.3
Heat stress	Weather conditions, physical activity, and wet clothing	Take breaks as necessary when wearing Tyveks. Use buddy system. Maintain dry clothing inventory. Monitor weather forecasts and dress appropriately. Provide sufficient drinking water. SSO monitoring of workers.	Sec. 2.4 & 6.4



FIGURE F-2; 5 Pages Total GENERAL PHYSICAL/ENVIRONMENTAL HAZARD ANALYSIS

HAZARD	PRE PLANNING TO CONTROL HAZARD	ACTIVE CONTROL MEASURES
Electrical	<ol style="list-style-type: none"> 1. Locate and mark existing energized lines. 2. De-energize lines if necessary to perform work safely. 3. All electrical circuits will be grounded. 4. All 120-volt single phase, which are not a part of the permanent wiring, will have a ground-fault interrupter in place. 5. Temporary wiring will be guarded, buried or isolated by elevation to prevent accidental contact by personnel or equipment. 6. Evaluate potential for high moisture/standing water areas and define special electrical wiring needs-typically requirement for low voltage lighting systems. 	<ol style="list-style-type: none"> 1. Use a ground fault interrupter (GFI). 2. Use grounded tools. 3. First aid on site.
Ergonomic	<ol style="list-style-type: none"> 1. All operations evaluated for ergonomic impact. 2. Procedures written to define limits of lifting, pulling, etc. 3. Procedures to define how personnel will utilize proper ergonomic concepts and utilize mechanical material handling equipment. 4. Necessary mechanical material handling equipment specified and ordered for project. 	<ol style="list-style-type: none"> 1. Proper body mechanics techniques stressed and enforced on a daily basis. 2. Mechanical handling equipment maintained and utilized. 3. Proper body mechanics stressed in scheduled safety meetings. 4. Injuries reported and medically treated if in doubt about severity. 5. Operations changed as necessary based on injury experience or potential.
Existing Site Topography	<ol style="list-style-type: none"> 1. Survey site prior to layout. Identify areas unsafe for personnel or equipment due to physical conditions. 2. Identify/locate existing utilities. 3. Determine impact of site operations on surrounding properties, communities, etc. 4. Identify mechanized equipment routes both on site and onto and off the site. 5. Layout site into exclusion and contamination reduction zones based on initial site evaluation. 	<ol style="list-style-type: none"> 1. Awareness to work environment - regular inspection/audits to identify changing conditions. 2. Shut down operations when unknown conditions encountered. 3. Utilize physical barriers, signs and markings.



HAZARD	PRE PLANNING TO CONTROL HAZARD	ACTIVE CONTROL MEASURES
<p>Fires & Explosions</p>	<ol style="list-style-type: none"> 1. Evaluate all operations for fire and explosion potential. 2. Define specific procedures for unique operations presenting unusual hazard such as flammable tank demolition. 3. Ensure that properly trained personnel and specialized equipment is available. 4. Define requirements for handling and storage of flammable liquids on site need for hot work permits and procedures to follow in the event of fire or explosion. 5. Define the type and quantity of fire suppression equipment needed on site. 6. Coordinate which local fire fighting agencies to discuss unique fire hazards, hazardous materials, etc. 7. Ensure site operations comply with 29CFR 1910.157G. 	<ol style="list-style-type: none"> 1. Inspect fire suppression equipment on a regular basis. 2. Store flammables away from oxidizers and corrosives. 3. Utilize Hot Work Permit for all hot work on site. 4. Follow any site-specific procedures regarding work around flammables. 5. Review and practice contingency plans. Discuss on regular basis at scheduled safety meetings.
<p>Flammable Vapor and Gases</p>	<ol style="list-style-type: none"> 1. Evaluate site to determine sources of likely flammable gas or vapor generation. 2. Develop specific procedures to be followed in the event of exposure to flammables. 3. Specify specialized equipment needs for inerting flammable atmospheres, ventilating spaces and monitoring flammable vapor concentrations. 4. Define requirements for intrinsically safe equipment. 5. Develop contingency plan to follow in the event of fire or explosion. 	<ol style="list-style-type: none"> 1. Calibrated monitoring equipment available and utilized by trained personnel whenever working where flammable gas or vapor is present. 2. Monitoring performed at regular frequency and in all areas where vapor could generate or pool. 3. Equipment and operations shut down when threshold levels are exceeded. 4. Contingency plans reviewed regularly by all involved personnel. 5. Work areas are carefully inspected to look for possible ignition sources. Sources are removed. 6. Operations shut down if specific task procedures can't be followed to the letter.



HAZARD	PRE PLANNING TO CONTROL HAZARD	ACTIVE CONTROL MEASURES
Heat Stress	<ol style="list-style-type: none"> 1. Anticipate possible elevated temperatures (summer months). 2. Awareness to stress placed on body by specific PPE. 3. Awareness to levels of heat stress symptoms. 	<ol style="list-style-type: none"> 1. Proper work/rest schedule and monitoring. 2. Drink plenty of fluids. 3. Buddy system/awareness. 4. First aid on site. 5. Medical care if symptoms persist.
Heavy Equipment Operations	<ol style="list-style-type: none"> 1. Define equipment routes and traffic patterns for site. 2. Insure that operators are properly trained on equipment operation for all equipment required on project. 3. Define safety equipment requirements, including back up alarm and roll over, for all equipment on site. 4. Define equipment routes and traffic patterns for site. 5. Implement SOP of requiring operators to perform safety inspections on equipment on a daily basis in accordance with manufacturer requirements. 6. Evaluate project requirements to ensure that equipment of adequate capacity is specified. 	<ol style="list-style-type: none"> 1. Equipment inspected as required. Equipment repaired or taken out of service. 2. Ground spotters are assigned to work with equipment operators. Utilize standard hand signals and communication protocols. 3. Personnel wear the proper PPE; utilize hearing protection, gloves for handling rigging, etc. 4. Equipment safety procedures discussed at daily scheduled safety meetings. 5. Do not exceed lifting capacities or load limits of equipment in question. 6. Personnel follow basic SOP's that prohibit passengers on equipment.
Illumination	<ol style="list-style-type: none"> 1. Evaluate all operations and work areas to determine lighting requirements. 2. Specify specialized lighting requirements including explosion proof, intrinsically safe, lighting needs. 3. Determine if nighttime outdoor operations are necessary. Evaluate tasks to be performed and number of light plants necessary to allow operations. 4. Ascertain if outdoor lighting from nighttime operations will have an impact on surrounding communities. 	<ol style="list-style-type: none"> 1. Inspect specialized equipment and discard or replace as needed. 2. Add additional lighting to areas with lighting deficiencies. 3. Inspect drop cords and portable lights on regular basis. Replace or repair as necessary.

HAZARD	PRE PLANNING TO CONTROL HAZARD	ACTIVE CONTROL MEASURES
Noise	<ol style="list-style-type: none"> 1. Local community noise standards examined. 2. Expected loud operations evaluated to determine compliance with community standards. 3. Loud operations scheduled for approved time periods. 4. Noise level standards established for equipment brought onto site. 5. Hearing protection requirements defined for personnel expected to have excessive exposures. 	<ol style="list-style-type: none"> 1. Personnel receive annual audiogram. 2. Personnel required to wear hearing protection; use baffles and mufflers. 3. Routine noise level monitoring and dosimetry performed. 4. Defective equipment repaired as needed. 5. Ongoing hearing conservation education promoted at scheduled safety meetings. 6. Medical evaluation following noise (impact) exposure if symptoms present themselves.
Personal Injuries	<ol style="list-style-type: none"> 1. Site operations will be evaluated for exposures with serious injury potential such as falling objects, pinch points, flying objects, falls from elevated surfaces, etc. 2. A written Fall Prevention Program will be developed if workers will be required to work at heights greater than 10 feet from unguarded work locations. 3. PPE requirements will be based on potential for injury. 	<ol style="list-style-type: none"> 1. Personnel will wear required PPE. 2. Specialized equipment such as rope grabs, winches, etc. will be inspected prior to each use. Defective equipment will be immediately replaced. 3. All injury and near miss incidents will be reported to the SSO. 4. First aid/CPR-trained person on site at all times. 5. All injuries will be treated on site with advanced medical treatment being sought if doubt about severity.



HAZARD	PRE PLANNING TO CONTROL HAZARD	ACTIVE CONTROL MEASURES
Small Equipment Usage	<ol style="list-style-type: none"> 1. Site operations evaluated to determine need for specialized intrinsically safe, explosion-proof and UL approved equipment and instruments. 2. Implement requirement for G.F.I., double insulated tool usage, or assured grounding program in all outdoor operations, will be utilized. 3. Specify equipment needs to ensure that equipment used only for the purpose for which it is designed and to prevent abuse or misuse of the equipment. 4. Specify requirements for the inspections and maintenance of specialized equipment. 5. Specify that all equipment utilized on the project meets all OSHA requirements. 	<ol style="list-style-type: none"> 1. First aid on site. 2. Transport for medical care if necessary.
Wildlife	<ol style="list-style-type: none"> 1. Inspect work environment where tasks are being performed. 2. Awareness to bites. 3. Dogs, animals, poison ivy, etc. 	<ol style="list-style-type: none"> 1. First aid on site. 2. Seek medical attention if symptoms-signs persist.
Weather Conditions	<ol style="list-style-type: none"> 1. Evaluate prevailing weather conditions for the site. 2. Contingency plans developed for likely severe weather conditions such as tornado, and extreme thunderstorm. 3. Provide for daily weather forecast service in extreme weather areas. 4. Plan to weatherize safety systems, such as showers and eyewashes, which would be impacted by extreme cold weather. 5. Order necessary specialized cold weather clothing. 6. Grounding and bonding requirements defined for thunderstorm areas. 7. Sheltered air-conditioned break areas provided for extreme hot and cold weather zones. 	<ol style="list-style-type: none"> 1. Employees trained in contingency plan for severe weather conditions. 2. Emergency water sources inspected regularly in cold areas. 3. Weather service contacted regularly during storm conditions. 4. Supervisory personnel cease operations during extreme storm conditions (i.e., first scenes of thunderstorms). Personnel evacuate to safe assembly area.



ATTACHMENT G
DAILY TAIL GATE SAFETY SHEETS



Daily Tool Box Safety Meeting Record

Signed By All In Attendance

Job Name:	Job Location:	Job Number:	1
Meeting Date:	Time Started:	Time Completed:	2
Meeting Conducted By:	Emergency Response { }	ERRS { }	3
			Commercial { }
Site Manager:	Site Health and Safety:		5
Foreman:	No. of EQ Employees:	No. of Subcontractors:	6
Client Manager:	No. of Others:		7
1. Daily Scope of Work / Topics:			8
			9
			10
			11
			12
			13
2. Daily Chemical/Physical Hazards:			14
Chemical	Exposure Limit	Route	System
			15
			16
			17
			18
3. Accidents Reviewed::			19
			20
			21
			22
4. Comments / Suggestions:			23
			24
			25
			26
			27
5. Protective Level / Task:			28
Level	PPE Description	Work Task	Type Cartridge - If Level C
Report Prepared By:			
		Job Title:	



ATTACHMENT H
SITE WALKTHROUGHS / ENTRY

Standard Operating Procedure

Title:	Site Walkthroughs	Document No.	61	
Date of Issue:	November 1999	Revision No.	1	Page 1 of 2
Approval	_____ (signature on file)	Approval	_____ (signature on file)	

TASK SAFETY AND HEALTH RISK ANALYSIS

This Hazard Assessment identifies the general hazards associated with site operations. Every effort must be made to reduce or eliminate these hazards. Those which cannot be eliminated must be guarded against by use of engineering controls and/or personal protective equipment.

1.0 HAZARDS

- Slip, trip, fall hazard from debris scattered throughout buildings, unstable stairways, and drum/containers in buildings.
- Slip, trip, fall hazards associated with general site operations.
- Injury from unstable overhead and falling building materials/debris.
- Gas release hazards due to the compressed gas cylinders.
- Direct skin contact and/or inhalation of contaminants.
- Biological hazards from uncultivated areas such as vermin, bees, poison ivy, poison oak, and ticks.

2.0 SOPs

- Be sure that all areas of entry have been provided with adequate lighting.
- Be sure that all manholes/floor drains in buildings are covered and marked.

- Be sure that stairways are structurally sound prior to work.
- Be sure that all rooms are checked for loose or unstable overhead structures/debris prior to commencement of work activities.
- Slip, trip, fall hazards can be minimized by keeping clean, organized work areas and being aware of unstable or loose footing areas.
- Air monitoring should be conducted prior to walkthrough.
- Wear proper level of protection when inside the hot zone area.
- Be aware of and avoid potential biological hazards as stated above. Personnel should check for ticks upon exiting hot zone area.



ATTACHMENT I
WORKING AROUND HEAVY EQUIPMENT

Standard Operating Procedure

Title:	Working Around Heavy Equipment and Machinery (Excavators/Loaders)	Document No.	HS-EqOp-8	
Date of Issue:	November 1999	Revision No.	1	Page 1 of 7
Approval	_____ (signature of file)	Approval	_____ (signature on file)	

The hazards associated with the operation of heavy equipment are injury to personnel, equipment damage, and property damage. The potential for injury or damage to personnel and property is due to the size of the equipment; limited visibility of the driver; the potential overhead hazards leading to crushing, tripping, falls, cuts, or punctures; and the high noise levels created by the equipment.

1.0 General

- The work area shall be appropriately delineated to prevent non-essential personnel from wandering into the area.
- Equipment operators shall maintain eye contact with ground personnel at all times, giving ground personnel the right of way.
- Vehicles/equipment paths shall be marked as feasible to prevent personnel from crossing.
- Equipment shall be outfitted with the appropriate safety features, back-up alarms, rollover protection, fire extinguishers, etc.
- Loads shall be lowered and equipment de-energized and secured before any adjustments are made to load, repositioning, etc.
- Personnel shall be cognizant of excavations, material/debris piles and other equipment in the work area. These areas shall be appropriately marked or protected to prevent falls.

2.0 EXCAVATORS/LOADERS

- Only trained and qualified individuals shall operate heavy equipment/excavators.
- All heavy equipment shall be inspected before mobilization, while on site, and daily prior to use; inspections shall be documented.
- All heavy equipment shall be equipped with the appropriate safety devices [ROPS, fire extinguishers, seat belts, backup alarms, (etc.)].
- Vehicles shall maintain appropriate operating speeds and load capacities at all times.
- When feasible, a spotter shall be used for each piece of heavy equipment to assist the operator and nearby personnel in preventing injuries. The spotter shall carry an emergency signal/alarm at all times during work operations.
- The area of excavation (or other operation) shall be appropriately marked to prevent non-essential personnel from wandering into the vehicle path (safe work buffer zone).
- Ground personnel shall be given the right of way at all times. Safety vests, and/or reflective clothing shall be worn by those working in the immediate area. Eye contact shall be maintained between operators and laborers in the vicinity.
- Radio contact shall be maintained between operators and the appropriate on-site personnel.
- At the end of the day, equipment breathing air and safety equipment shall be checked, the cab shall be cleaned, refueling will occur, brakes will be set, and a daily report shall be completed by the equipment operator.
- The area shall be visually inspected and all structural encumbrances shall be removed or protected prior to work.
- Personnel shall enter and exit vehicles using handrails and steps that are provided.
- Work area shall be kept neat and in an orderly state of housekeeping.
- All underground utilities shall be located prior to excavation; utility companies shall be contacted if necessary.

- Excavators shall be prohibited from operating on severe inclines or questionable surfaces. Excavators operating near the edge of a quarry shall be supported with a swamp pad.
- Employees shall be prohibited from standing or working in areas where they would be exposed to falling loads. Personnel shall stand away from vehicles during excavation or loading. Operators may remain within vehicle cabs during loading as outlined in 29 CFR 1926.601(b)(6) for adequate protection.
- All personnel working around the excavators shall be trained in emergency shutdown of the equipment.
- Stop logs/railroad ties shall be used to barricade a quarry rim to prevent equipment or personnel from coming too close to the edge. Barricade shall be established 5 feet from the edge of the excavation, and a warning sign shall be posted in this area to alert personnel of the dangers.
- Areas within a quarry that are directly beneath the excavation areas shall be barricaded to prevent personnel from standing below in areas with a potential hazard of falling objects/debris.
- When lowering excavator(s) from the rim into a quarry, the load weight shall be checked to ensure lifting equipment has sufficient capacity.
- Air monitoring for carbon monoxide, oxygen, etc., shall be performed by EQ within vehicle cabs throughout work operations.
- Equipment operators shall wear appropriate PPE as outlined in the SWP to protect personnel from exposure to potential chemical and radiological hazards.
- Personnel shall be prohibited from reaching into loading operations with arms or legs while in operation.
- Any adjustments or repairs that need to be made to equipment (or loads) shall be made with the equipment disengaged and shut down. If there is a suspended load, the load shall be lowered to the ground (or securely braced) before any adjustments are made to the equipment.

3.0 CRANES

- All cranes must have proof of a thorough inspection within the last year by an appropriately qualified individual. Crane personnel platform (manbasket) and rigging equipment shall be inspected daily prior to use.
- Load capacities shall be stenciled onto the equipment and observed during operations. The combined weight of the loaded personnel platform/manbasket and its rigging must not exceed 50 percent of the rated load capacity in all locations where the platform will be positioned.
- All hooks, slings, and other fittings shall be the correct size for the work to be done and with sufficient capacity for the load to be lifted.
- The manbasket will be load tested at 150 percent of rated capacity prior to daily use and whenever it is reattached to the hoist line.
- The manbasket shall be equipped with the appropriate safety features to prevent personnel from falling out (guardrails, grabrails, overhead protection if necessary, etc.).
- The crane operator must always have full control over the movement of the personnel platform/manbasket. All vertical movement must use the power of the crane winch.
- Employees shall be prohibited from standing or working beneath crane booms.
- In the event of emergency repair work on hoisting equipment with a suspended load, the area below the load shall be barricaded and the load blocked or otherwise supported.
- Employees are prohibited from riding on loads, hooks, slings (etc.) suspended from hoisting equipment.
- All hooks, rings, pins, shackles, or other lifting attachments shall be inspected, and defective parts shall not be used. Wire ropes shall be free of kinks, sharp bends, or twists.
- When the occupied personnel platform/manbasket is in a stationary position, all brakes and locking devices on the crane must be set.
- All cranes used for personnel hoisting must have a boom angle indicator that is visible to the operator, and shall be equipped with either an anti-two-blocking device that prevents contact with the load block or a two-

block damage feature that deactivates the hoisting action before damage occurs.

- No mobile crane will operate or make a heavy lift without its outriggers fully extended to assure maximum stabilization of the equipment.
- Appropriate hand signals shall be predetermined and used during crane operations. Only one individual shall issue signals to the operator unless a relay system is necessary.
- Tag lines shall be used at all times for controlling swinging loads.
- The crane operator and rigger shall confirm that the load is properly secured and balanced before it is lifted.
- Crane operations shall be stopped or restricted during bad weather or poor visibility.

4.0 MAINTENANCE AND REPAIRS

- All equipment hazards identified shall be controlled.
- Operators shall not wear loose clothing that might get tangled in the equipment or controls.
- Appropriate machine/equipment guards shall be in place and intact at all times during operation. When guards require maintenance or replacement, equipment will be shut down and repaired, to be restarted only when guards are replaced and in good condition.
- Heavy equipment shall be demobilized to a staging area and decontaminated as necessary before performing maintenance or repairs.
- An equipment repair log shall be maintained and updated on a daily basis/whenever a repair or adjustment is made.
- Pinching and cutting hazards shall be controlled by prohibiting personnel from reaching into running equipment and by wearing the appropriate PPE. All equipment repairs shall be made while equipment is shut down.
- Appropriate PPE shall be used as outlined in the SWP to prevent contact with chemicals.

5.0 REFUELING

- The equipment engine must be shut down and locked/tagged out before any refueling operations are conducted.
- Appropriate ABC-type fire extinguishers shall be available.
- All ignition sources shall be eliminated.
- Fuel shall be brought to the equipment using the designated vehicle. Appropriate vehicle safety precautions shall be followed.
- Appropriate grounding/bonding shall be conducted before transferring fuel.

6.0 DECONTAMINATION AND REMOVAL

- Appropriate PPE shall be worn as outlined in the SWP (faceshields, etc.).
- Only trained, authorized personnel shall operate high-pressure washers.
- The lance/nozzle must always be pointed at the work area, and not toward other personnel.
- The operator shall maintain good footing during cleaning.
- Non-operators shall maintain a safe distance (25 feet) from the operator during washing.
- Washer operators shall alternate to avoid fatigue. Assistants shall also be used to help move and handle the equipment.
- Washer equipment shall be cleaned/rinsed periodically to avoid build-up (around trigger, guard).
- An assistant shall monitor the pressure during operations, and shall stand near the generator in case emergency shutdown is necessary.
- All lances/nozzles shall be constructed of seamless stainless steel to avoid rusting.
- Washers shall be operated at the designated pressure. Inspections shall be made for leaks and malfunctions; damaged or faulty equipment must be repaired or taken out of service immediately.

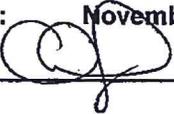
- Personnel shall use proper lifting techniques such as keeping their back straight, lifting with legs, limiting twisting, getting help in moving bulky/heavy loads, and using mechanical equipment to move material and equipment when appropriate.
- Personnel shall work at a rational pace.
- If decontamination is performed in the presence of electrical circuits, appropriate provisions shall be made to disconnect them or protect them from contact with water.



ATTACHMENT J
EXCAVATION

Environmental Quality Management, Inc.

Standard Operating Procedure

Title: Excavation and Trenching	Document No. HS-Fld-3
Date of Issue: November 1999	Revision No. 2 Page 1 of 58
Approval 	Approval 

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

2.0 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: A method of protecting employees from cave-ins by excavating the sides of an excavation to form one or a series of horizontal levels or steps, usually with vertical or near-vertical surfaces between levels.

Competent Person (Federal OSHA, 29 CFR 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 her ability to design shoring, sloping, benching, or alternate trench/excavation systems.

Excavation: Any man-made cut, cavity, trench, or depression 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 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: 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: 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: 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.

Sloping: A method of protecting employees from cave-ins by excavating to form sides of an excavation that are inclined away from the excavation so as to prevent cave-ins. The angle of incline required to prevent a cave-in varies with differences in such factors as the soil type, environmental conditions of exposure, and application of surcharge loads.

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

Support System: A structure such as underpinning, bracing, or shoring which provides support to an adjacent structure, underground installation, or the sides of an excavation.

Tabulated Data: 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.

3.0 EXCAVATION AND TRENCHING

3.1 Pre-Excavation Requirements

3.1.1 *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 be 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.

3.1.2 *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.

3.1.3 Training

Employees shall not be assigned, or permitted, to design, supervise, or work in or about excavations until they have completed formal classroom training on:

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

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.

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.

3.1.4 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.
- toxicity and flammability of hazardous substances present, or to be introduced into, the area of the excavation.
- potential for work meeting the definition of confined space work.
- the presence of nearby above-ground or overhead utility installations.
- exposure of the general public to the excavation operations.
- potential for surface water runoff into the excavation.

At this time, the Project Notification Worksheet must be completed.

3.2 Excavation Work Practices

3.2.1 General

Each employee in an excavation shall be protected from cave-ins by an adequate protective system designed in accordance with 29 CFR 1926.652. The project supervisor shall ensure that the required protective system is installed and maintained per the design specifications.

No employee shall be permitted to enter the excavation unless he/she is specifically required to do so. Unauthorized persons shall not be allowed access.

3.2.2 Supervision

Work in an excavation shall at all times be supervised by an EQ 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.

3.2.3 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 29 CFR 1926.651(c).

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

3.2.4 Protective Systems

Protective systems designed in accordance with 29 CFR 1926.652(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.

3.2.5 *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.

3.2.6 *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 any 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 29 CFR 1926.601(b)(6).

3.2.7 *Warning System for Mobile Equipment*

When mobile 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.

3.2.8 *Hazardous Atmospheres*

Where an oxygen deficient (less than 20.5% O₂) 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.

3.2.9 *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 Subsection 4.2.10 below.

3.2.10 *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 such excavation will not pose a hazard to employees.

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

3.2.11 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 material or barriers could be installed.

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 edge, and/or retaining devices shall be used to prevent materials or equipment from falling or rolling into excavations.

3.2.12 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 the 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.

3.2.13 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.

3.3 Requirements for Protective Systems

3.3.1 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 29 CFR 1926.652(b) or 29 CFR 1926.652(c), except when

- the 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.

4.0 EXCEPTION PROVISIONS

No exceptions to the requirements of this policy are permitted.

5.0 CROSS REFERENCES

29 CFR 1926 Subpart P - Excavations
§ 650; Scope, application and definitions
§ 651; General requirements
§ 652; Requirements for protective systems
Appendices A - F, mandatory

6.0 FORMS AND CHECKLISTS

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. 29 CFR 1926 Subpart P - Excavations

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

Project Description: _____

Anticipated Soil Condition: Hard Compact _____ Unstable _____ Running _____

Ground Protection Method: Shoring _____ Sloping _____
Trench Shield _____ Alternate _____

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

Describe Chemical Hazards at Site: _____

Subcontractor's Name: _____

Equipment to be Used: _____

Design Engineer: _____ Project Supervisor: _____

Phone: () _____

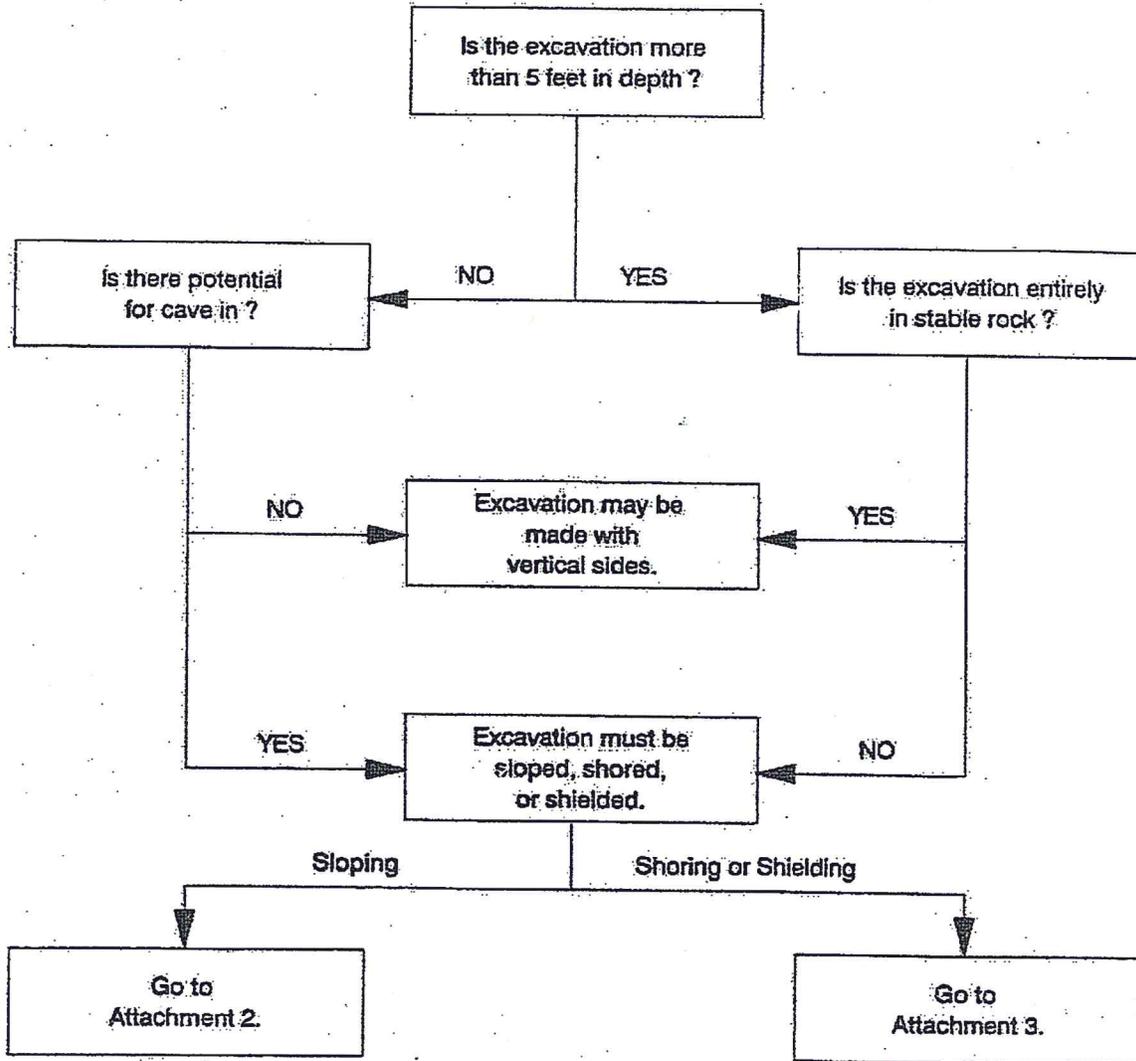
HEALTH AND SAFETY USE ONLY

EQ Permit Number: _____ Date Issued: _____ Expires: _____

Issued By: _____

ATTACHMENT 1.

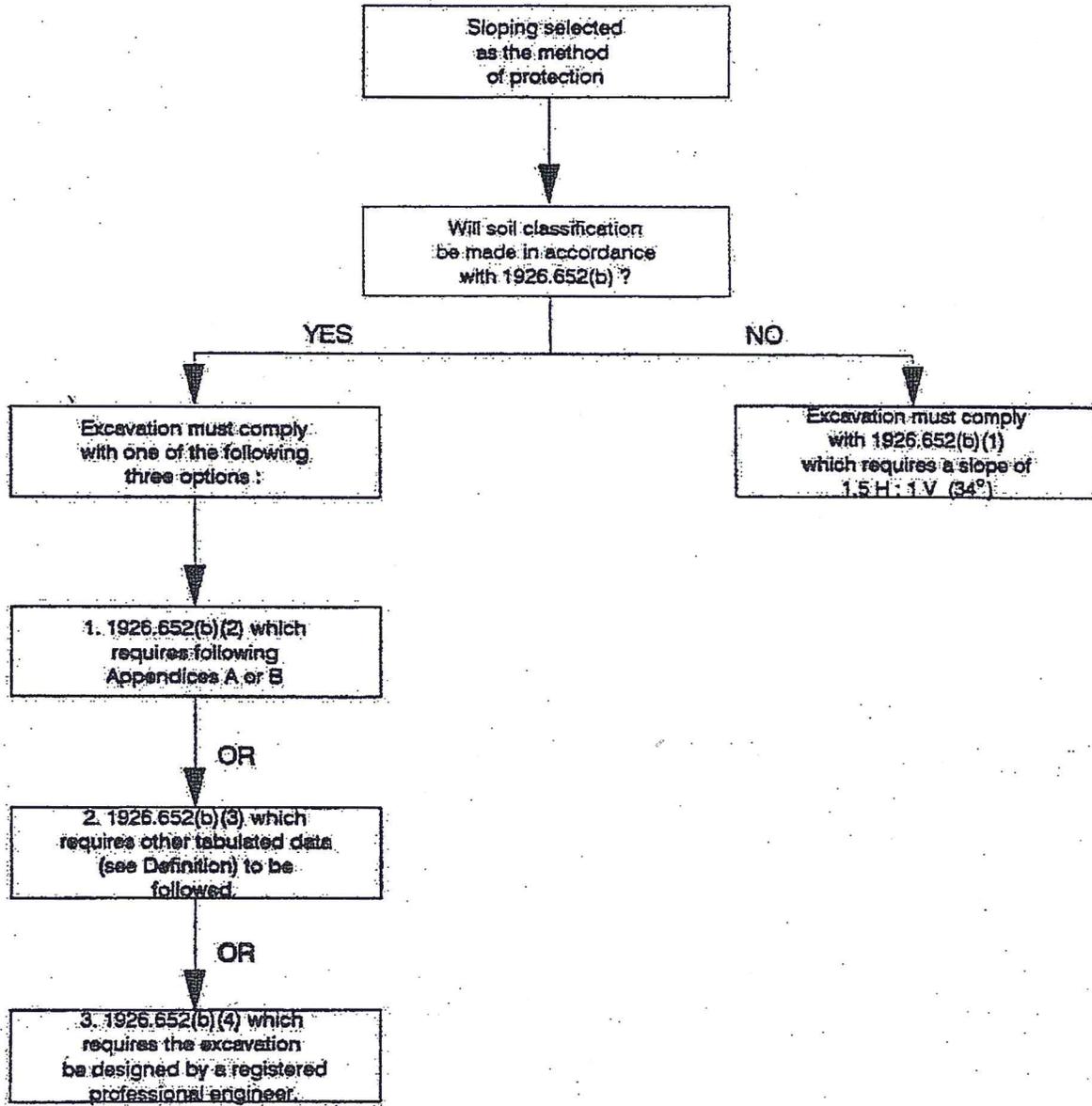
Selection of Protective Systems for Excavations 20 Feet or Less in Depth



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

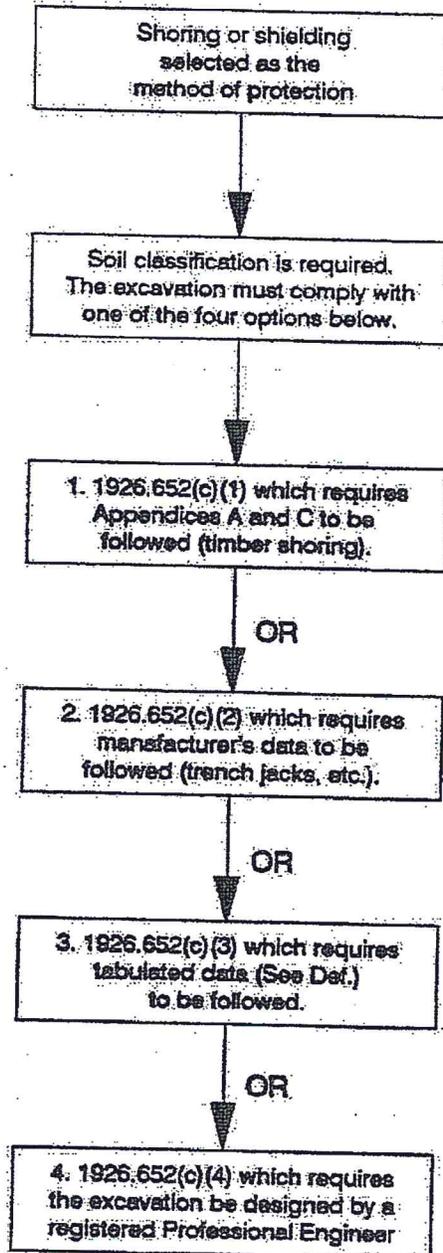
ATTACHMENT 2

Sloping Options



ATTACHMENT 3.

Shoring or Shielding Options



Subpart P--Excavations

Sec. 1926.650 Scope, application, and definitions applicable to this subpart.

Authority: Sec. 107, Contract Worker Hours and Safety Standards Act (Construction Safety Act) (40 U.S.C. 333); Secs. 4, 6, 8, Occupational Safety and Health Act of 1970 (29 U.S.C. 653, 655, 657); Secretary of Labor's Order No. 12-71 (36 FR 8754), 8-76 (41 FR 25059), or 9-83 (48 FR 35736), as applicable, and 29 CFR part 1911.

Source: 54 FR 45959, Oct. 31, 1989, unless otherwise noted.

(a) Scope and application. This subpart applies to all open excavations made in the earth's surface. Excavations are defined to include trenches.

(b) Definitions applicable to this subpart.

Accepted engineering practices means those requirements which are compatible with standards of practice required by a registered professional engineer.

Aluminum Hydraulic Shoring means a pre-engineered shoring system comprised of aluminum hydraulic cylinders (crossbraces) used in conjunction with vertical rails (uprights) or horizontal rails (walers). Such system is designed, specifically to support the sidewalls of an excavation and prevent cave-ins.

Bell-bottom pier hole means a type of shaft or footing excavation, the bottom of which is made larger than the cross section above to form a belled shape.

Benching (Benching system) means a method of protecting employees from cave-ins by excavating the sides of an excavation to form one or a series of horizontal levels or steps, usually with vertical or near-vertical surfaces between levels.

Cave-in means the separation of a mass of soil or rock material from the side of an excavation, or the loss of soil from under a trench shield or support system, and its sudden movement into the excavation, either by falling or sliding, in sufficient quantity so that it could entrap, bury, or otherwise injure and immobilize a person.

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

Cross braces mean the horizontal members of a shoring system installed perpendicular to the sides of the excavation, the ends of which bear against either uprights or wales.

Excavation means any man-made cut, cavity, trench, or depression in an earth surface, formed by earth removal.

Faces or sides means the vertical or inclined earth surfaces formed as a result of excavation work.

Failure means the breakage, displacement, or permanent deformation of a structural member or connection so as to reduce its structural integrity and its supportive capabilities.

Hazardous atmosphere means an atmosphere which by reason of being explosive, flammable, poisonous, corrosive, oxidizing, irritating, oxygen deficient, toxic, or otherwise harmful, may cause death, illness, or injury.

Kickout means the accidental release or failure of a cross brace.

Protective system means a method of protecting employees from cave-ins, from material that could fall or roll from an excavation face or into an excavation, or from the collapse of adjacent structures. Protective systems include support systems, sloping and benching systems, shield systems, and other systems that provide the necessary protection.

Ramp means an inclined walking or working surface that is used to gain access to one point from another, and is constructed from earth or from structural materials such as steel or wood.

Registered Professional Engineer means a person who is registered as a professional engineer in the state where the work is to be performed. However, a professional engineer, registered in any state is deemed to be a "registered professional engineer" within the meaning of this standard when approving designs for "manufactured protective systems" or "tabulated data" to be used in interstate commerce.

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 (Shield system) means a structure that is able to withstand the forces imposed on it by a cave-in and thereby protect employees within the structure. Shields can be permanent structures or can be designed to be portable and moved along as work progresses. Additionally, shields can be either premanufactured or job-built in accordance with Sec. 1926.652 (c)(3) or (c)(4). Shields used in trenches are usually referred to as "trench boxes" or "trench shields."

Shoring (Shoring system) means a structure such as a metal hydraulic, mechanical or timber shoring system that supports the sides of an excavation and which is designed to prevent cave-ins.

Sides. See "Faces."

Sloping (Sloping system) means a method of protecting employees from cave-ins by excavating to form sides of an excavation that are inclined away from the excavation so as to prevent cave-ins. The angle of incline required to prevent a cave-in varies with differences in such factors as the soil type, environmental conditions of exposure, and application of surcharge loads.

Stable rock means natural solid mineral material that can be excavated with vertical sides and will remain intact while exposed. Unstable rock is considered to be stable when the rock material on the side or sides of the excavation is secured against caving-in or movement by rock bolts or by another protective system that has been designed by a registered professional engineer.

Structural ramp means a ramp built of steel or wood, usually used for vehicle access. Ramps made of soil or rock are not considered structural ramps.

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 (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.

Sec. 1926.651 Specific excavation 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 Sec. 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 sufficiently 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) Walkways shall be provided where employees or equipment are required or permitted to cross over excavations. Guardrails which comply with Sec. 1926.502(b) shall be provided where walkways are 6 feet (1.8 m) or more above lower levels.

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Sec. 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 Sec. 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 Sec. 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 shear 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 on 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 American 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 spill 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 $\frac{1}{8}$ -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 $\frac{1}{8}$ -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 shear vane.

(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 Sec. 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 travelling, 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 $1\frac{1}{2}$ horizontal to one vertical ($1\frac{1}{2}$ H: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 Sec. 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°) 1 1/2 : 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)

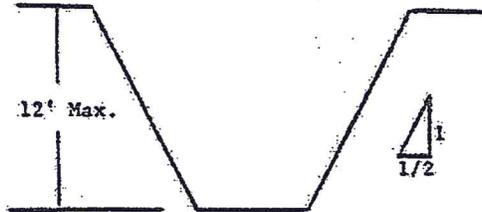
B-1.1 Excavations made in Type A soil.

1. All simple slope excavation 20 feet or less in depth shall have a maximum allowable slope of 3/4:1.



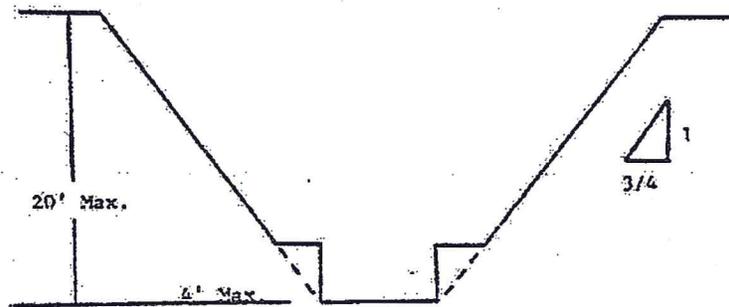
Simple Slope—General

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 1/2:1.

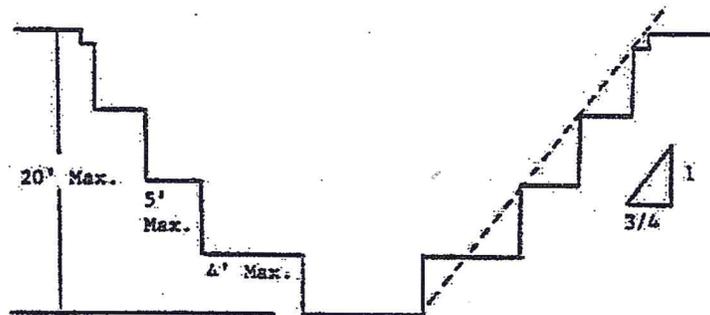


Simple Slope—Short Term

2. All benched excavations 20 feet or less in depth shall have a maximum allowable slope of $3/4$ to 1 and maximum bench dimensions as follows:

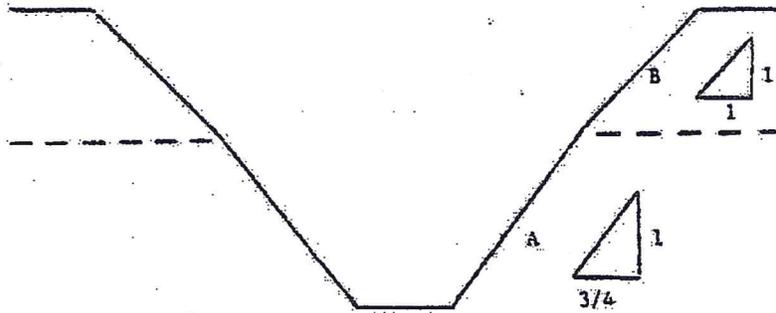


Simple Bench

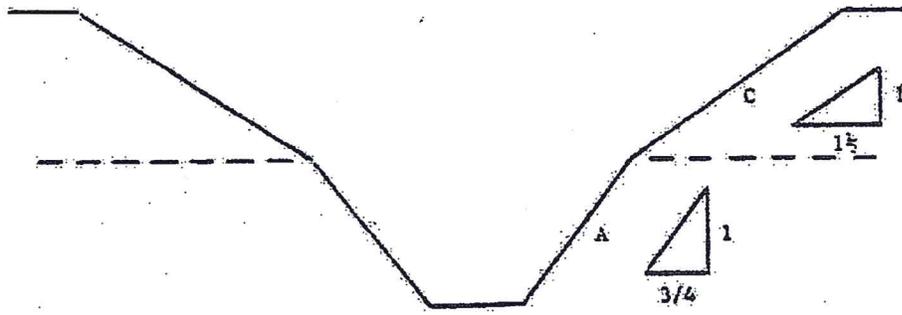


Multiple Bench

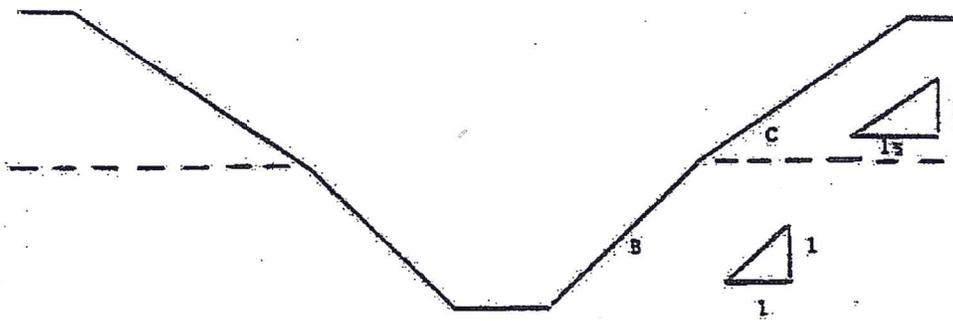
3. All excavations 8 feet or less in depth which have unsupported vertically sided lower portions shall have a maximum vertical side of 3 1/2 feet.



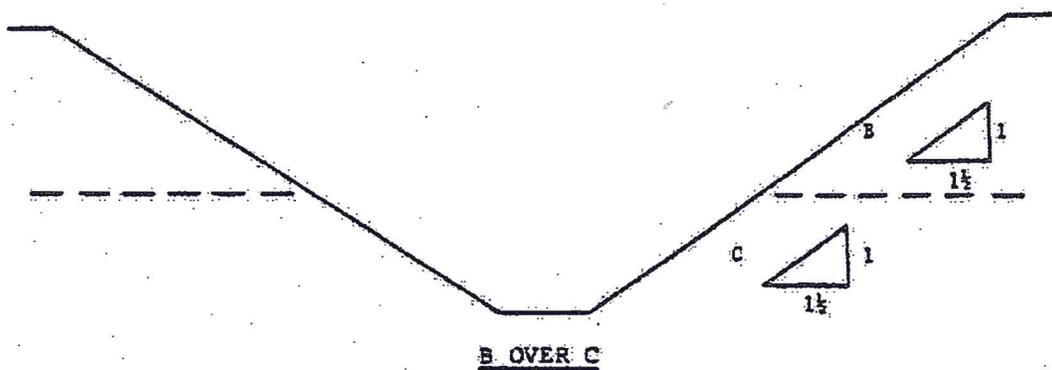
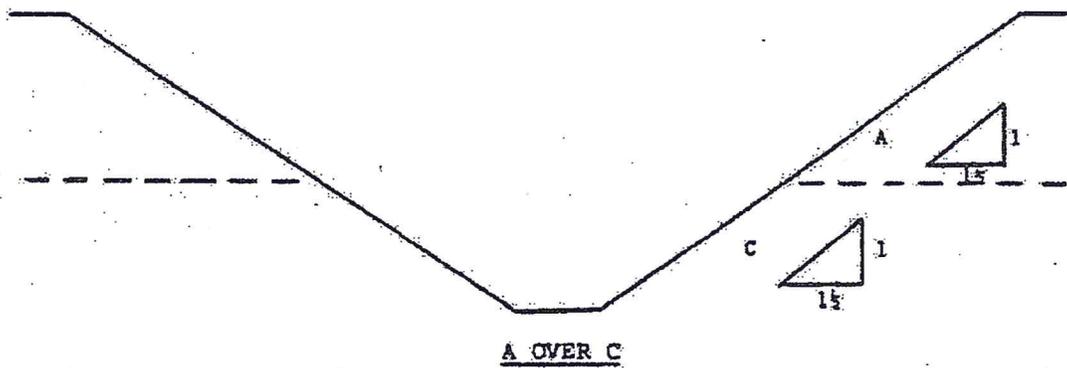
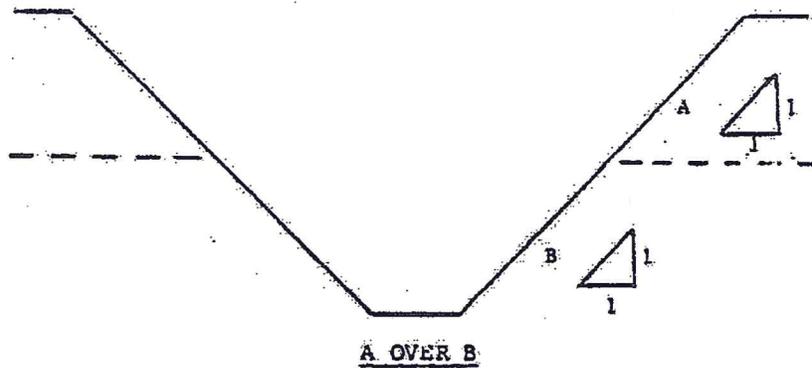
B OVER A



C OVER A



C OVER B



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 $\frac{3}{4}$: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 $\frac{1}{2}$:1.

Simple Slope--Short Term

2. All benched excavations 20 feet or less in depth shall have a maximum allowable slope of $\frac{3}{4}$ to 1 and maximum bench dimensions as follows:

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 $3\frac{1}{2}$ feet.

Unsupported Vertically Sided Lower Portion--Maximum 8 Feet in Depth

All excavations more than 8 feet but not more than 12 feet in depth which unsupported vertically sided lower portions shall have a maximum allowable slope of 1:1 and a maximum vertical side of $3\frac{1}{2}$ feet.

Unsupported Vertically Sided Lower Portion--Maximum 12 Feet in Depth

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

Supported or Shielded Vertically Sided Lower Portion

4. All other simple slope, compound slope, and vertically sided lower portion excavations shall be in accordance with the other options permitted under Sec. 1926.652(b).

B-1.2 Excavations Made in Type B Soil

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

Simple Slope

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

Multiple Bench

3. All excavations 20 feet or less in depth which have vertically sided lower portions shall be shielded or supported to a height at least 18 inches above the top of the vertical side. All such excavations shall have a maximum allowable slope of 1:1.

Vertically Sided Lower Portion

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

B-1.3 Excavations Made in Type C Soil

1. All simple slope excavations 20 feet or less in depth shall have a maximum allowable slope of 1 1/2:1.

Simple Slope

2. All excavations 20 feet or less in depth which have vertically sided lower portions shall be shielded or supported to a height at least 18 inches above the top of the vertical side. All such excavations shall have a maximum allowable slope of 1 1/2:1.

Vertical Sided Lower Portion

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

B-1.4 Excavations Made in Layered Soils

1. All excavations 20 feet or less in depth made in layered soils shall have a maximum allowable slope for each layer as set forth below.

2. All other sloped excavations shall be in accordance with the other options permitted in Sec. 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 Sec. 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 Sec. 1926.652(b) and Sec. 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 Sec. 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 Sec. 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 Sec. 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 B1

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

Wales are not required.

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

Arrangement B2

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

Space 8 x 8 wales at four feet vertically.

Space 2 x 6 uprights at four feet horizontally.

Arrangement B3

Space 6 x 6 crossbraces at 10 feet horizontally and four feet vertically.
Space 8 x 10 wales at four feet vertically.
Space 2 x 6 uprights at five feet horizontally.

Arrangement B4

Space 6 x 6 crossbraces at 12 feet horizontally and four feet vertically.
Space 10 x 10 wales at four feet vertically.
Spaces 3 x 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 B1

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

Space 8 x 8 wales at five feet vertically.

Space 2 x 6 uprights at two feet horizontally.

Arrangement B2

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

Space 10 x 10 wales at five feet vertically.

Space 2 x 6 uprights at two feet horizontally.

Arrangement B3

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

Space 10 x 12 wales at five feet vertically.

Space 2 x 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 B1

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

Space 10 x 12 wales at five feet vertically.

Position 2 x 6 uprights as closely together as possible.

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

Arrangement B2

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

Space 12 x 12 wales at five feet vertically.

Position 2 x 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 x 10 crossbraces at six feet horizontally and five feet

vertically.

Space 12 x 12 wales at five feet vertically.

Use 3 x 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 Sec. 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.

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 **												UPRIGHTS				
	CROSS BRACES						MALES						MAXIMUM ALLOWABLE HORIZONTAL SPACING (FEET)				
	HORIZ. SPACING (FEET)	WIDTH OF TRENCH (FEET)		VERT. SPACING (FEET)		SIZE (IN.)	VERT. SPACING (FEET)	UP TO		UP TO		UP TO		CLOSE	4	5	6
5	UP TO 6	4X4	4X4	4X6	6X6	6X6	4	6X6	6X6	6X6	6X6	6X6	---			2X6	
	UP TO 8	4X4	4X4	4X5	6X6	6X6	4	6X6	6X6	6X6	6X6	6X6	---				2X8
10	UP TO 10	4X6	4X6	4X6	6X6	6X6	4	6X6	6X6	6X6	6X6	6X6	4		2X6		
	UP TO 12	4X6	4X6	6X6	6X6	6X6	4	6X6	6X6	6X6	6X6	6X6	4			2X6	
15	UP TO 6	4X4	4X4	4X6	6X6	6X6	4	6X6	6X6	6X6	6X6	6X6	---			3X8	
	UP TO 8	4X6	4X6	6X6	6X6	6X6	4	6X6	6X6	6X6	6X6	6X6	4	2X6			
20	UP TO 10	6X6	6X6	6X6	6X8	6X8	4	6X8	6X8	6X8	6X8	6X8	4		2X6		
	UP TO 12	6X6	6X6	6X6	6X8	6X8	4	6X8	6X8	6X8	6X8	6X8	4			3X8	
OVER 20	UP TO 6	6X6	6X6	6X6	6X8	6X8	4	6X8	6X8	6X8	6X8	6X8	4	3X6			
	UP TO 8	6X6	6X6	6X6	6X8	6X8	4	6X8	6X8	6X8	6X8	6X8	4			3X6	
OVER 20	UP TO 10	8X8	8X8	8X8	8X8	8X10	4	8X10	8X10	8X10	8X10	8X10	4	3X6			
	UP TO 12	8X8	8X8	8X8	8X8	8X10	4	8X8	8X8	8X10	8X10	8X10	4			3X6	

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-1.2

TIMBER TRENCH SHORING -- MINIMUM TIMBER REQUIREMENTS *

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

DEPTH OF TRENCH (FEET)	SIZE (ACTUAL) AND SPACING OF MEMBERS**										UPRIGHTS		
	CROSS BRACES					RAILES					MAXIMUM ALLOWABLE HORIZONTAL SPACING		
	HORIZ. SPACING (FEET)	WIDTH OF TRENCH (FEET)		VERT. SPACING (FEET)		SIZE (IN)	VERT. SPACING (FEET)	CLOSE	2	3			
5	UP TO 6	4X6	4X6	6X6	6X6	6X6	5						
TO	UP TO 8	6X6	6X6	6X8	6X8	6X8	5						
10	UP TO 10	6X6	6X6	6X8	6X8	6X8	5						
	See Note 1												
10	UP TO 6	6X6	6X6	6X8	6X8	6X8	5						
TO	UP TO 8	6X8	6X8	8X8	8X8	8X8	5						
15	UP TO 10	8X8	8X8	8X8	8X10	8X10	5						
	See Note 1												
15	UP TO 6	6X8	6X8	8X8	8X8	8X8	5						
TO	UP TO 8	8X8	8X8	8X8	8X10	8X10	5						
20	UP TO 10	8X10	8X10	8X10	10X10	10X10	5						
	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-1.3

TIMBER TRENCH SHORING -- MINIMUM TIMBER REQUIREMENTS*
 SOIL TYPE C¹ 4 72 psf (2 ft. SurchARGE)

DEPTH OF TRENCH (FEET)	SIZE (ACTUAL) AND SPACING OF MEMBERS**											UPRIGHTS			
	HORIZ. SPACING (FEET)			CROSS BRACES						VERT. SPACING (FEET)	SIZE (IN)	VERT. SPACING (FEET)	MAXIMUM ALLOWABLE HORIZONTAL SPACING (FEET) (See Note 2)		
	UP TO	UP TO	UP TO	UP TO	UP TO	UP TO	UP TO	UP TO	UP TO				CLOSE		
5	UP TO 6	6X8	6X8	6X8	6X8	8X8	8X8	8X8	8X8	5	8X10	5	2X6		
TO	UP TO 8	8X8	8X8	8X8	8X8	8X8	8X8	8X10	8X10	5	10X12	5	2X6		
10	UP TO 10	8X10	8X10	8X10	8X10	8X10	8X10	8X10	10X10	5	12X12	5	2X6		
	See Note 1														
10	UP TO 6	8X8	8X8	8X8	8X8	8X8	8X8	8X10	8X10	5	10X12	5	2X6		
TO	UP TO 8	8X10	8X10	8X10	8X10	8X10	8X10	8X10	10X10	5	12X12	5	2X6		
15	See Note 1														
	See Note 1														
	See Note 1														
15	UP TO 6	8X10	8X10	8X10	8X10	8X10	8X10	8X10	10X10	5	12X12	5	3X6		
TO	See Note 1														
20	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 (S _A B) AND SPACING OF MEMBERS **												UNRIGHTS								
	CROSS BRACES						VALUES						MAXIMUM ALLOWABLE HORIZONTAL SPACING (FEET)								
	HORIZ. SPACING (FEET)		WIDTH OF TRENCH (FEET)				VERT. SPACING (FEET)		SIZE (IN)		VERT. SPACING (FEET)		CLOSE		3		4		6		
	UP TO	TO	UP TO	UP TO	UP TO	UP TO	UP TO	UP TO	UP TO	UP TO	UP TO	UP TO	UP TO	UP TO	UP TO	UP TO	UP TO	UP TO	UP TO	UP TO	
5 TO 10	UP TO 6	TO 8	UP TO 4	UP TO 6	UP TO 9	UP TO 12	UP TO 15	6X6	6X6	5	6X8	5	3X6	4X8	3X12	4X8	4X12				
	UP TO 8	TO 10	UP TO 6	UP TO 8	UP TO 9	UP TO 12	UP TO 15	6X6	6X6	5	8X8	5	3X8	4X8							
	UP TO 10	TO 12	UP TO 6	UP TO 8	UP TO 9	UP TO 12	UP TO 15	6X6	6X6	5	8X10	5									
10 TO 15	UP TO 6	TO 8	UP TO 6	UP TO 8	UP TO 6	UP TO 8	UP TO 8	6X6	6X8	5	8X8	5	3X6	4X10							
	UP TO 8	TO 10	UP TO 6	UP TO 8	UP TO 6	UP TO 8	UP TO 8	6X8	8X8	5	10X10	5	3X6	4X10							
	UP TO 10	TO 12	UP TO 6	UP TO 8	UP TO 6	UP TO 8	UP TO 8	6X8	8X8	5	10X12	5	3X6	4X10							
15 TO 20	UP TO 6	TO 8	UP TO 6	UP TO 8	UP TO 6	UP TO 8	UP TO 8	6X8	6X8	5	8X10	5	4X6								
	UP TO 8	TO 10	UP TO 6	UP TO 8	UP TO 6	UP TO 8	UP TO 8	6X8	8X8	5	10X12	5	4X6								
	UP TO 10	TO 12	UP TO 6	UP TO 8	UP TO 6	UP TO 8	UP TO 8	8X8	8X8	5	12X12	5	4X6								
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 Sec. 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 D-1.4 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 walers 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 manufacturer.

(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 Sec. 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 Sec. 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 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 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 B2) 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 x 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 x 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 Sec. 1926.652(c)(2) for use of manufacturer's tabulated data. For trench depths in excess of 20 feet, refer to Sec. 1926.652(c)(2) and Sec. 1926.652(c)(3).

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

(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.

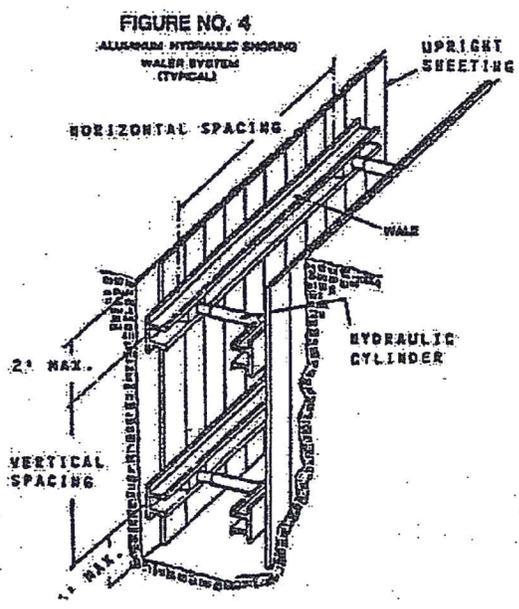
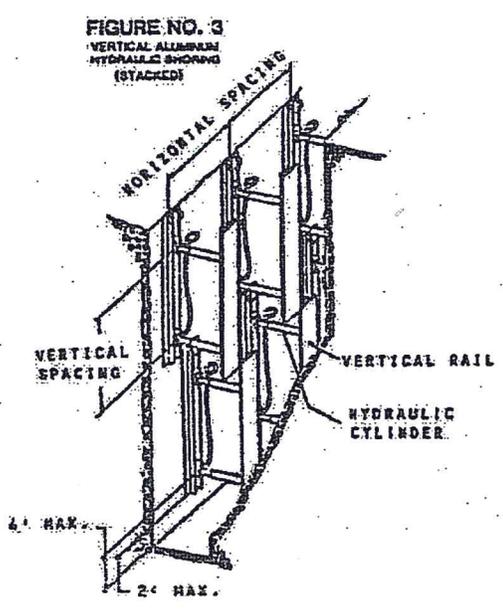
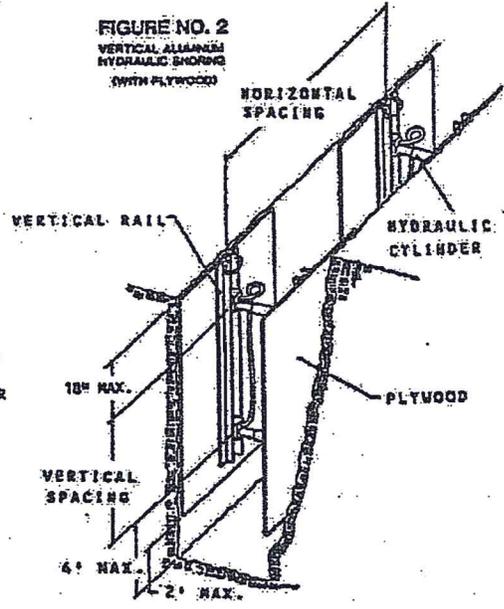
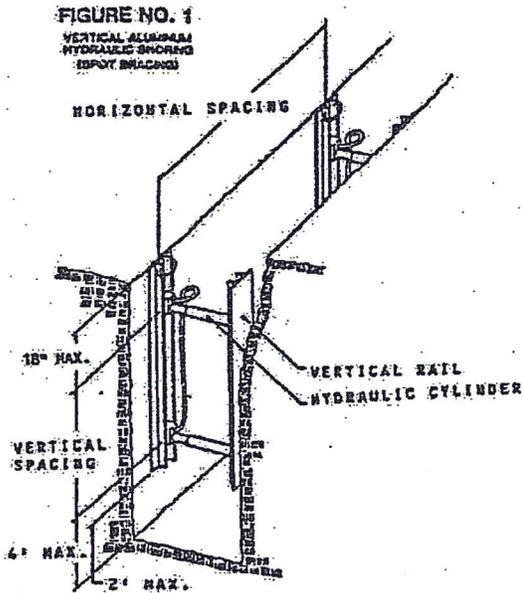
(7) Plywood shall be 1.125 in. thick softwood or 0.75 inch. thick, 14 ply, arctic white birch (Finland form). Please note that plywood is not intended as a structural member, but only for prevention of local raveling (sloughing of the trench face) between shores.

(8) See appendix C for timber specifications.

(9) Wales are calculated for simple span conditions.

(10) See appendix D, item (d), for basis and limitations of the data.

ALUMINUM HYDRAULIC SHORING TYPICAL INSTALLATIONS



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

HYDRAULIC CYLINDERS				
DEPTH OF TRENCH (FEET)	MAXIMUM HORIZONTAL SPACING (FEET)	MAXIMUM VERTICAL SPACING (FEET)	WIDTH OF TRENCH (FEET)	
			UP TO 8	OVER 8 UP TO 12
OVER 5 UP TO 10	8	4	2 INCH DIAMETER	3 INCH DIAMETER
OVER 10 UP TO 15	8		2 INCH DIAMETER NOTE (2)	
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 (e)

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**

HYDRAULIC CYLINDERS					
DEPTH OF TRENCH (FEET)	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		
	VERTICAL SPACING (FEET)	SECTION MODULUS (IN ³)	WIDTH OF TRENCH (FEET)								MAX. HORIZ. SPACING (ON CENTER)		
			UP TO 8		OVER 8 UP TO 12		OVER 12 UP TO 15		SOLID SHEET	2 FT.	3 FT.		
			HORIZ. SPACING	CYLINDER DIAMETER	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	8.0	3 IN	8.0	3 IN			
			9.0	2 IN	9.0	2 IN	9.0	3 IN	9.0	3 IN			
			12.0	3 IN	12.0	3 IN	12.0	3 IN	12.0	3 IN			3x12
OVER 10 UP TO 15	4	3.5	6.0	2 IN	6.0	2 IN	6.0	3 IN	6.0	3 IN			
			8.0	3 IN	8.0	3 IN	8.0	3 IN	8.0	3 IN			3x12
			10.0	3 IN	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	5.5	3 IN	5.5	3 IN			
			6.0	3 IN	6.0	3 IN	6.0	3 IN	6.0	3 IN			3x12
			9.0	3 IN	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		
	VERTICAL SPACING (FEET)	SECTION MODULUS (IN ⁴)	WIDTH OF TRENCH (FEET)						MAX. HORIZ. SPACING (ON CENTER)	SOLID SHEET	
			UP TO 8		OVER 8 UP TO 12		OVER 12 UP TO 15				
			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	6.0	3 IN	3x12	2 FT.	3 FT.
			6.5	2 IN	6.5	NOTE(2)	6.5	3 IN			
			14.0	3 IN	10.0	3 IN	10.0	3 IN			
OVER 10 UP TO 15	4	7.0	4.0	2 IN	4.0	NOTE(2)	4.0	3 IN	3x12	—	—
			5.5	3 IN	5.5	3 IN	5.5	3 IN			
			14.0	3 IN	8.0	3 IN	8.0	3 IN			
OVER 15 UP TO 20	4	14.0	3.5	2 IN	3.5	NOTE(2)	3.5	3 IN	3x12	—	—
			5.0	3 IN	5.0	3 IN	5.0	3 IN			
			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 F—Alternatives to Timber Shoring

Figure 1. Aluminum Hydraulic Shoring

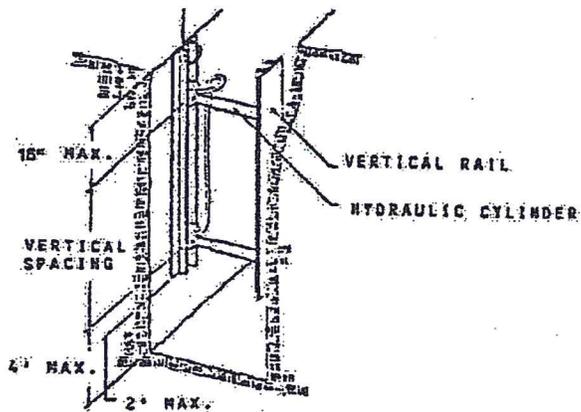
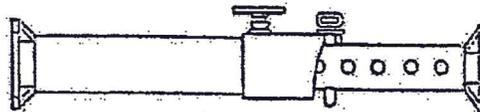


Figure 2. Pneumatic/hydraulic Shoring



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Figure 3. Trench Jacks (Screw Jacks)

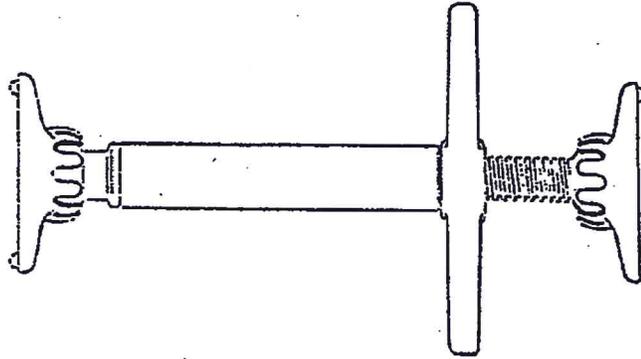
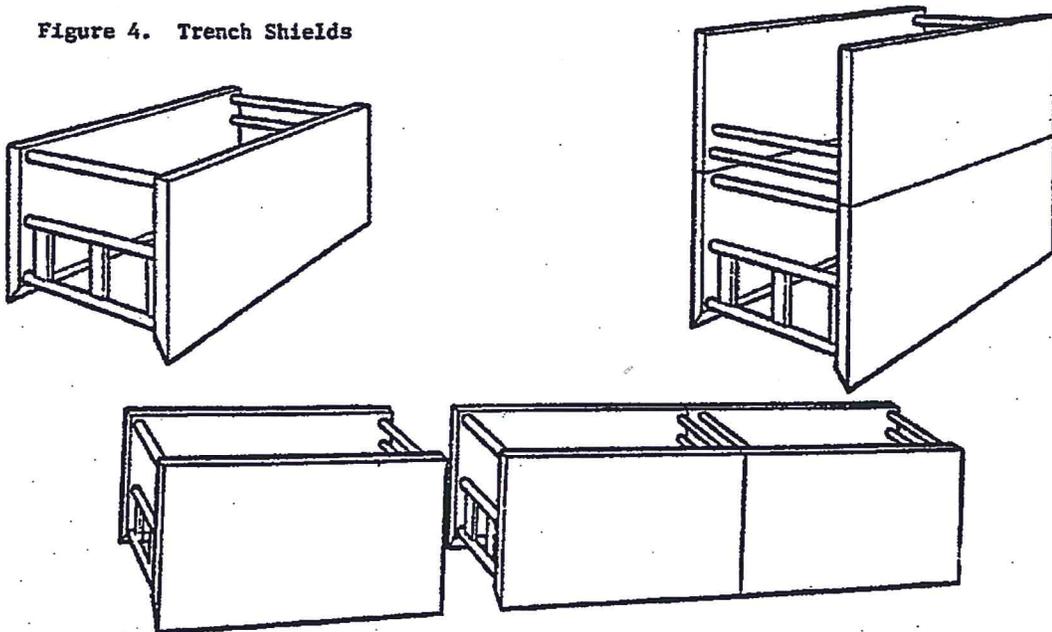


Figure 4. Trench Shields



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).

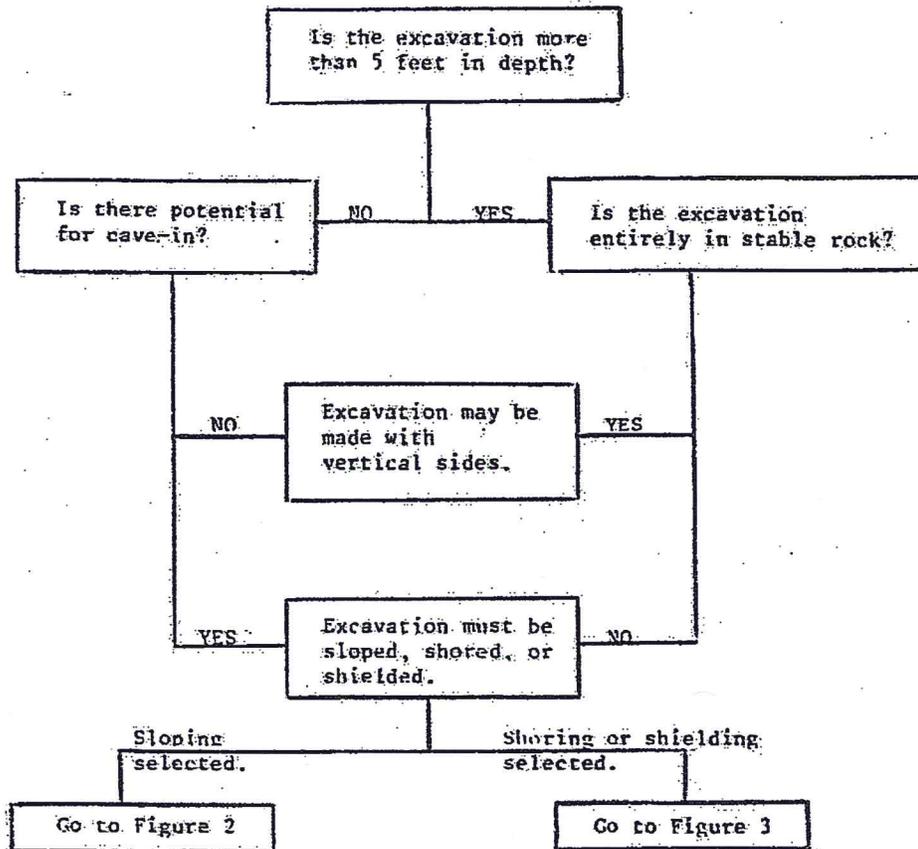


FIGURE 1 - PRELIMINARY DECISIONS

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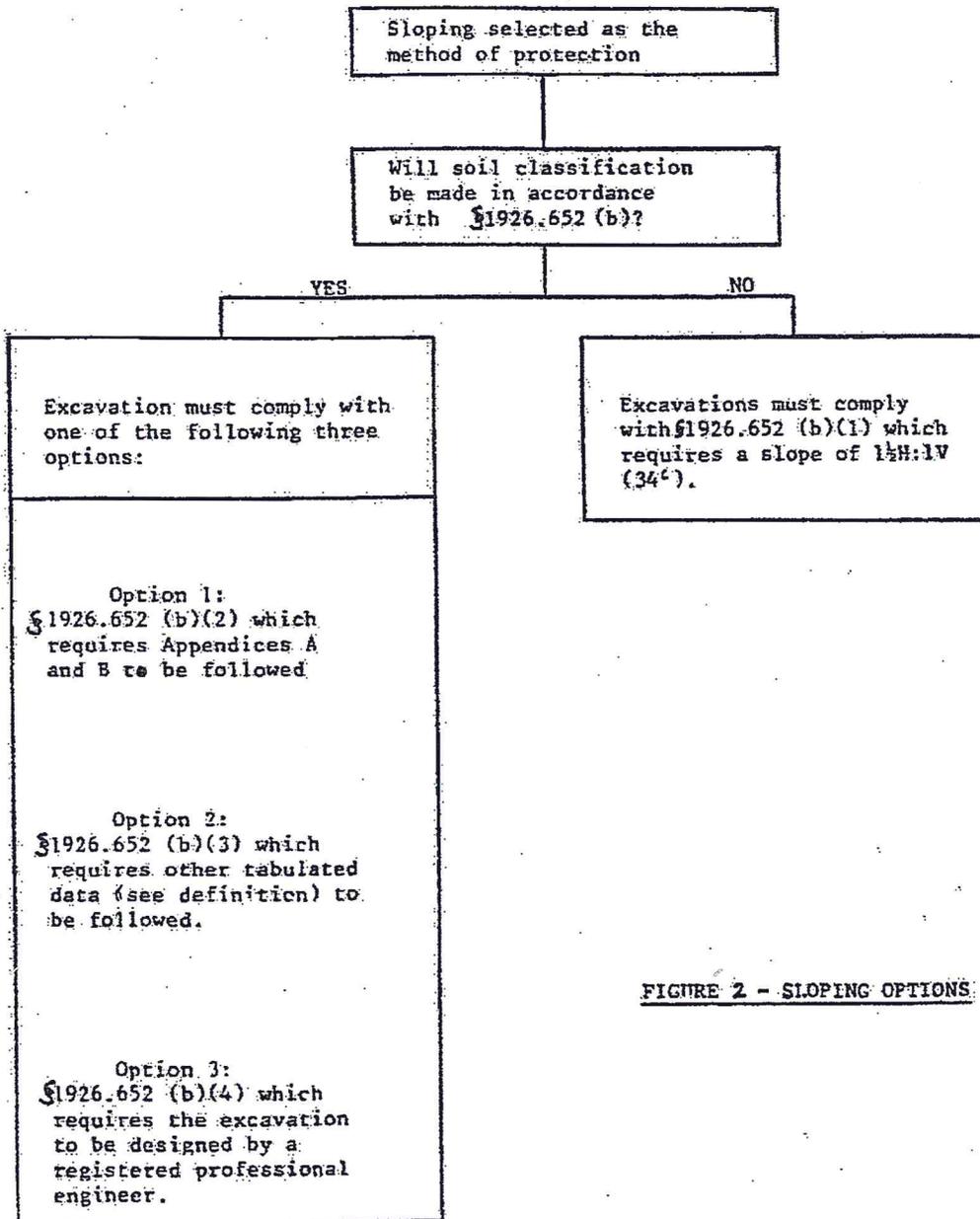


FIGURE 2 - SLOPING OPTIONS.

**EXCAVATION AND TRENCHING
NOTIFICATION LOG**

Date: _____ Project Number: _____
Customer: _____ OSHA Permit Required: YES ___ NO ___
Customer: _____ Project Manager: _____
H&S Internal Permit Number: _____
Comments: _____

Date: _____ Project Number: _____
Customer: _____ OSHA Permit Required: YES ___ NO ___
Customer: _____ Project Manager: _____
H&S Internal Permit Number: _____
Comments: _____

Date: _____ Project Number: _____
Customer: _____ OSHA Permit Required: YES ___ NO ___
Customer: _____ Project Manager: _____
H&S Internal Permit Number: _____
Comments: _____

Date: _____ Project Number: _____
Customer: _____ OSHA Permit Required: YES ___ NO ___
Customer: _____ Project Manager: _____
H&S Internal Permit Number: _____
Comments: _____



ATTACHMENT K
TRAFFIC CONTROL

Environmental Quality Management, Inc.

Standard Operating Procedure

Title:	Traffic Control	Document No.	HS-EqOp-5
Date of Issue:	July 2005	Revision No.	3
Point of Contact:	_____ (signature on file) Nick Michailides, Corp. H&S Manager	Approval:	_____ (signature on file) Jackie Doan, Corporate QA Director

The possibility of vehicle-related injury or accident is inherent to all aspects of field work. Vehicle-related accidents may occur during travel to or from the site as well as during on-site activities. The latter will be a major factor given the fairly continuous activities and the potential for heavy equipment which may be used as part of the planned work tasks. Additionally, work may take place in or near areas where there is frequent vehicle traffic. Personnel must be alert and maintain awareness of their surroundings while driving.

Traffic will be controlled in and around the job site at all times. Personnel will be protected from injury, and equipment damage will be prevented. Delineation will be accomplished using any effective means such as barricades, warning signs, warning lights, traffic cones, etc. [See American National Standards Institute (ANSI) "Manual on Uniform Traffic Control Devices" (D 6.1 - 1921) for further information.]

If work takes place in or near high traffic areas, these areas will be appropriately marked with the aforementioned devices as necessary to protect personnel. Personnel will wear fluorescent orange and/or reflective clothing, vests, etc., when working in and around roads.

Vehicles not actively used in operations will be parked so that they do not interfere with traffic. Supervisors should ensure that site access roads are suitable for vehicle travel and that turnaround spots are constructed to ease maneuverability. When vehicles are maneuvered in confined areas with limited visibility, assistance will be given to the operator by personnel positioned outside the vehicle.

Pedestrian traffic has the right-of-way on site. Personnel on foot need to be careful around heavy equipment and when walking near roads. Ground personnel should always make eye contact and wait for a signal to proceed before passing close to or in front of operating equipment or moving vehicles.

All drivers and operators will adhere to the speed limits, signs, and road markings. Equipment operators and ground personnel will be especially careful if air line respirators are in use because of the potential for injury if an air line becomes tangled in the track or wheel of a vehicle or equipment. Under no circumstances will breathing air systems be attached to vehicles or equipment while air is supplied to the respirators of ground employees.



ATTACHMENT L
SITE MSDS

Material Safety Data Sheet



1. Product and company identification

Product name	DIESEL FUEL NO. 2
MSDS #	11155
Code	11155
Product use	Fuel.
Synonyms	Ultra Low Sulfur No. 2 Amoco Premier Diesel Fuel, Ultra Low Sulfur No. 2 Amoco Premier Diesel Fuel – Winterized, Ultra Low Sulfur No. 2 BP Supreme Diesel, Low Sulfur No. 2 BP Diesel Fuel, Ultra Low Sulfur No. 2 BP Diesel Fuel, Ultra Low Sulfur No. 2 BP Diesel Fuel – Winterized
Supplier	BP Products North America Inc. 150 West Warrenville Road Naperville, Illinois 60563-8460 USA
EMERGENCY HEALTH INFORMATION:	1 (800) 447-8735 Outside the US: +1 703-527-3887 (CHEMTREC)
EMERGENCY SPILL INFORMATION:	1 (800) 424-9300 CHEMTREC (USA)
OTHER PRODUCT INFORMATION	1 (866) 4 BP - MSDS (866-427-6737 Toll Free - North America) email: bpcares@bp.com

2. Hazards identification

Physical state	Liquid.
or	Colorless. to Various Colors. (May be dyed Red., Light Green. ,Yellow.)
Emergency overview	WARNING ! COMBUSTIBLE LIQUID AND VAPOR. VAPOR MAY CAUSE FLASH FIRE. HARMFUL IF SWALLOWED. ASPIRATION HAZARD. HARMFUL OR FATAL IF LIQUID IS ASPIRATED INTO LUNGS. MAY CAUSE RESPIRATORY TRACT IRRITATION. INHALATION CAUSES HEADACHES, DIZZINESS, DROWSINESS, AND NAUSEA, AND MAY LEAD TO UNCONSCIOUSNESS. Combustible liquid. Harmful if swallowed. Aspiration hazard if swallowed. Can enter lungs and cause damage. Keep away from heat, sparks and flame. Avoid exposure - obtain special instructions before use. Do not breathe vapor or mist. Do not ingest. If ingested, do not induce vomiting. Avoid contact with eyes, skin and clothing. Contains material which may cause cancer, based on animal data. Risk of cancer depends on duration and level of exposure. Use only with adequate ventilation. Keep container tightly closed and sealed until ready for use. Wash thoroughly after handling.
Routes of entry	Dermal contact. Eye contact. Inhalation. Ingestion.
Potential health effects	
Eyes	Slightly irritating to the eyes.
Skin	Prolonged or repeated contact can defat the skin and lead to irritation and/or dermatitis.
Inhalation	May cause respiratory tract irritation. Inhalation causes headaches, dizziness, drowsiness and nausea and may lead to unconsciousness. See toxicological information (section 11).

Product name	DIESEL FUEL NO. 2	Product code	11155	Page:	1/8
Version	2	Date of issue	07/20/2010.	Format	US-COMP
				(US-COMP)	Language ENGLISH.
					(ENGLISH)

Ingestion

Harmful if swallowed. Aspiration hazard if swallowed. Can enter lungs and cause damage. See toxicological information (section 11).

See toxicological information (section 11)

Composition/information on ingredients

Ingredient name	CAS #	%
Petroleum distillates (Diesel Fuel No. 2)	68476-34-6	95 - 100
Contains one or more of the following biodiesels:	Varies	0 - 5
soybean oil, me ester	67784-80-9	.
Fatty acids, sunflower-oil, Me esters	68919-54-0	.
Fatty acids methyl esters	67762-38-3	.
Fatty acids, vegetable-oil, Methyl esters	68990-52-3	.
rape oil, me ester	73891-99-3	.
Fatty acids, canola-oil, Me esters	129828-16-6	.
fatty acids, tallow, me esters	61788-61-2	.
Contains:		
Naphthalene	91-20-3	1 - 3
May also contain small quantities of proprietary performance additives.		

4. First aid measures

Eye contact	In case of contact, immediately flush eyes with plenty of water for at least 15 minutes. Get medical attention.
Skin contact	Flush contaminated skin with plenty of water. Remove contaminated clothing and shoes. Wash clothing before reuse. Clean shoes thoroughly before reuse. Get medical attention if irritation develops.
Inhalation	If inhaled, remove to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. Get medical attention immediately.
Ingestion	Aspiration hazard if swallowed. Can enter lungs and cause damage. Do not induce vomiting. Never give anything by mouth to an unconscious person. Get medical attention immediately.

Fire-fighting measures

Flammability of the product	Combustible liquid.
Auto-ignition temperature	257°C (494°F)
Flash point	Closed cup: >38°C (>100.4°F) [Pensky-Martens.]
Explosion limits	Lower: 0.6% Upper: 7.5%
Fire/explosion hazards	Combustible liquid and vapor. Vapor may cause flash fire. Vapors may accumulate in low or confined areas or travel a considerable distance to a source of ignition and flash back. Runoff to sewer may create fire or explosion hazard.
Unusual fire/explosion hazards	Explosive in the presence of the following materials or conditions: open flames, sparks and static discharge and heat.
Extinguishing media	
Suitable	In case of fire, use water fog, foam, dry chemicals, or carbon dioxide.
Not suitable	Do not use water jet.
Fire-fighting procedures	Promptly isolate the scene by removing all persons from the vicinity of the incident if there is a fire. No action shall be taken involving any personal risk or without suitable training. Move containers from fire area if this can be done without risk. Use water spray to keep fire-exposed containers cool.
Hazardous combustion products	Combustion products may include the following: carbon oxides (CO, CO ₂) (carbon monoxide, carbon dioxide)
Protective clothing (fire)	

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Fire-fighters should wear appropriate protective equipment and self-contained breathing apparatus (SCBA) with a full face-piece operated in positive pressure mode.

Special remarks on fire hazards

Do not use water jet.

Accidental release measures

Environmental precautions

Avoid dispersal of spilled material and runoff and contact with soil, waterways, drains and sewers. Inform the relevant authorities if the product has caused environmental pollution (sewers, waterways, soil or air).

Personal protection in case of a large spill

Chemical splash goggles. Chemical-resistant protective suit. Boots. Chemical-resistant gloves. Self-contained breathing apparatus (SCBA) should be used to avoid inhalation of the product. Suggested protective clothing might not be adequate. Consult a specialist before handling this product. CAUTION: The protection provided by air-purifying respirators is limited. Use a positive pressure air-supplied respirator if there is any potential for an uncontrolled release, if exposure levels are not known, or if concentrations exceed the protection limits of air-purifying respirator.

Methods for cleaning up

Large spill

Stop leak if without risk. Eliminate all ignition sources. Move containers from spill area. Approach release from upwind. Prevent entry into sewers, water courses, basements or confined areas. Wash spillages into an effluent treatment plant or proceed as follows. Contain and collect spillage with non-combustible, absorbent material e.g. sand, earth, vermiculite or diatomaceous earth and place in container for disposal according to local regulations (see section 13). Use spark-proof tools and explosion-proof equipment. Dispose of via a licensed waste disposal contractor. Contaminated absorbent material may pose the same hazard as the spilled product. Note: see section 1 for emergency contact information and section 13 for waste disposal.

Small spill

Stop leak if without risk. Eliminate all ignition sources. Move containers from spill area. Absorb with an inert material and place in an appropriate waste disposal container. Use spark-proof tools and explosion-proof equipment. Dispose of via a licensed waste disposal contractor.

7. Handling and storage

Handling

Do not ingest. Never siphon by mouth. If ingested, do not induce vomiting. Put on appropriate personal protective equipment (see section 8). Workers should wash hands and face before eating, drinking and smoking. Do not get in eyes or on skin or clothing. Do not breathe vapor or mist. Use only with adequate ventilation. Wear appropriate respirator when ventilation is inadequate. Do not enter storage areas and confined spaces unless adequately ventilated. Store and use away from heat, sparks, open flame or any other ignition source. Use explosion-proof electrical (ventilating, lighting and material handling) equipment. Use non-sparking tools. Take precautionary measures against electrostatic discharges. To avoid fire or explosion, dissipate static electricity during transfer by grounding and bonding containers and equipment before transferring material.

Storage

Store in accordance with local regulations. Store in a segregated and approved area. Store away from direct sunlight in a dry, cool and well-ventilated area, away from incompatible materials (see section 10). Eliminate all ignition sources. Separate from oxidizing materials. Keep container tightly closed and sealed until ready for use. Containers that have been opened must be carefully resealed and kept upright to prevent leakage. Do not store in unlabeled containers. Use appropriate containment to avoid environmental contamination.

8. Exposure controls/personal protection

Occupational exposure limits

Ingredient name

Occupational exposure limits

Petroleum distillates

ACGIH TLV (United States). Absorbed through skin.

TWA: 100 mg/m³, (measured as total hydrocarbons) 8 hour(s). Issued/Revised: 1/2002 Form: Total hydrocarbons

Naphthalene

ACGIH TLV (United States).

STEL: 79 mg/m³ 15 minute(s). Issued/Revised: 5/1996

STEL: 15 ppm 15 minute(s). Issued/Revised: 5/1996

TWA: 52 mg/m³ 8 hour(s). Issued/Revised: 5/1996

TWA: 10 ppm 8 hour(s). Issued/Revised: 5/1996

OSHA PEL (United States).

TWA: 50 mg/m³ 8 hour(s). Issued/Revised: 6/1993

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While specific OELs for certain components may be shown in this section, other components may be present in any mist, vapor or dust produced. Therefore, the specific OELs may not be applicable to the product as a whole and are provided for guidance only.

Some states may enforce more stringent exposure limits.

Control Measures

Use only with adequate ventilation. Use process enclosures, local exhaust ventilation or other engineering controls to keep worker exposure to airborne contaminants below any recommended or statutory limits. The engineering controls also need to keep gas, vapor or dust concentrations below any lower explosive limits. Use explosion-proof ventilation equipment.

Hygiene measures

Wash hands, forearms and face thoroughly after handling chemical products, before eating, smoking and using the lavatory and at the end of the working period. Appropriate techniques should be used to remove potentially contaminated clothing. Wash contaminated clothing before reusing.

Personal protection

Eyes

Avoid contact with eyes. Safety glasses with side shields.

Skin and body

Avoid contact with skin and clothing. Wear suitable protective clothing.

Respiratory

Use only with adequate ventilation. Do not breathe vapor or mist. If ventilation is inadequate, use a NIOSH-certified respirator with an organic vapor cartridge and P95 particulate filter.

CAUTION: The protection provided by air-purifying respirators is limited. Use a positive pressure air-supplied respirator if there is any potential for an uncontrolled release, if exposure levels are not known, or if concentrations exceed the protection limits of air-purifying respirator.

Hands

Wear gloves that cannot be penetrated by chemicals or oil.

The correct choice of protective gloves depends upon the chemicals being handled, the conditions of work and use, and the condition of the gloves (even the best chemically resistant glove will break down after repeated chemical exposures). Most gloves provide only a short time of protection before they must be discarded and replaced. Because specific work environments and material handling practices vary, safety procedures should be developed for each intended application. Gloves should therefore be chosen in consultation with the supplier/manufacturer and with a full assessment of the working conditions.

Consult your supervisor or Standard Operating Procedure (S.O.P) for special handling instructions.

Physical and chemical properties

Physical state	Liquid.
Color	Colorless. to Various Colors. (May be dyed Red., Light Green. ,Yellow.)
Odor	Petroleum
Flash point	Closed cup: >38°C (>100.4°F) [Pensky-Martens.]
Explosion limits	Lower: 0.6% Upper: 7.5%
Auto-ignition temperature	257°C (494°F)
Specific gravity	<1 [Water = 1]
Density	820 to 875 kg/m ³ (0.82 to 0.875 g/cm ³)
Viscosity	Kinematic: 1.7 to 4.1 mm ² /s (1.7 to 4.1 cSt) at 40°C
Solubility	negligible <0.1%

10. Stability and reactivity

Stability and reactivity	Stable under recommended storage and handling conditions (see section 7).
Possibility of hazardous reactions	Under normal conditions of storage and use, hazardous reactions will not occur.
Conditions to avoid	Keep away from heat, sparks and flame. Avoid all possible sources of ignition (spark or flame).
Incompatibility with various substances	Reactive or incompatible with the following materials: oxidizing materials, acids and alkalis. halogenated compounds.

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Hazardous decomposition products carbon oxides (CO, CO₂) (carbon monoxide, carbon dioxide)

Hazardous polymerization Under normal conditions of storage and use, hazardous polymerization will not occur.

11. Toxicological information

Acute toxicity

Classification

Product/ingredient name	IARC	NTP	OSHA
Naphthalene	2B	Possible	-
fuel, diesel no. 2	3	-	-

IARC :
2B - Possible carcinogen to human.
3 - Not classifiable as a human carcinogen.

NTP :
Possible - Reasonably anticipated to be human carcinogens.

Other Toxicity Data

Aspiration of this product into the lungs can cause chemical pneumonia and can be fatal. Aspiration into the lungs can occur while vomiting after ingestion of this product. Do not siphon by mouth.

Middle distillate: From skin-painting studies of petroleum distillates of similar composition and distillate range, it has been shown that these types of materials often possess weak carcinogenic activity in laboratory animals. In these tests, the material is painted on the shaved backs of mice twice a week for their lifetime. The material is not washed off between applications. Therefore, there may be a potential risk of skin cancer from prolonged or repeated skin contact with this product in the absence of good personal hygiene. This particular product has not been tested for carcinogenic activity, but we have chosen to be cautious in light of the findings with other distillate streams.

Occasional skin contact with this product is not expected to have serious effects, but good personal hygiene should be practiced and repeated skin contact avoided. This product can also be expected to produce skin irritation upon prolonged or repeated skin contact. Personal hygiene measures taken to prevent skin irritation are expected to be adequate to prevent risk of skin cancer.

Diesel exhaust particulates have been classified by the National Toxicological Program (NTP) to be a reasonably anticipated human carcinogen. Exposure should be minimized to reduce potential risk.

Naphthalene has been reported to cause developmental toxicity in mice after oral exposure to relatively high dose levels, but developmental toxicity was not observed in NTP (National Toxicology Program) sponsored studies in rats and rabbits. Ingestion or inhalation of naphthalene can result in hemolysis and other blood abnormalities, and individuals (and infants) deficient in glucose-6-phosphate dehydrogenase may be especially susceptible to these effects. Inhalation of naphthalene may cause headache and nausea. Airborne exposure can result in eye irritation. Naphthalene exposure has been associated with cataracts in animals and humans.

Other information

Potential chronic health effects

Carcinogenicity Contains material which may cause cancer, based on animal data. Risk of cancer depends on duration and level of exposure.

12. Ecological information

Ecotoxicity

No testing has been performed by the manufacturer.

Mobility Spillages may penetrate the soil causing ground water contamination.

Bioaccumulative potential This product is not expected to bioaccumulate through food chains in the environment.

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13. Disposal considerations

Waste information

The generation of waste should be avoided or minimized wherever possible. Empty containers or liners may retain some product residues. This material and its container must be disposed of in a safe way. Dispose of surplus and non-recyclable products via a licensed waste disposal contractor. Disposal of this product, solutions and any by-products should at all times comply with the requirements of environmental protection and waste disposal legislation and any regional local authority requirements. Avoid dispersal of spilled material and runoff and contact with soil, waterways, drains and sewers.

NOTE: The generator of waste has the responsibility for proper waste identification (based on characteristic(s) or listing), transportation and disposal

14. Transport information

International transport regulations

Regulatory information	UN number	Proper shipping name	Class	Packing group	Additional information
DOT Classification	NA 1993	Diesel fuel	3	III	-
TDG Classification	UN 1202	Gas oil	3	III	-
IMDG Classification	UN 1202	Gas oil	3	III	Remarks Marine pollutant
IATA/ICAO Classification	UN 1202	Gas oil	3	III	Remarks Environmentally hazardous substance mark.

15. Regulatory information

U.S. Federal Regulations

United States inventory (TSCA 8b)

All components are listed or exempted.

TSCA 12(b) one-time export: Naphthalene

SARA 302/304/311/312 extremely hazardous substances: No products were found.

SARA 302/304 emergency planning and notification: No products were found.

SARA 302/304/311/312 hazardous chemicals: Naphthalene

SARA 311/312 MSDS distribution - chemical inventory - hazard identification: DIESEL FUEL NO. 2: Fire hazard, Immediate (acute) health hazard, Delayed (chronic) health hazard

SARA 313

Product name	CAS number	Concentration
Naphthalene	91-20-3	1.0035 - 3.0111
Naphthalene	91-20-3	1.0035 - 3.0111

Form R - Reporting requirements

Supplier notification

CERCLA Sections 102a/103 Hazardous Substances (40 CFR Part 302.4):

CERCLA: Hazardous substances.: o-Xylene: 1000 lbs. (454 kg); Naphthalene: 100 lbs. (45.4 kg); benzo[def]chrysene: 1 lb. (0.454 kg); Ethylbenzene: 1000 lbs. (454 kg); xylene: 100 lbs. (45.4 kg); Cumene: 5000 lbs. (2270 kg); Phenol: 1000 lbs. (454 kg); Benzene: 10 lbs. (4.54 kg); Alkylaryl sulfonic acid: 1000 lbs. (454 kg); Toluene: 1000 lbs. (454 kg); Methanol: 5000 lbs. (2270 kg); 2-Butoxyethanol;

State regulations

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Massachusetts
Substances

The following components are listed: NAPHTHALENE

New Jersey Hazardous
Substances

The following components are listed: DIESEL FUEL; # 2 HEATING OIL; NAPHTHALENE; MOTH
FLAKES

Pennsylvania RTK
Hazardous Substances

The following components are listed: NAPHTHALENE

California Prop. 65

WARNING: This product contains a chemical known to the State of California to cause cancer.
Naphthalene; Ethylbenzene; benzo[def]chrysene

WARNING: This product contains a chemical known to the State of California to cause birth
defects or other reproductive harm.
Toluene

WARNING: This product contains a chemical known to the State of California to cause cancer and
birth defects or other reproductive harm.
Benzene

Prop 65 chemicals will result under certain conditions from the use of this material. For example,
burning fuels produces combustion products including diesel exhaust, a Prop 65 carcinogen, and
carbon monoxide, a Prop 65 reproductive toxin.

Inventories

Canada inventory	Not determined.
Europe inventory	At least one component is not listed.
Australia inventory (AICS)	At least one component is not listed.
China inventory (IECSC)	Not determined.
Japan inventory (ENCS)	At least one component is not listed.
Korea inventory (KECI)	At least one component is not listed.
Philippines inventory (PICCS)	At least one component is not listed.

16. Other information

Label requirements

WARNING !

COMBUSTIBLE LIQUID AND VAPOR.
VAPOR MAY CAUSE FLASH FIRE.
HARMFUL IF SWALLOWED.
ASPIRATION HAZARD.
HARMFUL OR FATAL IF LIQUID IS ASPIRATED INTO LUNGS.
MAY CAUSE RESPIRATORY TRACT IRRITATION.
INHALATION CAUSES HEADACHES, DIZZINESS, DROWSINESS, AND NAUSEA, AND MAY
LEAD TO UNCONSCIOUSNESS.

HMIS® Rating :

Health * 1
Flammability 2
Physical Hazard 0
Personal protection X

National Fire
Protection
Association (U.S.A.)



History

Date of issue	07/20/2010.
Date of previous issue	07/20/2010.
Prepared by	Product Stewardship
Notice to reader	

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All reasonably practicable steps have been taken to ensure this data sheet and the health, safety and environmental information contained in it is accurate as of the date specified below. No warranty or representation, express or implied is made as to the accuracy or completeness of the data and information in this data sheet.

The data and advice given apply when the product is sold for the stated application or applications. You should not use the product other than for the stated application or applications without seeking advice from us.

; the user's obligation to evaluate and use this product safely and to comply with all applicable laws and regulations. The BP Group shall not be responsible for any damage or injury resulting from use, other than the stated product use of the material, from any failure to adhere to recommendations, or from any hazards inherent in the nature of the material. Purchasers of the product for supply to a third party for use at work, have a duty to take all necessary steps to ensure that any person handling or using the product is provided with the information in this sheet. Employers have a duty to tell employees and others who may be affected of any hazards described in this sheet and of any precautions that should be taken.

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Material Safety Data Sheet

SECTION 1 PRODUCT AND COMPANY IDENTIFICATION

CHEVRON REGULAR UNLEADED GASOLINE

Product Number(s): CPS201000 [See Section 16 for Additional Product Numbers]

Synonyms: Calco Regular Unleaded Gasoline

Company Identification

Chevron Products Company
Marketing, MSDS Coordinator
6001 Bollinger Canyon Road
San Ramon, CA 94583
United States of America

Transportation Emergency Response

CHEMTREC: (800) 424-9300 or (703) 527-3887

Health Emergency

ChevronTexaco Emergency Information Center: Located in the USA. International collect calls accepted. (800) 231-0623 or (510) 231-0623

Product Information

Technical Information: (510) 242-5357

SPECIAL NOTES: This MSDS applies to: Federal Reformulated Gasoline, California Reformulated Gasoline, Wintertime Oxygenated Gasoline, Low RVP Gasoline and Conventional Gasoline.

SECTION 2 COMPOSITION/ INFORMATION ON INGREDIENTS

COMPONENTS	CAS NUMBER	AMOUNT
Gasoline	86290-81-5	100 %volume
Benzene	71-43-2	0.1 - 4.9 %volume
Ethyl benzene	100-41-4	0.1 - 3 %volume
Naphthalene	91-20-3	0.1 - 2 %volume
Ethanol	64-17-5	0 - 10 %volume
Methyl tert-butyl ether (MTBE)	1634-04-4	0 - 15 %volume
Tertiary amyl methyl ether (TAME)	994-05-8	0 - 17 %volume
Ethyl tert-butyl ether (ETBE)	637-92-3	0 - 18 %volume

Motor gasoline is considered a mixture by EPA under the Toxic Substances Control Act (TSCA). The refinery streams used to blend motor gasoline are all on the TSCA Chemical Substances Inventory. The appropriate CAS number for refinery blended motor gasoline is 86290-81-5. The product specifications of motor gasoline sold in your area will depend on applicable Federal and State regulations.

SECTION 3 HAZARDS IDENTIFICATION

EMERGENCY OVERVIEW

- EXTREMELY FLAMMABLE LIQUID AND VAPOR. VAPOR MAY CAUSE FLASH FIRE
- HARMFUL OR FATAL IF SWALLOWED - MAY CAUSE LUNG DAMAGE IF SWALLOWED
- VAPOR HARMFUL
- CAUSES SKIN IRRITATION
- CAUSES EYE IRRITATION
- LONG-TERM EXPOSURE TO VAPOR HAS CAUSED CANCER IN LABORATORY ANIMALS
- KEEP OUT OF REACH OF CHILDREN
- TOXIC TO AQUATIC ORGANISMS

IMMEDIATE HEALTH EFFECTS

Eye: Contact with the eyes causes irritation. Symptoms may include pain, tearing, reddening, swelling and impaired vision.

Skin: Contact with the skin causes irritation. Skin contact may cause drying or defatting of the skin. Symptoms may include pain, itching, discoloration, swelling, and blistering. Contact with the skin is not expected to cause an allergic skin response. Not expected to be harmful to internal organs if absorbed through the skin.

Ingestion: Because of its low viscosity, this material can directly enter the lungs, if swallowed, or if subsequently vomited. Once in the lungs it is very difficult to remove and can cause severe injury or death.

Inhalation: The vapor or fumes from this material may cause respiratory irritation. Symptoms of respiratory irritation may include coughing and difficulty breathing. Breathing this material at concentrations above the recommended exposure limits may cause central nervous system effects. Central nervous system effects may include headache, dizziness, nausea, vomiting, weakness, loss of coordination, blurred vision, drowsiness, confusion, or disorientation. At extreme exposures, central nervous system effects may include respiratory depression, tremors or convulsions, loss of consciousness, coma or death.

DELAYED OR OTHER HEALTH EFFECTS:

Reproduction and Birth Defects: This material is not expected to cause birth defects or other harm to the developing fetus based on animal data.

Cancer: Prolonged or repeated exposure to this material may cause cancer. Gasoline has been classified as a Group 2B carcinogen (possibly carcinogenic to humans) by the International Agency for Research on Cancer (IARC).

Contains benzene, which has been classified as a carcinogen by the National Toxicology Program (NTP) and a Group 1 carcinogen (carcinogenic to humans) by the International Agency for Research on Cancer (IARC).

Contains ethylbenzene which has been classified as a Group 2B carcinogen (possibly carcinogenic to humans) by the International Agency for Research on Cancer (IARC).

Contains naphthalene, which has been classified as a Group 2B carcinogen (possibly carcinogenic to humans) by the International Agency for Research on Cancer (IARC).

Whole gasoline exhaust has been classified as a Group 2B carcinogen (possibly carcinogenic to humans) by the International Agency for Research on Cancer (IARC).

Risk depends on duration and level of exposure. See Section 11 for additional information.

SECTION 4 FIRST AID MEASURES

Eye: Flush eyes with water immediately while holding the eyelids open. Remove contact lenses, if worn, after initial flushing, and continue flushing for at least 15 minutes. Get medical attention if irritation persists.

Skin: Wash skin with water immediately and remove contaminated clothing and shoes. Get medical attention if any symptoms develop. To remove the material from skin, use soap and water. Discard contaminated clothing and shoes or thoroughly clean before reuse.

Ingestion: If swallowed, get immediate medical attention. Do not induce vomiting. Never give anything by mouth to an unconscious person.

Inhalation: Move the exposed person to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. Get medical attention if breathing difficulties continue.

Note to Physicians: Ingestion of this product or subsequent vomiting may result in aspiration of light hydrocarbon liquid, which may cause pneumonitis.

SECTION 5 FIRE FIGHTING MEASURES

Section 7 for proper handling and storage.

FIRE CLASSIFICATION:

OSHA Classification (29 CFR 1910.1200): Flammable liquid.

NFPA RATINGS: Health: 1 Flammability: 3 Reactivity: 0

FLAMMABLE PROPERTIES:

Flashpoint: (Tagliabue Closed Cup) < -45 °C (< -49 °F)

Autoignition: > 280 °C (> 536 °F)

Flammability (Explosive) Limits (% by volume in air): Lower: 1.4 Upper: 7.6

EXTINGUISHING MEDIA: Dry Chemical, CO2, AFFF Foam or alcohol resistant foam if >15% volume polar solvents (oxygenates).

PROTECTION OF FIRE FIGHTERS:

Fire Fighting Instructions: Use water spray to cool fire-exposed containers and to protect personnel. For fires involving this material, do not enter any enclosed or confined fire space without proper protective equipment, including self-contained breathing apparatus.

Combustion Products: Highly dependent on combustion conditions. A complex mixture of airborne solids, liquids, and gases including carbon monoxide, carbon dioxide, and unidentified organic compounds will be evolved when this material undergoes combustion.

SECTION 6 ACCIDENTAL RELEASE MEASURES

Protective Measures: Eliminate all sources of ignition in the vicinity of the spill or released vapor. If this material is released into the work area, evacuate the area immediately. Monitor area with combustible gas indicator.

Spill Management: Stop the source of the release if you can do it without risk. Contain release to prevent further contamination of soil, surface water or groundwater. Clean up spill as soon as possible, observing precautions in Exposure Controls/Personal Protection. Use appropriate techniques such as applying non-combustible absorbent materials or pumping. All equipment used when handling the product must be grounded. A vapor suppressing foam may be used to reduce vapors. Use clean non-sparking tools to collect absorbed material. Where feasible and appropriate, remove contaminated soil. Place contaminated materials in disposable containers and dispose of in a manner consistent with applicable regulations.

Reporting: Report spills to local authorities and/or the U.S. Coast Guard's National Response Center at (800) 424-8802 as appropriate or required. This material is covered by EPA's Comprehensive Environmental Response, Compensation and Liability Act (CERCLA) Petroleum Exclusion. Therefore, releases to the environment may not be reportable under CERCLA.

SECTION 7 HANDLING AND STORAGE

Precautionary Measures: READ AND OBSERVE ALL PRECAUTIONS ON PRODUCT LABEL. This product presents an extreme fire hazard. Liquid very quickly evaporates, even at low temperatures, and forms vapor (fumes) which can catch fire and burn with explosive violence. Invisible vapor spreads easily and can be set on fire by many sources such as pilot lights, welding equipment, and electrical motors and switches. Never siphon gasoline by mouth.

Use only as a motor fuel. Do not use for cleaning, pressure appliance fuel, or any other such use. Do not store in open or unlabeled containers. Do not get in eyes, on skin, or on clothing. Do not taste or swallow. Do not breathe vapor or fumes. Wash thoroughly after handling. Keep out of the reach of children.

Unusual Handling Hazards: WARNING! Do not use as portable heater or appliance fuel. Toxic fumes may accumulate and cause death.

General Handling Information: Avoid contaminating soil or releasing this material into sewage and drainage systems and bodies of water.

Static Hazard: Electrostatic charge may accumulate and create a hazardous condition when handling this material. To minimize this hazard, bonding and grounding may be necessary but may not, by themselves, be sufficient. Review all operations which have the potential of generating an accumulation of electrostatic charge and/or a flammable atmosphere (including tank and container filling, splash filling, tank cleaning, sampling, gauging, switch loading, filtering, mixing, agitation, and vacuum truck operations) and use appropriate mitigating procedures. For more information, refer to OSHA Standard 29 CFR 1910.106, 'Flammable and Combustible Liquids', National Fire Protection Association (NFPA 77, 'Recommended Practice on Static Electricity', and/or the American Petroleum Institute (API) Recommended Practice 2003, 'Protection Against Ignitions Arising Out of Static, Lightning, and Stray Currents'. Improper filling of portable gasoline containers creates danger of fire. Only dispense gasoline into approved and properly labeled gasoline containers. Always place portable containers on the ground. Be sure pump nozzle is in contact with the container while filling. Do not use a nozzle's lock-open device. Do not fill portable containers that are inside a vehicle or truck/trailer bed.

General Storage Information: DO NOT USE OR STORE near heat, sparks or open flames. USE AND STORE ONLY IN WELL VENTILATED AREA. Keep container closed when not in use.

Container Warnings: Container is not designed to contain pressure. Do not use pressure to empty container or it may rupture with explosive force. Empty containers retain product residue (solid, liquid, and/or vapor) and can be dangerous. Do not pressurize, cut, weld, braze, solder, drill, grind, or expose such containers to heat, flame, sparks, static electricity, or other sources of ignition. They may explode and cause injury or death. Empty containers should be completely drained, properly closed, and promptly returned to a drum reconditioner or disposed of properly.

SECTION 8 EXPOSURE CONTROLS/PERSONAL PROTECTION

GENERAL CONSIDERATIONS:

Consider the potential hazards of this material (see Section 3), applicable exposure limits, job activities, and other substances in the work place when designing engineering controls and selecting personal protective equipment. If engineering controls or work practices are not adequate to

prevent exposure to harmful levels of this material, the personal protective equipment listed below is recommended. The user should read and understand all instructions and limitations supplied with the equipment since protection is usually provided for a limited time or under certain circumstances.

ENGINEERING CONTROLS:

process enclosures, local exhaust ventilation, or other engineering controls to control airborne levels below the recommended exposure limits.

PERSONAL PROTECTIVE EQUIPMENT

Eye/Face Protection: No special eye protection is normally required. Where splashing is possible, wear safety glasses with side shields as a good safety practice.

Skin Protection: No special protective clothing is normally required. Where splashing is possible, select protective clothing depending on operations conducted, physical requirements and other substances in the workplace. Suggested materials for protective gloves include: Chlorinated Polyethylene (or Chlorosulfonated Polyethylene), Nitrile Rubber, Polyurethane, Viton.

Respiratory Protection: Determine if airborne concentrations are below the recommended exposure limits. If not, wear an approved respirator that provides adequate protection from measured concentrations of this material, such as: Air-Purifying Respirator for Organic Vapors. When used as a fuel, this material can produce carbon monoxide in the exhaust. Determine if airborne concentrations are below the occupational exposure limit for carbon monoxide. If not, wear an approved positive-pressure air-supplying respirator. Use a positive pressure air-supplying respirator in circumstances where air-purifying respirators may not provide adequate protection.

Occupational Exposure Limits:

Component	Limit	TWA	STEL	Ceiling	Notation
Benzene	ACGIH_TLV	.5 ppm	2.5 ppm		Skin A1
Benzene	OSHA_PEL	1 ppm	5 ppm		
Benzene	OSHA_Z2	10 ppm		25 ppm	
Ethanol	ACGIH_TLV	1000 ppm			A4
anol	OSHA_PEL	1000 ppm			
Ethyl benzene	ACGIH_TLV	100 ppm	125 ppm		A3
Ethyl benzene	OSHA_PEL	100 ppm	125 ppm		
Ethyl tert-butyl ether (ETBE)	ACGIH_TLV	5 ppm			
Gasoline	ACGIH_TLV	300 ppm	500 ppm		A3
Gasoline	OSHA_PEL	300 ppm	500 ppm		
Methyl tert-butyl ether (MTBE)	ACGIH_TLV	50 ppm			A3
Naphthalene	ACGIH_TLV	10 ppm	15 ppm		Skin A4
Naphthalene	OSHA_PEL	10 ppm	15 ppm		
Tertiary amyl methyl ether (TAME)	CHEVRON		50 ppm		

Refer to the OSHA Benzene Standard (29 CFR 1910.1028) and Table Z-2 for detailed training, exposure monitoring, respiratory protection and medical surveillance requirements before using this product.

SECTION 9 PHYSICAL AND CHEMICAL PROPERTIES

Attention: the data below are typical values and do not constitute a specification.

Color: Colorless to yellow**Physical State:** Liquid**Odor:** Petroleum odor

NA

Vapor Pressure: 5 psi - 15 psi (Typical) @ 37.8°C (100°F)**Vapor Density (Air = 1):** 3 - 4 (Typical)**Boiling Point:** 37.8°C (100°F) - 204.4°C (400°F) (Typical)**Solubility:** Insoluble in water; miscible with most organic solvents.**Freezing Point:** NA**Melting Point:** NA**Specific Gravity:** 0.7 g/ml - 0.8 g/ml @ 15.6°C (60.1°F)**Viscosity:** <1 SUS @ 37.8°C (100°F)**SECTION 10 STABILITY AND REACTIVITY****Chemical Stability:** This material is considered stable under normal ambient and anticipated storage and handling conditions of temperature and pressure.**Incompatibility With Other Materials:** May react with strong oxidizing agents, such as chlorates, nitrates, peroxides, etc.**Hazardous Decomposition Products:** None known (None expected)**Hazardous Polymerization:** Hazardous polymerization will not occur.**SECTION 11 TOXICOLOGICAL INFORMATION****IMMEDIATE HEALTH EFFECTS****Eye Irritation:** The Draize eye irritation mean score in rabbits for a 24-hour exposure was: 0/110.**Skin Irritation:** For a 4-hour exposure, the Primary Irritation Index (PII) in rabbits is: 4.8/8.0.**Skin Sensitization:** This material did not cause sensitization reactions in a Modified Buehler guinea pig test.**Acute Dermal Toxicity:** 24 hour(s) LD50: >3.75g/kg (rabbit).**Acute Oral Toxicity:** LD50: >5 ml/kg (rat)**Acute Inhalation Toxicity:** 4 hour(s) LD50: >2000ppm (rat).**ADDITIONAL TOXICOLOGY INFORMATION:**

Gasolines are highly volatile and can produce significant concentrations of vapor at ambient temperatures. Gasoline vapor is heavier than air and at high concentrations may accumulate in confined spaces to present both safety and health hazards. When vapor exposures are low, or short duration and infrequent, such as during refuelling and tanker loading/unloading, neither total hydrocarbon nor components such as benzene are likely to result in any adverse health effects. In situations such as accidents or spills where exposure to gasoline vapor is potentially high, attention should be paid to potential toxic effects of specific components. Information about specific components in gasoline can be found in Sections 2, 8 and 15 of this MSDS. More detailed information on the health hazard of specific gasoline components can be obtained calling the Chevron Emergency Information Center (see Section 1 for phone numbers).

NEUROTOXICITY: Pathological misuse of solvents and gasoline, involving repeated and prolonged exposure to high concentrations of vapor is a significant exposure on which there are many reports in the medical literature. As with other solvents, persistent abuse involving repeated and prolonged exposures to high concentrations of vapor has been reported to result in central nervous system damage and eventually, death. In a study in which ten human volunteers were exposed for 30 minutes to approximately 200, 500 or 1000 ppm concentrations of gasoline vapor, irritation of the eyes was the only significant effect observed, based on both subjective and objective assessments. In an inhalation study, groups of 6 Fischer rats (3 male, 3 female) were exposed to 2056 ppm of wholly vaporized unleaded gasoline for 6 hours per day, 5 day per week for up to 18 months. Histopathology of the peripheral nervous system and spinal cord revealed no distal axonal neuropathy of the type associated with exposure to n-hexane even though gasoline contained 1.9% n-hexane. The authors concluded that gasoline treatment may have amplified the incidence and prominence of some naturally occurring age-related (subclinical) in the nervous system.

BIRTH DEFECTS AND REPRODUCTIVE TOXICITY: An inhalation study with rats exposed to 0, 400 and 1600 ppm of wholly vaporized unleaded gasoline, 6 hours per day on day 6 through 16 of gestation, showed no teratogenic effects nor indication of toxicity to either the mother or the fetus. Another inhalation study in rats exposed to 3000, 6000, or 9000 ppm of gasoline vapor, 6 hours per day on day 6 through 20 of gestation, also showed no teratogenic effects nor indications of toxicity to either the mother or the fetus.

CHRONIC TOXICITY/CANCER: Wholly vaporized unleaded gasoline was used in a 3 month inhalation study. Groups of 40 rats (20 males, 20 female) and 8 squirrel monkeys (4 male, 4 female) were exposed 6 hours per day and 5 days per week for 13 weeks to 384 or 1552 ppm gasoline. One group of each species served as unexposed controls. The initial conclusion of this study was that inhalation of gasoline at airborne concentrations of up to 1522 ppm caused no toxicity in rats or monkeys. However, further histopathological examination of male rat kidneys on the highest dose group revealed an increased incidence and severity of regenerative epithelium and dilated tubules containing proteinaceous deposits. Lifetime inhalation of wholly vaporized unleaded gasoline at 2056 ppm has caused increased liver tumors in female mice. The mechanism of this response is still being investigated but it is thought to be an epigenetic process unique to the female mouse.

This exposure also caused kidney damage and eventually kidney cancer in male rats. No other animal model studied has shown these adverse

kidney effects and there is no physiological reason to believe that they would occur in man. EPA has concluded that mechanism by which wholly vaporized unleaded gasoline causes kidney damage is unique to the male rat. The effects in that species (kidney damage and cancer) should not be used in human risk assessment. In their 1988 review of carcinogenic risk from gasoline, The International Agency for Research on Cancer (IARC) noted that, because published epidemiology studies did not include any exposure data, only occupations where gasoline exposure may have occurred were reviewed. These included gasoline service station attendants and automobile mechanics. IARC also noted that there was no opportunity to separate effects of combustion products from those of gasoline itself. Although IARC allocated gasoline a final overall classification of Group 2B, i.e. possibly carcinogenic to humans, this was based on limited evidence in experimental animals plus supporting evidence including the presence in gasoline of benzene and 1, 3-butadiene. The actual evidence for carcinogenicity in humans was considered inadequate.

MUTAGENICITY: Gasoline was not mutagenic, with or without activation, in the Ames assay (*Salmonella typhimurium*), *Saccharomyces cerevisiae*, or mouse lymphoma assays. In addition, point mutations were not induced in human lymphocytes. Gasoline was not mutagenic when tested in the mouse dominant lethal assay. Administration of gasoline to rats did not cause chromosomal aberrations in their bone marrow cells. **EPIDEMIOLOGY:** To explore the health effects of workers potentially exposed to gasoline vapors in the marketing and distribution sectors of the petroleum industry, the American Petroleum Institute sponsored a cohort mortality study (Publication 4555), a nested case-control study (Publication 4551), and an exposure assessment study (Publication 4552). Histories of exposure to gasoline were reconstructed for cohort of more than 18,000 employees from four companies for the time period between 1946 and 1985. The results of the cohort mortality study indicated that there was no increased mortality from either kidney cancer or leukemia among marketing and marine distribution employees who were exposed to gasoline in the petroleum industry, when compared to the general population. More importantly, based on internal comparisons, there was no association between mortality from kidney cancer or leukemia and various indices of gasoline exposure. In particular, neither duration of employment, duration of exposure, age at first exposure, year of first exposure, job category, cumulative exposure, frequency of peak exposure, nor average intensity of exposure had any effect on kidney cancer or leukemia mortality. The results of the nested case-control study confirmed the findings of the original cohort study. That is, exposure to gasoline at the levels experienced by this cohort of distribution workers is not a significant risk factor for leukemia (all cell types), acute myeloid leukemia, kidney cancer or multiple myeloma.

SECTION 12 ECOLOGICAL INFORMATION

ECOTOXICITY

The 96 hour(s) LC50 for rainbow trout (*Oncorhynchus mykiss*) is 2.7 mg/l.

The 48 hour(s) LC50 for water flea (*Daphnia magna*) is 3.0 mg/l.

The 96 hour(s) LC50 for sheepshead minnow (*Cyprinodon variegatus*) is 8.3 mg/l.

The 96 hour(s) LC50 for mysid shrimp (*Mysidopsis bahia*) is 1.8 mg/l.

This material is expected to be toxic to aquatic organisms. Gasoline studies have been conducted in the laboratory under a variety of test conditions with a range of fish and invertebrate species. An even more extensive database is available on the aquatic toxicity of individual aromatic constituents. The majority of published studies do not identify the type of gasoline evaluated, or even provide distinguishing characteristics such as aromatic content or presence of lead alkyls. As a result, comparison of results among studies using open and closed vessels, different ages and species of test animals and different gasoline types, is difficult.

The bulk of the available literature on gasoline relates to the environmental impact of monoaromatic (BTEX) and diaromatic (naphthalene, methylnaphthalenes) constituents. In general, non-oxygenated gasoline exhibits some short-term toxicity to freshwater and marine organisms, especially under closed vessel or flow-through exposure conditions in the laboratory. The components which are the most prominent in the water soluble fraction and cause aquatic toxicity, are also highly volatile and can be readily biodegraded by microorganisms.

ENVIRONMENTAL FATE

This material is expected to be readily biodegradable. Following spillage, the more volatile components of gasoline will be rapidly lost, with concurrent dissolution of these and other constituents into the water. Factors such as local environmental conditions (temperature, wind, mixing or wave action, soil type, etc), photo-oxidation, biodegradation and adsorption onto suspended sediments, can contribute to the weathering of spilled gasoline.

The aqueous solubility of non-oxygenated unleaded gasoline, based on analysis of benzene, toluene, ethylbenzene+xylenes and naphthalene, is reported to be 112 mg/l. Solubility data on individual gasoline constituents also available.

SECTION 13 DISPOSAL CONSIDERATIONS

Use material for its intended purpose or recycle if possible. This material, if it must be discarded, may meet the criteria of a hazardous waste as defined by US EPA under RCRA (40 CFR 261) or other State and local regulations. Measurement of certain physical properties and analysis for regulated components may be necessary to make a correct determination. If this material is classified as a hazardous waste, federal law requires disposal at a licensed hazardous waste disposal facility.

SECTION 14 TRANSPORT INFORMATION

The description shown may not apply to all shipping situations. Consult 49CFR, or appropriate Dangerous Goods Regulations, for additional description requirements (e.g., technical name) and mode-specific or quantity-specific shipping requirements.

DOT Shipping Name: GASOLINE

DOT Hazard Class: 3 (Flammable Liquid)

DOT Identification Number: UN1203

DOT Packing Group: II

SECTION 15 REGULATORY INFORMATION

SARA 311/312 CATEGORIES:

1. Immediate (Acute) Health Effects:	YES
2. Delayed (Chronic) Health Effects:	YES
3. Fire Hazard:	YES
4. Sudden Release of Pressure Hazard:	NO
5. Reactivity Hazard:	NO

REGULATORY LISTS SEARCHED:

4_I1=IARC Group 1	15=SARA Section 313
4_I2A=IARC Group 2A	16=CA Proposition 65
4_I2B=IARC Group 2B	17=MA RTK
05=NTP Carcinogen	18=NJ RTK
06=OSHA Carcinogen	19=DOT Marine Pollutant
09=TSCA 12(b)	20=PA RTK

The following components of this material are found on the regulatory lists indicated.

Benzene	15, 16, 17, 18, 20, 4_I1, 5, 6
Ethanol	17, 18, 20
Ethyl benzene	15, 17, 18, 20, 4_I2B
Gasoline	17, 18, 20
Methyl tert-butyl ether (MTBE)	15, 17, 18, 20, 9
Naphthalene	15, 16, 17, 18, 20, 4_I2B
Tertiary amyl methyl ether (TAME)	9

CERCLA REPORTABLE QUANTITIES(RQ)/SARA 302 THRESHOLD PLANNING QUANTITIES(TPQ):

Component	Component RQ	Component TPQ	Product RQ
Benzene	10 lbs	None	186 lbs
Ethanol	100 lbs	None	1961 lbs

Prepared according to the OSHA Hazard Communication Standard (29 CFR 1910.1200) and the ANSI MSDS Standard (Z400.1) by the ChevronTexaco Energy Research & Technology Company, 100 Chevron Way, Richmond, California 94802.

The above information is based on the data of which we are aware and is believed to be correct as of the date hereof. Since this information may be applied under conditions beyond our control and with which we may be unfamiliar and since data made available subsequent to the date hereof may suggest modifications of the information, we do not assume any responsibility for the results of its use. This information is furnished upon condition that the person receiving it shall make his own determination of the suitability of the material for his particular purpose.



Health	3
Fire	1
Reactivity	2
Personal Protection	E

Material Safety Data Sheet Arsenic MSDS

Section 1: Chemical Product and Company Identification

Product Name: Arsenic

Catalog Codes: SLA1006

CAS#: 7440-38-2

RTECS: CG0525000

TSCA: TSCA 8(b) inventory: Arsenic

CI#: Not applicable.

Synonym:

Chemical Name: Arsenic

Chemical Formula: As

Contact Information:

Sciencelab.com, Inc.

14025 Smith Rd.

Houston, Texas 77396

US Sales: **1-800-901-7247**

International Sales: **1-281-441-4400**

Order Online: ScienceLab.com

CHEMTREC (24HR Emergency Telephone), call:
1-800-424-9300

International CHEMTREC, call: 1-703-527-3887

For non-emergency assistance, call: 1-281-441-4400

Section 2: Composition and Information on Ingredients

Composition:

Name	CAS #	% by Weight
Arsenic	7440-38-2	100

Toxicological Data on Ingredients: Arsenic: ORAL (LD50): Acute: 763 mg/kg [Rat]. 145 mg/kg [Mouse].

Section 3: Hazards Identification

Potential Acute Health Effects:

Very hazardous in case of ingestion, of inhalation. Slightly hazardous in case of skin contact (irritant), of eye contact (irritant).

Potential Chronic Health Effects:

CARCINOGENIC EFFECTS: Classified A1 (Confirmed for human.) by ACGIH. MUTAGENIC EFFECTS: Not available.

TERATOGENIC EFFECTS: Not available. DEVELOPMENTAL TOXICITY: Not available. The substance is toxic to kidneys, lungs, the nervous system, mucous membranes. Repeated or prolonged exposure to the substance can produce target organs damage.

Section 4: First Aid Measures

Eye Contact:

Check for and remove any contact lenses. In case of contact, immediately flush eyes with plenty of water for at least 15 minutes. Get medical attention if irritation occurs.

Skin Contact: Wash with soap and water. Cover the irritated skin with an emollient. Get medical attention if irritation develops.

Serious Skin Contact: Not available.

Inhalation:

If inhaled, remove to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. Get medical attention.

Serious Inhalation:

Evacuate the victim to a safe area as soon as possible. Loosen tight clothing such as a collar, tie, belt or waistband. If breathing is difficult, administer oxygen. If the victim is not breathing, perform mouth-to-mouth resuscitation. Seek medical attention.

Ingestion:

Do NOT induce vomiting unless directed to do so by medical personnel. Never give anything by mouth to an unconscious person. If large quantities of this material are swallowed, call a physician immediately. Loosen tight clothing such as a collar, tie, belt or waistband.

Serious Ingestion: Not available.

Section 5: Fire and Explosion Data

Flammability of the Product: May be combustible at high temperature.

Auto-Ignition Temperature: Not available.

Flash Points: Not available.

Flammable Limits: Not available.

Products of Combustion: Some metallic oxides.

Fire Hazards in Presence of Various Substances: Flammable in presence of open flames and sparks, of heat, of oxidizing materials.

Explosion Hazards in Presence of Various Substances:

Risks of explosion of the product in presence of mechanical impact: Not available. Risks of explosion of the product in presence of static discharge: Not available.

Fire Fighting Media and Instructions:

SMALL FIRE: Use DRY chemical powder. LARGE FIRE: Use water spray, fog or foam. Do not use water jet.

Special Remarks on Fire Hazards:

Material in powder form, capable of creating a dust explosion. When heated to decomposition it emits highly toxic fumes.

Special Remarks on Explosion Hazards: Not available.

Section 6: Accidental Release Measures

Small Spill: Use appropriate tools to put the spilled solid in a convenient waste disposal container.

Large Spill:

Use a shovel to put the material into a convenient waste disposal container. Be careful that the product is not present at a concentration level above TLV. Check TLV on the MSDS and with local authorities.

Section 7: Handling and Storage

Precautions:

Keep locked up.. Keep away from heat. Keep away from sources of ignition. Empty containers pose a fire risk, evaporate the residue under a fume hood. Ground all equipment containing material. Do not ingest. Do not breathe dust. Wear suitable

protective clothing. In case of insufficient ventilation, wear suitable respiratory equipment. If ingested, seek medical advice immediately and show the container or the label. Keep away from incompatibles such as oxidizing agents, acids, moisture.

Storage: Keep container tightly closed. Keep container in a cool, well-ventilated area.

Section 8: Exposure Controls/Personal Protection

Engineering Controls:

Use process enclosures, local exhaust ventilation, or other engineering controls to keep airborne levels below recommended exposure limits. If user operations generate dust, fume or mist, use ventilation to keep exposure to airborne contaminants below the exposure limit.

Personal Protection: Safety glasses. Lab coat. Dust respirator. Be sure to use an approved/certified respirator or equivalent. Gloves.

Personal Protection in Case of a Large Spill:

Splash goggles. Full suit. Dust respirator. Boots. Gloves. A self contained breathing apparatus should be used to avoid inhalation of the product. Suggested protective clothing might not be sufficient; consult a specialist BEFORE handling this product.

Exposure Limits:

TWA: 0.01 from ACGIH (TLV) [United States] [1995] Consult local authorities for acceptable exposure limits.

Section 9: Physical and Chemical Properties

Physical state and appearance: Solid. (Lustrous solid.)

Odor: Not available.

Taste: Not available.

Molecular Weight: 74.92 g/mole

Color: Silvery.

pH (1% soln/water): Not applicable.

Boiling Point: Not available.

Melting Point: Sublimation temperature: 615°C (1139°F)

Critical Temperature: Not available.

Specific Gravity: 5.72 (Water = 1)

Vapor Pressure: Not applicable.

Vapor Density: Not available.

Volatility: Not available.

Odor Threshold: Not available.

Water/Oil Dist. Coeff.: Not available.

Ionicity (in Water): Not available.

Dispersion Properties: Not available.

Solubility: Insoluble in cold water, hot water.

Section 10: Stability and Reactivity Data

Stability: The product is stable.

Instability Temperature: Not available.

Conditions of Instability: Not available.

Incompatibility with various substances: Reactive with oxidizing agents, acids, moisture.

Corrosivity: Non-corrosive in presence of glass.

Special Remarks on Reactivity: Not available.

Special Remarks on Corrosivity: Not available.

Polymerization: Will not occur.

Section 11: Toxicological Information

Routes of Entry: Inhalation. Ingestion.

Toxicity to Animals: Acute oral toxicity (LD50): 145 mg/kg [Mouse].

Chronic Effects on Humans:

CARCINOGENIC EFFECTS: Classified A1 (Confirmed for human.) by ACGIH. Causes damage to the following organs: kidneys, lungs, the nervous system, mucous membranes.

Other Toxic Effects on Humans:

Very hazardous in case of ingestion, of inhalation. Slightly hazardous in case of skin contact (irritant).

Special Remarks on Toxicity to Animals: Not available.

Special Remarks on Chronic Effects on Humans: Not available.

Special Remarks on other Toxic Effects on Humans: Not available.

Section 12: Ecological Information

Ecotoxicity: Not available.

BOD5 and COD: Not available.

Products of Biodegradation:

Possibly hazardous short term degradation products are not likely. However, long term degradation products may arise.

Toxicity of the Products of Biodegradation: The products of degradation are as toxic as the original product.

Special Remarks on the Products of Biodegradation: Not available.

Section 13: Disposal Considerations

Waste Disposal:

Section 14: Transport Information

DOT Classification: CLASS 6.1: Poisonous material.

Identification: : Arsenic UNNA: UN1558 PG: II

Special Provisions for Transport: Not available.

Section 15: Other Regulatory Information

Federal and State Regulations:

California prop. 65: This product contains the following ingredients for which the State of California has found to cause cancer, birth defects or other reproductive harm, which would require a warning under the statute: Arsenic California prop. 65: This product contains the following ingredients for which the State of California has found to cause cancer which would require a warning under the statute: Arsenic Pennsylvania RTK: Arsenic Massachusetts RTK: Arsenic TSCA 8(b) inventory: Arsenic

Other Regulations: OSHA: Hazardous by definition of Hazard Communication Standard (29 CFR 1910.1200).

Other Classifications:**WHMIS (Canada):**

CLASS D-1A: Material causing immediate and serious toxic effects (VERY TOXIC). CLASS D-2A: Material causing other toxic effects (VERY TOXIC).

DSCL (EEC):

R22- Harmful if swallowed. R45- May cause cancer.

HMIS (U.S.A.):

Health Hazard: 3

Fire Hazard: 1

Reactivity: 2

Personal Protection: E

National Fire Protection Association (U.S.A.):

Health: 3

Flammability: 1

Reactivity: 2

Specific hazard:

Protective Equipment:

Gloves. Lab coat. Dust respirator. Be sure to use an approved/certified respirator or equivalent. Wear appropriate respirator when ventilation is inadequate. Safety glasses.

Section 16: Other Information**References:**

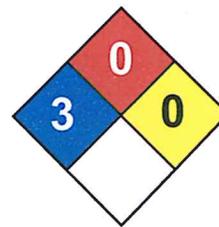
-Hawley, G.G.. The Condensed Chemical Dictionary, 11e ed., New York N.Y., Van Nostrand Reinold, 1987. -Liste des produits purs tératogènes, mutagènes, cancérigènes. Répertoire toxicologique de la Commission de la Santé et de la Sécurité du Travail du Québec. -Material safety data sheet emitted by: la Commission de la Santé et de la Sécurité du Travail du Québec. -SAX, N.I. Dangerous Properties of Industrial Materials. Toronto, Van Nostrand Reinold, 6e ed. 1984. -The Sigma-Aldrich Library of Chemical Safety Data, Edition II. -Guide de la loi et du règlement sur le transport des marchandises dangereuses au Canada. Centre de conformité international Ltée. 1986.

Other Special Considerations: Not available.

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Health	3
Fire	0
Reactivity	0
Personal Protection	

Material Safety Data Sheet Mercury MSDS

Section 1: Chemical Product and Company Identification

Product Name: Mercury

Catalog Codes: SLM3505, SLM1363

CAS#: 7439-97-6

RTECS: OV4550000

TSCA: TSCA 8(b) inventory: Mercury

CI#: Not applicable.

Synonym: Quick Silver; Colloidal Mercury; Metallic Mercury; Liquid Silver; Hydragyrum

Chemical Name: Mercury

Chemical Formula: Hg

Contact Information:

Sciencelab.com, Inc.

14025 Smith Rd.

Houston, Texas 77396

US Sales: **1-800-901-7247**

International Sales: **1-281-441-4400**

Order Online: ScienceLab.com

CHEMTREC (24HR Emergency Telephone), call:
1-800-424-9300

International CHEMTREC, call: 1-703-527-3887

For non-emergency assistance, call: 1-281-441-4400

Section 2: Composition and Information on Ingredients

Composition:

Name	CAS #	% by Weight
Mercury	7439-97-6	100

Toxicological Data on Ingredients: Mercury LD50: Not available. LC50: Not available.

Section 3: Hazards Identification

Potential Acute Health Effects:

Very hazardous in case of skin contact (irritant), of eye contact (irritant), of ingestion, of inhalation. Hazardous in case of skin contact (corrosive, permeator). Liquid or spray mist may produce tissue damage particularly on mucous membranes of eyes, mouth and respiratory tract. Skin contact may produce burns. Inhalation of the spray mist may produce severe irritation of respiratory tract, characterized by coughing, choking, or shortness of breath. Severe over-exposure can result in death. Inflammation of the eye is characterized by redness, watering, and itching. Skin inflammation is characterized by itching, scaling, reddening, or, occasionally, blistering.

Potential Chronic Health Effects:

Hazardous in case of skin contact (permeator). **CARCINOGENIC EFFECTS:** Classified A5 (Not suspected for human.) by ACGIH. 3 (Not classifiable for human.) by IARC. **MUTAGENIC EFFECTS:** Not available. **TERATOGENIC EFFECTS:** Not available. **DEVELOPMENTAL TOXICITY:** Not available. The substance may be toxic to blood, kidneys, liver, brain, peripheral nervous system, central nervous system (CNS). Repeated or prolonged exposure to the substance can produce target organs damage. Repeated or prolonged contact with spray mist may produce chronic eye irritation and severe skin irritation.

Repeated or prolonged exposure to spray mist may produce respiratory tract irritation leading to frequent attacks of bronchial infection. Repeated exposure to a highly toxic material may produce general deterioration of health by an accumulation in one or many human organs.

Section 4: First Aid Measures

Eye Contact:

Check for and remove any contact lenses. In case of contact, immediately flush eyes with plenty of water for at least 15 minutes. Cold water may be used. WARM water MUST be used. Get medical attention immediately.

Skin Contact:

In case of contact, immediately flush skin with plenty of water for at least 15 minutes while removing contaminated clothing and shoes. Cover the irritated skin with an emollient. Wash clothing before reuse. Thoroughly clean shoes before reuse. Get medical attention immediately.

Serious Skin Contact:

Wash with a disinfectant soap and cover the contaminated skin with an anti-bacterial cream. Seek immediate medical attention.

Inhalation:

If inhaled, remove to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. Get medical attention immediately.

Serious Inhalation:

Evacuate the victim to a safe area as soon as possible. Loosen tight clothing such as a collar, tie, belt or waistband. If breathing is difficult, administer oxygen. If the victim is not breathing, perform mouth-to-mouth resuscitation. WARNING: It may be hazardous to the person providing aid to give mouth-to-mouth resuscitation when the inhaled material is toxic, infectious or corrosive. Seek immediate medical attention.

Ingestion:

Do NOT induce vomiting unless directed to do so by medical personnel. Never give anything by mouth to an unconscious person. If large quantities of this material are swallowed, call a physician immediately. Loosen tight clothing such as a collar, tie, belt or waistband.

Serious Ingestion: Not available.

Section 5: Fire and Explosion Data

Flammability of the Product: Non-flammable.

Auto-Ignition Temperature: Not applicable.

Flash Points: Not applicable.

Flammable Limits: Not applicable.

Products of Combustion: Not available.

Fire Hazards in Presence of Various Substances: Not applicable.

Explosion Hazards in Presence of Various Substances:

Risks of explosion of the product in presence of mechanical impact: Not available. Risks of explosion of the product in presence of static discharge: Not available.

Fire Fighting Media and Instructions: Not applicable.

Special Remarks on Fire Hazards:

When thrown into mercury vapor, boron phosphodiiodide ignites at once. Flame forms with chlorine jet over mercury surface at 200 deg to 300 deg C. Mercury undergoes hazardous reactions in the presence of heat and sparks or ignition.

Special Remarks on Explosion Hazards:

A violent exothermic reaction or possible explosion occurs when mercury comes in contact with lithium and rubidium. CHLORINE DIOXIDE & LIQUID HG, WHEN MIXED, EXPLODE VIOLENTLY. Mercury and Ammonia can produce an

explosive compound. A mixture of the dry carbonyl and oxygen will explode on vigorous shaking with mercury. Methyl azide in the presence of mercury was shown to be potentially explosive.

Section 6: Accidental Release Measures

Small Spill: Absorb with an inert material and put the spilled material in an appropriate waste disposal.

Large Spill:

Corrosive liquid. Poisonous liquid. Stop leak if without risk. Absorb with DRY earth, sand or other non-combustible material. Do not get water inside container. Do not touch spilled material. Use water spray curtain to divert vapor drift. Use water spray to reduce vapors. Prevent entry into sewers, basements or confined areas; dike if needed. Call for assistance on disposal. Be careful that the product is not present at a concentration level above TLV. Check TLV on the MSDS and with local authorities.

Section 7: Handling and Storage

Precautions:

Keep locked up.. Keep container dry. Do not ingest. Do not breathe gas/fumes/ vapor/spray. Never add water to this product. In case of insufficient ventilation, wear suitable respiratory equipment. If ingested, seek medical advice immediately and show the container or the label. Avoid contact with skin and eyes. Keep away from incompatibles such as oxidizing agents, metals.

Storage: Keep container tightly closed. Keep container in a cool, well-ventilated area. Do not store above 25°C (77°F).

Section 8: Exposure Controls/Personal Protection

Engineering Controls:

Provide exhaust ventilation or other engineering controls to keep the airborne concentrations of vapors below their respective threshold limit value. Ensure that eyewash stations and safety showers are proximal to the work-station location.

Personal Protection:

Face shield. Full suit. Vapor respirator. Be sure to use an approved/certified respirator or equivalent. Gloves. Boots.

Personal Protection in Case of a Large Spill:

Splash goggles. Full suit. Vapor respirator. Boots. Gloves. A self contained breathing apparatus should be used to avoid inhalation of the product. Suggested protective clothing might not be sufficient; consult a specialist BEFORE handling this product.

Exposure Limits:

TWA: 0.025 from ACGIH (TLV) [United States] SKIN TWA: 0.05 CEIL: 0.1 (mg/m³) from OSHA (PEL) [United States]
Inhalation TWA: 0.025 (mg/m³) [United Kingdom (UK)] Consult local authorities for acceptable exposure limits.

Section 9: Physical and Chemical Properties

Physical state and appearance: Liquid. (Heavy liquid)

Odor: Odorless.

Taste: Not available.

Molecular Weight: 200.59 g/mole

Color: Silver-white

pH (1% soln/water): Not available.

Boiling Point: 356.73°C (674.1°F)

Melting Point: -38.87°C (-38°F)

Critical Temperature: 1462°C (2663.6°F)

Specific Gravity: 13.55 (Water = 1)

Vapor Pressure: Not available.

Vapor Density: 6.93 (Air = 1)

Volatility: Not available.

Odor Threshold: Not available.

Water/Oil Dist. Coeff.: Not available.

Ionicity (in Water): Not available.

Dispersion Properties: Not available.

Solubility: Very slightly soluble in cold water.

Section 10: Stability and Reactivity Data

Stability: The product is stable.

Instability Temperature: Not available.

Conditions of Instability: Incompatible materials

Incompatibility with various substances: Reactive with oxidizing agents, metals.

Corrosivity: Non-corrosive in presence of glass.

Special Remarks on Reactivity:

Ground mixtures of sodium carbide and mercury, aluminum, lead, or iron can react vigorously. A violent exothermic reaction or possible explosion occurs when mercury comes in contact with lithium and rubidium. Incompatible with boron diiodophosphide; ethylene oxide; metal oxides, metals(aluminum, potassium, lithium, sodium, rubidium); methyl azide; methylsilane, oxygen; oxidants(bromine, peroxyformic acid, chlorine dioxide, nitric acid, tetracarbonylnickel, nitromethane, silver perchlorate, chlorates, sulfuric acid, nitrates.); tetracarbonylnickel, oxygen, acetylinic compounds, ammonia, ethylene oxide, methylsilane, calcium,

Special Remarks on Corrosivity:

The high mobility and tendency to dispersion exhibited by mercury, and the ease with which it forms alloys (amalgam) with many laboratory and electrical contact metals, can cause severe corrosion problems in laboratories. Special precautions: Mercury can attack copper and copper alloy materials.

Polymerization: Will not occur.

Section 11: Toxicological Information

Routes of Entry: Absorbed through skin. Dermal contact. Eye contact. Inhalation. Ingestion.

Toxicity to Animals:

LD50: Not available. LC50: Not available.

Chronic Effects on Humans:

CARCINOGENIC EFFECTS: Classified A5 (Not suspected for human.) by ACGIH. 3 (Not classifiable for human.) by IARC. May cause damage to the following organs: blood, kidneys, liver, brain, peripheral nervous system, central nervous system (CNS).

Other Toxic Effects on Humans:

Very hazardous in case of skin contact (irritant), of ingestion, of inhalation. Hazardous in case of skin contact (corrosive, permeator).

Special Remarks on Toxicity to Animals: Not available.

Special Remarks on Chronic Effects on Humans:

May affect genetic material. May cause cancer based on animal data. Passes through the placental barrier in animal. May cause adverse reproductive effects (paternal effects- spermatogenesis; effects on fertility - fetotoxicity, post-implantation mortality), and birth defects.

Special Remarks on other Toxic Effects on Humans:

Section 12: Ecological Information

Ecotoxicity: Not available.

BOD5 and COD: Not available.

Products of Biodegradation:

Possibly hazardous short term degradation products are not likely. However, long term degradation products may arise.

Toxicity of the Products of Biodegradation: The products of degradation are less toxic than the product itself.

Special Remarks on the Products of Biodegradation: Not available.

Section 13: Disposal Considerations

Waste Disposal:

Waste must be disposed of in accordance with federal, state and local environmental control regulations.

Section 14: Transport Information

DOT Classification: Class 8: Corrosive material

Identification: : Mercury UNNA: 2809 PG: III

Special Provisions for Transport: Not available.

Section 15: Other Regulatory Information

Federal and State Regulations:

California prop. 65: This product contains the following ingredients for which the State of California has found to cause cancer, birth defects or other reproductive harm, which would require a warning under the statute: Mercury California prop. 65: This product contains the following ingredients for which the State of California has found to cause birth defects which would require a warning under the statute: Mercury Connecticut hazardous material survey.: Mercury Illinois toxic substances disclosure to employee act: Mercury Illinois chemical safety act: Mercury New York acutely hazardous substances: Mercury Rhode Island RTK hazardous substances: Mercury Pennsylvania RTK: Mercury Minnesota: Mercury Massachusetts RTK: Mercury New Jersey: Mercury New Jersey spill list: Mercury Louisiana spill reporting: Mercury California Director's List of Hazardous Substances.: Mercury TSCA 8(b) inventory: Mercury SARA 313 toxic chemical notification and release reporting: Mercury CERCLA: Hazardous substances.: Mercury: 1 lbs. (0.4536 kg)

Other Regulations:

OSHA: Hazardous by definition of Hazard Communication Standard (29 CFR 1910.1200). EINECS: This product is on the European Inventory of Existing Commercial Chemical Substances.

Other Classifications:

WHMIS (Canada):

CLASS D-1A: Material causing immediate and serious toxic effects (VERY TOXIC). CLASS D-2A: Material causing other toxic effects (VERY TOXIC). CLASS E: Corrosive liquid.

DSCL (EEC):

R23- Toxic by inhalation. R33- Danger of cumulative effects. R38- Irritating to skin. R41- Risk of serious damage to eyes.

R50/53- Very toxic to aquatic organisms, may cause long-term adverse effects in the aquatic environment. S2- Keep out of the

reach of children. S7- Keep container tightly closed. S26- In case of contact with eyes, rinse immediately with plenty of water and seek medical advice. S39- Wear eye/face protection. S45- In case of accident or if you feel unwell, seek medical advice immediately (show the label where possible). S46- If swallowed, seek medical advice immediately and show this container or label. S60- This material and its container must be disposed of as hazardous waste. S61- Avoid release to the environment. Refer to special instructions/Safety data sheets.

HMIS (U.S.A.):

Health Hazard: 3

Fire Hazard: 0

Reactivity: 0

Personal Protection:

National Fire Protection Association (U.S.A.):

Health: 3

Flammability: 0

Reactivity: 0

Specific hazard:

Protective Equipment:

Gloves. Full suit. Vapor respirator. Be sure to use an approved/certified respirator or equivalent. Wear appropriate respirator when ventilation is inadequate. Face shield.

Section 16: Other Information

References: Not available.

Other Special Considerations: Not available.

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