

APPENDIX J
Accident Prevention Plan

DRAFT

ACCIDENT PREVENTION PLAN

for

**OPERABLE UNIT 3 MONK HILL TREATMENT SYSTEM
AT THE NASA JPL FACILITY
PASADENA, CALIFORNIA**

Contract No. G005862

Prepared for:

**National Aeronautics and Space Administration
Management Office, Jet Propulsion Laboratory
4800 Oak Grove Drive
Pasadena, California 91109**

Prepared by:

**Battelle
505 King Ave.
Columbus, OH 43201**

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Personnel assigned to this project will need to be familiar with the possible hazards involved, the safety procedures, and other information outlined in this plan. Prior to the commencement of work, the Project Manager/Site Safety and Health Officer will discuss additional procedures to be implemented, addressing any other site-specific conditions that may arise. All on-site personnel from Battelle and all subcontractors must sign the Plan Acknowledgement Form found in Attachment 3.

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ACRONYMS AND ABBREVIATIONS

AED	Automated External Defibrillator
AHA	Activity Hazard Analysis
APP	Accident Prevention Plan
Caltech	California Institute of Technology
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
COR	Contracting Officer's Representative
CPR	Cardiopulmonary Resuscitation
EMR	Experience Modification Rate
GAC	granular activated carbon
GFCI	ground fault circuit interrupter
HAZWOPER	Hazardous Waste Operations and Emergency Response
JPL	Jet Propulsion Laboratory
MHTS	Monk Hill Treatment System
MSDS	Material Safety Data Sheets
NASA	National Aeronautics and Space Administration
NPL	National Priorities List
OSHA	Occupational Safety and Health Administration
OU	operable unit
PPE	Personal Protective Equipment
RD/RA	Remedial Design/Remedial Action
RPM	Remedial Project Manager
SHER	Safety, Health and Emergency Response
SSHO	Site Safety and Health Officer
SSHP	Site Safety and Health Plan
USACE	U.S. Army Corps of Engineers
VOC	volatile organic compound

Section 1.0. APPROVAL PAGE

FINAL

ACCIDENT PREVENTION PLAN

for

**OPERABLE UNIT 3 MONK HILL TREATMENT SYSTEM
AT THE NASA JPL FACILITY
PASADENA, CALIFORNIA**

Contract No. G005862

Plan Preparation:	<hr/> David Conner, Principal Research Scientist	Battelle (619) 574-4827
Plan Approval:	<hr/> Keith Fields, Project Manager	Battelle (614) 424-7723
Plan Concurrence:	<hr/> Bernard Himmelsbach, CIH Battelle Safety and Health Representative	Battelle (614) 424-4302

Section 2.0: BACKGROUND INFORMATION
(EM 385-1-1, Appendix A, Section 2)

The following provides information regarding the contractor, contract information and project activities:

Contractor: Battelle

Contract Number: G005862

Project Name: Operable Unit 3 Monk Hill Treatment System at the NASA JPL Facility
Pasadena, California

Brief Project Description: Monk Hill Treatment System (MHTS) is adjacent to the Jet Propulsion Laboratory (JPL), which is located in Los Angeles County, California. JPL adjoins the incorporated cities of La Cañada-Flintridge and Pasadena, and is bordered on the east by the unincorporated community of Altadena. A National Aeronautics and Space Administration (NASA)-owned facility, JPL encompasses approximately 176 acres of land and more than 150 buildings and other structures. Of the JPL facility's 176 acres, approximately 156 acres are federally owned. The remaining land is leased for parking from the City of Pasadena and the Flintridge Riding Club. Development at JPL is primarily located on the southern half, in two regions: an early-developed northeastern area and a later developed southwestern area. Figure 1 shows the location and boundaries of the JPL facility. The facility is bordered by the San Gabriel Mountains to the north, an equestrian club and Fire Station to the southwest, residential neighborhoods to the west, and the Arroyo Seco wash to the east and southeast. JPL is located in the Monk Hill Subarea of the Raymond Basin, which serves as a source of drinking water for several communities in the area.

The JPL is a Federally Funded Research and Development Center in Pasadena, California, currently operated under contract by the California Institute of Technology (Caltech) for the NASA. NASA has been investigating and taking actions to clean up the groundwater associated with historic practices since the mid-1980s. In 1992, JPL was placed on the National Priorities List (NPL) of sites governed by the Comprehensive Environmental Response, Compensation and Liability Act (CERCLA). The JPL facility has been divided into three Operable Units (OUs). OU-1 is on-facility groundwater at JPL; OU-2 is on-facility vadose zone soil at JPL; and OU-3 is off-facility groundwater adjacent to the JPL property.

This Accident Prevention Plan (APP) has been prepared to implement the construction activities associated with the liquid-phase granular activated carbon (GAC) system to remove volatile organic compounds (VOCs), the ion exchange system to remove perchlorate, and the evaluation, repair, and rehabilitation of four municipal production wells at MHTS in Pasadena, California, as set forth in the Remedial Design/Remedial Action (RD/RA) Work Plan (Battelle, 2008).

The primary objectives of this project are:

- Landscaping Phase I
 - Utility Location
 - Irrigation installation
 - Shrub and Tree Planting

- Mobilization Demobilization
 - Mobilization and Demobilization
 - Utility Location
- Construction Efforts
 - Site Grading and Excavation
 - Concrete Pad Installation
 - Underground Pipeline Installation
 - Electrical Systems Installation
 - Installation of Ion Exchange, GAC Units, and Miscellaneous Piping
 - Pipe Cutting and Fitting
 - Driveway and Access Road Construction
 - Street Improvements and Landscaping
 - Media Loading
 - Concrete Forming
- Well Evaluation and Rehabilitation
 - Installation of temporary treatment system
 - Pump Removal, Storage, and Disposal
 - Initial Well and Pump Inspection
 - Well Rehabilitation and Development
- Landscaping
 - Planting
 - Excavation/Grading
- Waste Management
 - Soil and Water Removal

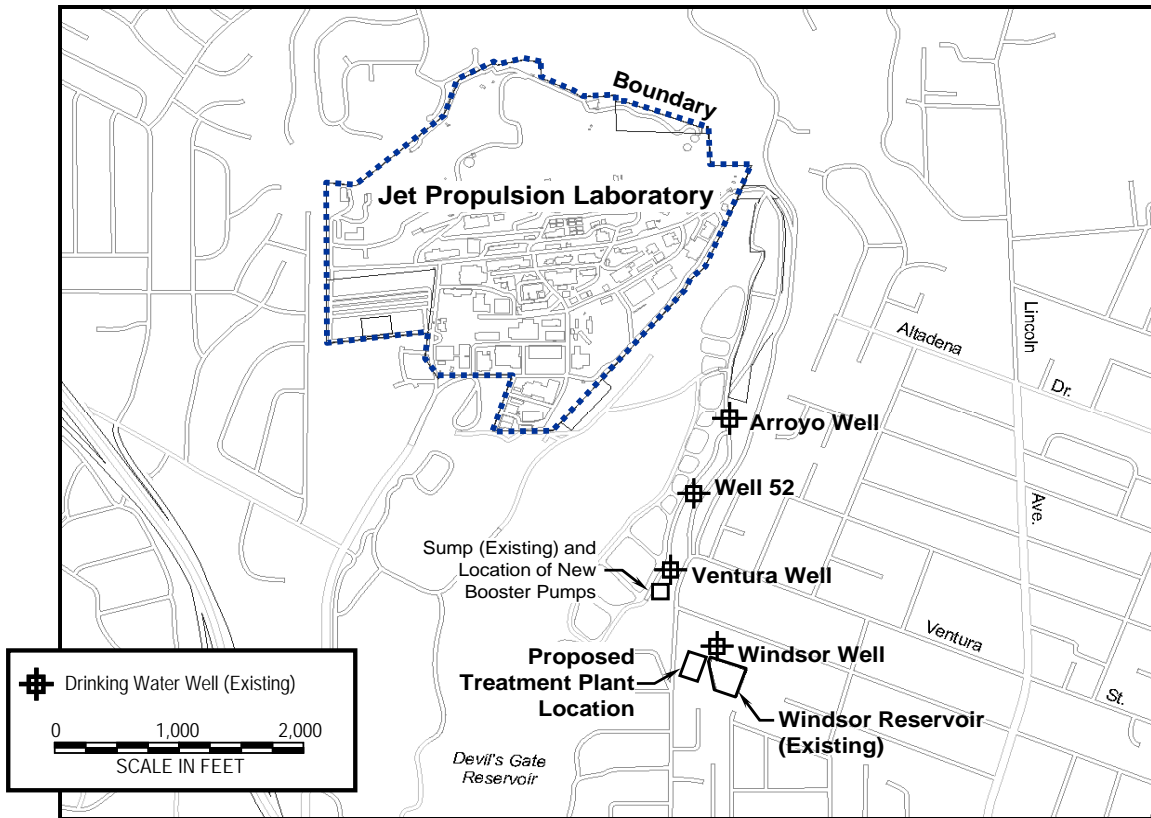


Figure 1. Site Location Map

Contractor Accident Experience: Battelle has performed numerous remedial projects and has an excellent accident prevention record, as shown in the attached Occupational Safety and Health Administration (OSHA) 300A forms (Attachment 5). Battelle has an Experience Modification Rate (EMR) factor of 0.98, 1.10, 1.04 and 0.79 for 2005, 2006, 2007, 2008, respectively. These rates are similar to the national average of 1.0 for all companies performing similar types of work. The Battelle team will work to prevent accidents during this project by following Battelle Policy, this APP, and the U.S. Army Corps of Engineers (USACE) Manual, EM 385-1-1 (USACE, 2003).

Section 3.0: STATEMENT OF SAFETY AND HEALTH POLICY

Battelle's Safety, Health and Emergency Response (SHER) Department develops, implements, and manages Battelle industrial hygiene, industrial safety, and emergency management programs that are fully integrated with Battelle operational requirements and provide the services and support necessary to maintain compliance with corporate policies and procedures, as well as applicable regulations and industry standards and policies. The SHER staff members work with researchers to assist them with health and safety compliance. The ultimate responsibility and accountability for compliance and staff safety falls upon Battelle department managers and the staff members themselves.

Battelle is committed to establishing and maintaining an accident-, injury- and occupational illness-free environment. Battelle Corporate Policy, Environmental, Safety and Health Program states, "Battelle values human life above all else and strives to provide a workplace free of occupational injuries and illnesses. Battelle values the environment and protects it, the public and future generations from unacceptable risks resulting from its operations." ALL staff must plan and conduct their work in a responsible manner to create and maintain a safe and healthy environment in Battelle facilities and projects. The purpose of this program is to describe the operational framework and guidelines in addressing safety and health issues within Battelle.

A copy of Battelle's Health and Safety programs and procedures pertinent to the scope of this field effort can be accessed in Attachment 4 of this APP.

Section 4.0: RESPONSIBILITIES AND LINES OF AUTHORITY

Throughout this project, definitive roles and responsibilities will be given to individual Battelle staff members. Table 1 provides the name and title of the staff members involved with this project. Mr. Bernard Himmelsbach has responsibility for Battelle Safety, Health and Emergency Response, including authority for final approval of all projects completed within this group. The Battelle Safety, Health and Emergency Response Manager will be consulted as needed during the project and will have final authority in matters relating to health and safety when in question. All site personnel will be briefed and encouraged to report any health and safety violations they observe. Mr. Keith Fields, the Project Manger, has the overall responsibility of health and safety on this project. He will be assisted by Mr. David Conner, the Site Safety Health Officer (SSHO), and Mr. Ben Headington, Mr. Derek Payne, and Mr. Scott Lowe (alternate SSHOs). The SSHO is responsible for day-to-day safety and health, ensuring compliance with this APP, providing daily safety briefings, performing daily inspections, noise monitoring, and changes in personal protective equipment (PPE) levels after consultation with the appropriate SHER representative. The SSHO will report all safety violations to the Project Manager. Employees cited for health and safety violations will be counseled or dismissed from the site.

Table 1. Project Contact List

Title	Name and Contact Information
Environmental Program Manager	Steve Slaten JPL NASA Management Office 4800 Oak Grove Drive Pasadena, CA 91109-8099 (818) 393-6683 sslaten@nmo.jpl.nasa.gov
Battelle Project Manager	Keith Fields Battelle 505 King Avenue Columbus, OH 43201 (614) 424-7723 fieldsk@battelle.org
Battelle Field Team Leader/Onsite Health and Safety Officer	David Conner Battelle 3990 Old Town Ave, Suite C205 San Diego, CA 92110-2933 (619) 574-4827 connerd@battelle.org
Battelle Field Team Leader/Onsite Health and Safety Officer (alternate)	Ben Headington Battelle 505 King Ave. Columbus, OH 43201 (614) 424-5489 headingtonb@battelle.org
Battelle Field Team Leader/Onsite Health and Safety Officer (alternate)	Derek Payne Battelle 3990 Old Town Ave, Suite C205 San Diego, CA 92110 (619) 574-4822 payned@battelle.org
Battelle Field Team Leader/Onsite Health and Safety Officer (alternate)	Scott Lowe Battelle 3990 Old Town Ave, Suite C205 San Diego, CA 92110 (619) 574-4821 lowes@battelle.org
Battelle Project Health and Safety Officer	Bernard Himmelsbach Battelle 505 King Avenue Columbus, OH 43201 (614) 424-4302 Mobile: (614) 348-3408 himmelsb@battelle.org

Section 5.0: SUBCONTRACTORS AND SUPPLIERS

Battelle's subcontractors for this Task Order will be:

- RC Foster Corporation, general engineering contractor
 - Hunter Electric Services, electrical controls
 - Regan Paving Inc., asphalt paving and frinding
 - MSL Development, masonry work
 - Murphy Building Corporation, parkline metal building
- Layne Christensen Company, Well Rehabilitation
 - Welenco, downhole geophysics
- Sam Serpa LLC, general construction support
- Southwest Geophysics, utility survey
- Calgon International, tank and filtration supplier

All subcontractors and suppliers will be provided with a copy of this APP. Subcontractors will review the plan with their employees and each individual will be expected to sign the APP acknowledgement sheet provided in Attachment 3, certifying that they have read, understand, and will comply with the requirements of this plan. Subcontractor personnel are expected to attend all daily health and safety briefings while working on the site. Battelle requires its subcontractors to work in a responsible and safe manner. Subcontractors for this project will be required to adhere to applicable requirements set forth in the USACE *Safety and Health Requirements Manual*, EM 385-1-1 (USACE, 2003).

Section 6.0: TRAINING

The following applicable subject matter will be discussed with project team members during the project safety indoctrination training, which will be held prior to commencing site activities:

- Emergency response/notification/procedures (contained in the Site Safety and Health Plan [SSHP]; Attachment 1 of this APP).
- Personal protective equipment
- First aid/cardiopulmonary resuscitation (CPR) procedures
- Fire extinguisher use
- Communications
- Adverse weather, evacuation and personnel rally points (contained in the Site Safety and Health Plan [SSHP]; Attachment 1 of this APP).
- Material Safety Data Sheets (MSDSs) (See Attachment 6), Hazard Communications

The following mandatory training and/or certifications applicable to this project will be available for those involved or assigned to those activities:

- First Aid/CPR certificates and blood-borne pathogen training for the two on-site personnel requiring first aid/CPR training. Training will be in accordance with requirements of the American Red Cross, First Aid/CPR Program.
- Documented hazard communication for all project personnel. Training will meet the requirements outlined in the Battelle Chemical Safety Information Program SIH-PP-005 or the individual subcontractors' health and safety programs.
- OSHA 40-hour Hazardous Waste Operations and Emergency Response (HAZWOPER) for all personnel conducting work on this site.
- OSHA 8-hour Site Supervisor for person in charge of daily operations.
- OSHA 10-hour Construction Safety training for SSHO and alternates.

All site personnel will be briefed on the site Emergency Procedures provided in Section 7.0 of the SSHP provided as Attachment 1 to this document. Site personnel will be briefed on roles and responsibilities during an emergency, notification of emergency responders, potential emergency situations, rally points, and the location(s) of emergency equipment.

All prime and subcontract personnel will attend daily safety meetings to discuss the upcoming day's events, by the project manager or site safety officer as required, health and safety issues and to review Activity Hazard Analyses (AHAs). Minutes will be recorded for all health and safety meetings and will include, at a minimum, a record of who attended, duration of the meeting, and topics discussed. Documentation will be kept onsite.

Section 7.0: SAFETY AND HEALTH INSPECTIONS

Daily safety and health inspections will be performed by the SSHO or qualified designee in accordance with EM 385-1-1, Section 01.A.12 (USACE, 2003). All inspections will be thoroughly documented using the Daily Safety Inspection Form provided in Attachment 3. The results will be filed on site or forwarded to the Project Manager should any items requiring corrective action be discovered. These inspections will cover general site hazards, such as the presence and condition of safety supplies, housekeeping and slip/trip/fall hazard potentials. All identified deficiencies will be corrected at the time of identification and before work resumes.

**Section 8.0: SAFETY AND HEALTH EXPECTATIONS, INCENTIVE
PROGRAM, AND COMPLIANCE
(EM 385-1-1, APPENDIX A, SECTION 8)**

Battelle's written safety program goals are to maintain a safe work environment that promotes the following:

- Reducing the risk of injury, illness, and loss of life to employees.
- Maintaining compliance with federal, state and other applicable safety regulations, and minimizing employees' work exposure to potential physical, chemical, biological, and radiological hazards.

Battelle does not currently have a safety incentive program nor do its subcontractors.

Battelle is committed to providing a safe workplace for its employees. This Plan and the Company's Safety and Health Program have been developed to ensure that its employees' risk of injury is minimized and to ensure their quality of life. Battelle expects all employees to fully comply with all established health and safety policies and to immediately notify their supervisor if they notice a health or safety hazard or someone not complying with established procedures. Violators of the Safety and Health Policies will be disciplined and may be dismissed. Disciplinary action will follow the policy outline in Battelle's Operating Guide 135-3 Disciplinary Action-General Safety Inspection and Disciplinary Action for Violators.

Health and safety is everyone's responsibility. Each Battelle project supervisor has been entrusted with the responsibility of ensuring that the policies and procedures outlined in Battelle's Health and Safety Program and this APP are followed. Each supervisor is to be held responsible for the health and safety of those he or she supervises.

Section 9.0: ACCIDENT REPORTING

Battelle will complete the “USACE Contractor Monthly Summary Record of Injuries/Illness and Work Hour Exposure” (for prime and its subcontractors) on the attached form (Attachment 3) and forward the completed form to the Contracting Officer’s Representative (COR) no later than close of business on the 10th calendar day of the following month. The method of transmission by the prime contractor to the COR shall be electronically. A guide to completing the form is also provided in Attachment 3.

All reportable incidents, OSHA recordable incidents, lost time injuries, injuries requiring medical attention, fires, accidents involving the public, and property damage exceeding \$2,000.00 will be investigated by the SSHO and Project Manager as well as the applicable Battelle Safety and Health Representative in accordance with Battelle’s Accident/Incident Reporting and Investigation Procedure SIH-GP-025. In addition to the internal investigation, a verbal report will be made to the NASA Environmental Program Manager within 24 hours and a written report of the accident/incident will be submitted on ENG Form 3394, Accident Investigation Form (Attachment 3), within five working days of the incident.

Fatalities will be reported immediately to the NASA Environmental Program Manager. Fatalities and serious accident scenes will not be disturbed until NASA has convened and completed its internal Board of Investigation and then instructed Battelle that it is satisfactory to resume activities.

Section 10.0: MEDICAL SUPPORT

In the case of minor injuries, Mr. Conner, Mr. Headington, Mr. Payne, and Mr. Lowe have been trained in First Aid, CPR (including the automated external defibrillator [AED]), and bloodborne pathogens and will provide immediate on-site care. For serious injuries, call 911 and request emergency medical assistance. Seriously injured persons should not be moved, unless they are in immediate danger. Table 2 contains emergency phone numbers. Figure 2 is a map, along with written directions, to the Huntington Memorial Hospital, which is the nearest emergency care provider for the sites. Figure 3 is a map for Verdugo Hills Hospital, which is the alternate emergency care provider.

Table 2. Emergency Notification/Contact List

Emergency Services

Ambulance	911
Fire Department	911
Highway Patrol	911
Police	911
Poison Control Center	(800) 222-1222
Dept. of Environmental Health Services	(800) 258-6942
National Response Center, Toxic Chemicals and Oil Spills	(800) 424-8802
NASA-JPL Security Fire/Medical Service (on-site telephones only)	3-3333
NASA Security and Safety Officer	(818) 354-6053

NASA Points of Contact

Steve Slaten, Environmental Program Manager Office: (818) 393-6683

Medical Centers

Huntington Memorial Hospital (626) 397-5000
 100 W California Blvd.
 Pasadena, CA 91105-3010

Emergency Room (626) 397-5112

Verdugo Hills Hospital (818) 790-7100
 1812 Verdugo Blvd
 Glendale, CA 91208-1407

Emergency Room (818) 952-2222

Regulatory Agencies

U.S. EPA, Region 9 Environmental Emergencies (415) 947-4400
 California EPA Emergency Response (916) 323-3600
 After Hours: (800) 852-7550

Battelle Personnel

Keith Fields, Project Manager Office: (614) 424-7406

Mobile: (614) 378-9188

Bernard Himmelsbach, CIH Office: (614) 424-4302

Mobile: (614) 348-3408

David Conner, SHSO Office: (619) 574-4827

Mobile: (619) 726-7311

Ben Headington, Alternate SHSO Office: (614) 424-5489

Mobile: (614) 348-8939

Derek Payne, Alternate SHSO Office: (619) 574-4822

Mobile: (619) 427-8013

Scott Lowe, Alternate SHSO Office: (619) 574-4821

Mobile: (619) 571-8208

DIRECTIONS TO HUNTINGTON MEMORIAL HOSPITAL (4.4 miles):

- Exit MHTS main gate on Windsor Ave and proceed 0.75 mi toward Kent St, which becomes N. Arroyo Blvd.
- Proceed 1.94 miles, turn left onto I-210 San Bernardino Fwy.
- Exit Del Mar Blvd/California Blvd., 1.48 miles
- Turn Left on W. California Blvd., 0.18 miles
- Arrive at 100 W. California Blvd., hospital entrance.



Figure 2. Site Location and Hospital Route Map to Huntington Memorial Hospital (shown as “B”) from MHTS (shown as “A”)

DIRECTIONS TO VERDUGO HILLS HOSPITAL (4.5 miles):

- Exit MHTS main gate on Windsore Ave. and proceed 0.72 miles south toward Kent Ave.
- Turn Right onto I-210 W toward San Fernando, 2.29 miles
- Exit the Angeles Crest Hwy/La Canada Flintridge, 0.36 miles
- Turn Left on Angeles Crest Hwy (CA-2), 0.2 miles
- Turn Right onto Foothill Blvd., 0.28 miles
- Turn Left onto Verdugo Blvd., 0.64 miles

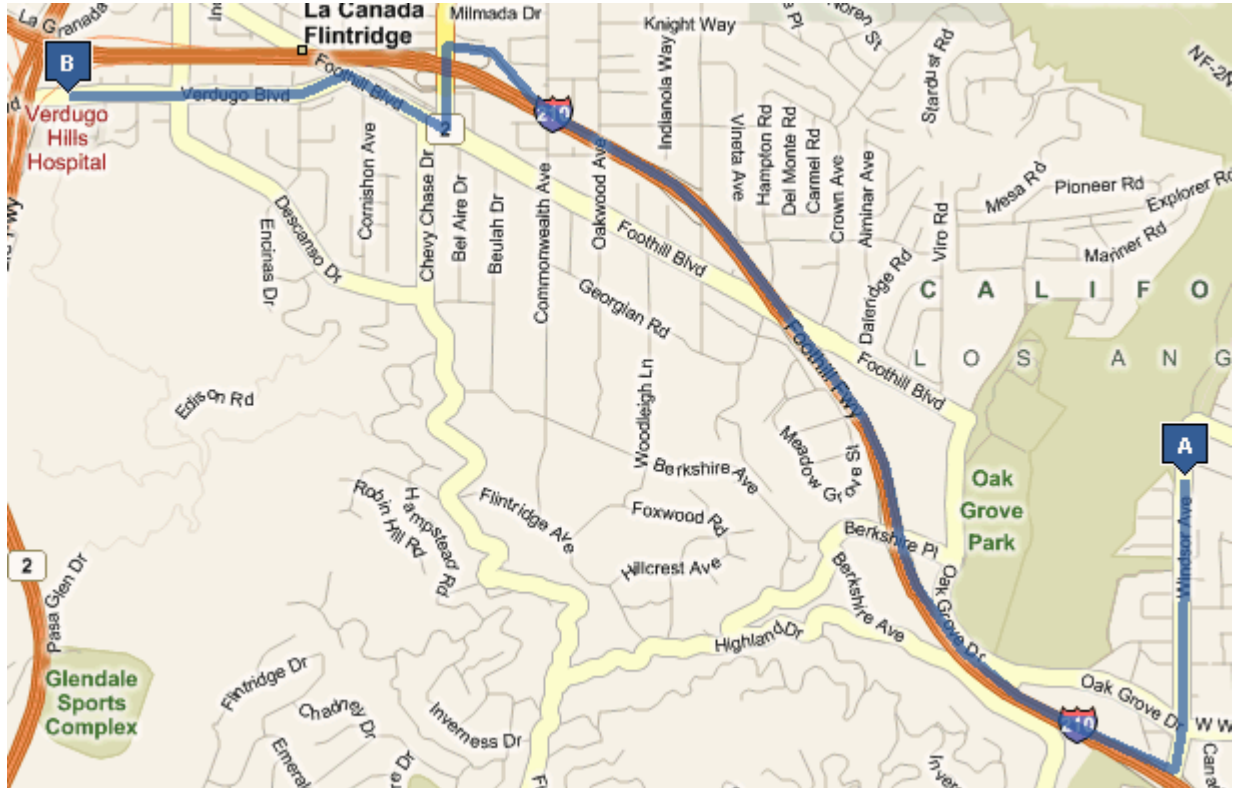


Figure 3. Site Location and Hospital Route Map to Verdugo Hills Hospital (shown as "B") from MHTS (shown as "A")

Section 11.0: PERSONAL PROTECTIVE EQUIPMENT

A hazard assessment of each of the anticipated tasks during the field effort has been performed. A list of the tasks and the necessary PPE are provided in Table 3. Individuals using PPE have been medically cleared to use such equipment when required and have been trained in accordance with the applicable sections of the Battelle Safety and Health Program. Proof of training will be maintained on-site and will be available for inspection by USACE and Navy representatives.

Table 3. Task Specific Personal Protective Equipment

Task	Activities	Required PPE
Mobilization and Site Survey	Transport/organize personnel and equipment at the site and conduct a site survey to identify potential hazards	Level D (work boots, nitrile gloves, leather gloves, etc.)
Construction Efforts	To include utility location, concrete forming/pouring, chemical curing, pipe fitting, hot work and electrical installations.	Level D (safety toe shoes, safety glasses, hardhats and leather gloves as needed) No loose clothing, jewelry or long hair will be permitted around the rotating auger.
Landscaping	Excavation/grading of site for treatment system and plantation of trees and shrubs surrounding facility.	Level D (safety glasses with sideshields or goggles, steel-toed shoes, nitrile gloves, leather gloves, etc.) Paper or cloth coveralls may also be worn to eliminate any contamination of employees' clothes.
Equipment Decontamination	Any residual soil particles on the sampling equipment will be wiped from the sampling equipment using a dry cloth	Level D (safety glasses with sideshields or goggles, steel toed shoes, nitrile gloves, leather gloves, etc.)
Waste Management	Sampling equipment and decontamination wastes will be disposed in an appropriate manner	Level D (safety glasses with sideshields or goggles, steel toed shoes, nitrile gloves, leather gloves, etc.)
Demobilization	Removal of equipment and departure of personnel from the field site	Level D - work boots and leather gloves (as required)

Section 12.0: PLANS REQUIRED BY THE SAFETY MANUAL

Specific information on Battelle's programs and procedures outlined in the safety manual are contained in Attachment 4 and are identified in this section.

- a. Layout plans: Not applicable at this time
- b. Emergency Response Plan:
 - (1) Procedures and tests. Presented in the SSHP (Attachment 1) and titled as Emergency Procedures (Section 7.0), the emergency action plan contains procedures for:
 - o Communication
 - o Site evacuation
 - o First Aid
 - o Decontamination during medical emergencies
 - o Emergency contact list
 - (2) Spill plan. Not applicable, as the subcontractors will supply for their vehicles and heavy equipment.
 - (3) Firefighting plan. Each vehicle will be supplied a standard 10 lb ABC fire extinguisher for use by personnel on incipient stage fires; if this is not suitable personnel are instructed to use local 911 and evacuate work site.
 - (4) Posting of emergency telephone numbers. Each onsite vehicle will be supplied a map to local hospital facilities (Figures 2 and 3), with the local numbers and will be passed out during initial onsite briefing.
 - (5) Wild land fire prevention: Not applicable
 - (6) Man overboard/abandon ship: Not applicable
- c. Hazard Communication Plan: Battelle's written Hazard Communication Program (entitled Chemical Safety Information Program) has been provided in Attachment 4 as part of the Health and Safety Program Package. This program addresses all of the elements required by 29 CFR 1910.1200, Hazard Communication Standard.
- d. Respiratory protection plan: Not applicable as no respiratory protection is anticipated for this scope of work
- e. Health hazard control plan: All hazards identified are listed in Attachment 2.
- f. Lead abatement plan: Not applicable
- g. Asbestos abatement plan: Not applicable
- h. Abrasive blasting: Not applicable
- i. Confined space: All hazards identified are listed in Attachment 2.
- j. Hazardous energy control plan: Not applicable, any admission of energy release is identified in Attachment 2, with onsite protection by ground fault circuit interrupter (GFCI).
- k. Critical lift procedures: All hazards identified are identified in Attachment 2.
- l. Contingency plan for severe weather: Not applicable, personnel are briefed to take cover at site setup brief.
- m. Access and haul road plan: Not applicable, covered by site setup.
- n. Demolition plan: Not applicable.

- o. Emergency rescue: Not applicable.
- p. Underground construction fire prevention and protection plan: Not applicable.
- q. Compressed air plan: Not applicable; covered in Attachment 2 under and shoring erection and removal plans: Not applicable.
- s. Jacking plan: Not applicable.
- t. Safety and Health Plan is included as Attachment 1 to this APP.
- u. Blasting plan: Not applicable.
- v. Diving plan: Not applicable.
- w. Plan for prevention of alcohol and drug abuse-Battelle's policy regarding a Drug Free Workplace will be followed by all staff and subcontracted employees, at a minimum. This policy is included in Attachment 4 of this APP.
- x. Fall protection plan: All hazards are listed in Attachment 2.
- y. Steel erection plan: Not applicable.
- z. Night operations lighting plan: Not applicable.
- aa. Site sanitation plan: Not applicable.
- bb. Fire prevention plan: Not applicable, covered under emergency procedures.

Section 13.0: CONTRACTOR INFORMATION

Additional information describing how requirements outlined in this APP will be met is provided as separate plans in Attachment 4 or the SSHP (Attachment 1) and includes the following:

- Medical and First Aid requirements: outlined in the SSHP
- Personal Protective Equipment requirements: outlined in the SSHP
- Fire Protection and Prevention requirements: attached in Attachment 4; pertains to the transfer and storage of flammable liquids and is outlined in the SSHP
- Machinery and Mechanized Equipment requirements: Attachment 4; pertains to the use of mobile equipment

Additional plans required for this project have been included in Attachment 4 and include:

- Bloodborne Pathogens Program
- Reporting and Recording Occupational Injuries and Illnesses
- Accident/Incident Reporting and Investigative Procedure
- Personal Protective Equipment Program
- Safety and Health Management Program

Section 14.0: SITE-SPECIFIC HAZARDS AND CONTROLS

Before initiating a work activity presenting hazards not identified in Attachment 2, the SSHO will complete an AHA in consultation with the subcontracted personnel and the Battelle SHER Representative. Should the job requirements change, the AHA will be updated promptly to address any new hazard. The AHA will describe ways to safely mitigate potential safety hazards, and chemical, physical, and biological hazards. All team members will be briefed via daily tailgate safety meetings about the dangers during these activities and the steps to mitigate any contact hazards. Other hazards and controls associated with the remaining scope of work are also outlined in tabular format as Table 1 of the SSHP. Documentation of attendance at these meetings will be provided on the appropriate safety meeting forms.

Section 15.0: REFERENCES

Battelle. 2008. *Draft Final Remedial Design/Remedial Action (RD/RA) Work Plan For the Monk Hill Treatment System (MHTS), NASA, Jet Propulsion Laboratory Pasadena, CA.* November.

United States Army Corps of Engineers (USACE). 2003. *Safety & Health Requirements Manual, 385-1-1.* November.

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Site Safety Health Plan

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ABBREVIATIONS AND ACRONYMS

ACGIH	American Conference of Governmental Industrial Hygienists
ATSDR	Agency for Toxic Substances and Disease Registry
CCl ₄	carbon tetrachloride
CFR	Code of Federal Regulations
CIH	Certified Industrial Hygienist
CNS	central nervous system
CPR	cardiopulmonary resuscitation
DCA	dichlorethane
DCE	dichloroethylene
EMS	Emergency Medical Services
ESH&Q	Environmental, Safety, Health, and Quality
GFCI	ground fault circuit interrupter
HASP	Health and Safety Plan
HSDB	Hazardous Substances Database
HSO	Health and Safety Officer
JPL	Jet Propulsion Laboratory
LEL	lower explosive limit
LO/TO	lock-out/tag-out
MSDS	Material Safety Data Sheets
NASA	National Aeronautics and Space Administration
NIOSH	National Institute for Occupational Safety and Health
O&M	operation and maintenance
OEHHA	Office of Environmental Health Hazard Assessment
OSHA	Occupational Safety and Health Administration
PCE	tetrachloroethene
PEL	permissible exposure limit
PPE	personal protective equipment
ppm	part(s) per million
SHSO	Site Health and Safety Officer
SSHP	Site Safety and Health Plan
SSO	Site Safety Officer
STEL	short-term exposure limit
TCE	trichloroethene
TLV	threshold limit value

TWA	time-weighted average
UEL	upper explosive limit
USACE	United States Army Corp of Engineers
USDHH	United States Department of Health and Human Services
U.S. EPA	United States Environmental Protection Agency
UV	ultraviolet

PROJECT TEAM

The following persons will be provided copies of the approved Site Safety and Health Plan (SSHP) and any subsequent revisions.

Title	Name and Contact Information
Battelle Project Manager	Keith Fields Battelle Memorial Institute 505 King Avenue Columbus, OH 43201 (614) 424-7723 fieldsk@battelle.org
Battelle Project Quality Assurance Officer	Betsy Cutié Battelle Memorial Institute 505 King Avenue Columbus, OH 43201 (614) 424-4899 cutie@battelle.org
Battelle Project Health and Safety Officer	Linc Remmert Battelle Memorial Institute 505 King Avenue Columbus, OH 43201 (614) 424-3678 remmertl@battelle.org
Battelle Site Health and Safety Manager (or delegates thereof)	Dave Conner Battelle Memorial Institute 3990 Old Town Ave, Suite C205 San Diego, CA 92110 (619) 574-4827 connerd@battelle.org
Battelle Project Engineers	Ben Headington Battelle Memorial Institute 505 King Avenue Columbus, OH 43201 (614) 424-5489 headingtonb@battelle.org

1.0 ADMINISTRATIVE INFORMATION

This Site Safety Health Plan (SSHP) was written for work performed by Battelle within the city of Pasadena, California. This SSHP is intended to meet the requirements of:

- United States Army Corp of Engineering (USACE) *Safety and Health Manual*, EM 385-1-1 (USACE, 2003)
- Title 29, Code of Federal Regulations (CFR) 1910 and 29 CFR 1926
- U.S. Environmental Protection Agency (U.S. EPA) Standard Operating Safety Guidelines for Hazardous Waste Operations (U.S. EPA, 1992)
- Navy/Marine Corps Installation Restoration (IR) Manual (U.S. Navy, 2001)
- California Code of Regulations, Title 8 Section 5192

1.1 Scope of Site Safety Health Plan

This SSHP has been prepared for use by Battelle project personnel and their subcontractors for work at the city of Pasadena reservoirs. The plan is written for the specific site conditions, purposes, tasks, dates and personnel specified. If these conditions change, this plan will be amended and reviewed by those named in Section 1.2.

All site activities will be performed in accordance with the documents listed above, especially 29 CFR 1910.120. All Battelle employees involved in fieldwork at the city of Pasadena will have completed the required training programs and maintained qualification through annual refresher training. They are under a program of medical surveillance and are certified to wear respiratory protection as specified in 29 CFR Part 1910.134. Full details of the Battelle safety training, Respiratory Protection, and Medical surveillance Programs are given in the Battelle Environment, Safety, Health and Quality (ESH&Q) Training Program (Battelle, 2005a), Respiratory Protection Program (Battelle, 2005b), and the Chemical Safety Information Program - Medical Consultation (Battelle, 2005c), respectively.

This SSHP was prepared from the best available information concerning site conditions at the time. The health and safety specifications in this SSHP are based on reasonable knowledge that chemicals, such as volatile organic chemicals, including carbon tetrachloride and trichloroethene (TCE), perchlorate, and 1,4-dioxane, are potentially present in groundwater.

1.2 Key Personnel and Responsibilities

Key Battelle personnel for this project include:

- Project Manager – Keith Fields
- Project Engineers – Ben Headington, Scott Lowe, Derek Payne
- Certified Industrial Hygienist (CIH) – Bernard Himmelsbach
- Health and Safety Officer (HSO) – Linc Remmert
- Site Health and Safety Officer (SHSO) – Dave Conner or delegates thereof

All project field staff have completed comprehensive health and safety training, which meets the requirement of Title 29 Code of Federal Regulations – Part 1910.120 (29 CFR 1910.120). The SHSO or the alternate SHSO will have:

- Completed the required training for this project assignment
- The responsibility for completing the required field forms and reports
- The authority to modify and stop work, or remove personnel from the site if working conditions may affect on-site and off-site health and safety
- First Aid and cardiopulmonary resuscitation (CPR) certifications and be trained in blood borne pathogens control.

Specific project safety responsibilities for these key personnel are detailed below.

1.2.1 Project Manager Responsibilities

As the Project Manager, Mr. Keith Fields is responsible for generating, organizing, and compiling the SSHP, which describes planned field activities and potential hazards that may be encountered at the site. Mr. Fields also is responsible for ensuring that adequate training and site safety briefing(s), including the provision of safety equipment, are provided to the project field staff. Mr. Fields will provide a copy of this SSHP to each member of the project field staff and one copy to each subcontractor prior to the initiation of field activities. Associated health and safety responsibilities will include:

- Coordinating the activities of all field personnel, including their signed acknowledgement of the SSHP.
- Selecting a SHSO and field personnel for the work to be undertaken on-site.
- Ensuring that the assigned tasks are being completed as specified by this SSHP.
- Providing authority and resources to ensure that the SHSO is able to implement and manage safety procedures.
- Preparing reports and recommendations regarding project safety to the client and concerned personnel.
- Ensuring that the SHSO is aware of all provisions of this SSHP and that all on-site personnel are instructed about safety practices and emergency procedures as defined in this SSHP.
- Ensuring that the SHSO is monitoring site safety.

1.2.2 HSO/CIH Responsibilities

The HSO, Mr. Linc Remmert, and/or CIH, Mr. Bernard Himmelsbach, are responsible for developing and coordinating the health and safety program outlined in this SSHP. They are also responsible for reviewing and approving the SSHP for accuracy and incorporating any new information or guidelines that aid the Project Manager and SHSO in further definition and control of the potential health and safety hazards associated with this project. Mr. Remmert/Mr. Himmelsbach also have the authority to suspend or modify work practices for safety reasons and to dismiss individuals whose site conduct endangers the health and safety of others.

1.2.3 SHSO Responsibilities

The SHSO, Mr. David Conner, has a direct line of authority from the HSO to implement specific health and safety requirements for specific site activities, and for ensuring that all team members, including subcontractors, comply with the SSHP. It is Mr. Conner's responsibility to inform the subcontractors and other field personnel of chemical and physical hazards as he becomes aware of them. Mr. Conner has the authority to suspend work if he feels the operations threaten the health and safety of the field team or the surrounding population and to dismiss individuals whose site conduct endangers the health and safety of others.

Mr. Conner or his designee is responsible for completing and submitting the appropriate following forms

- Safety Compliance Agreement Form
- Tailgate Safety Meeting Form
- Air/Noise Monitoring Data Sheet
- Accident/Incident Analysis Form

Additional SHSO responsibilities include, but are not limited to, the following:

- Evaluating weather conditions and chemical hazard information and making recommendations to the Project Manager about any modification to this SSHP or personal protective equipment (PPE) requirements to maintain personnel safety.
- Approving all field personnel working on-site, taking into consideration their level of training, physical capacity and their eligibility to wear protective equipment necessary for the assigned tasks.
- Monitoring the compliance of field personnel for the routine and proper use of protective equipment that has been required for each task.
- Enforcing the "buddy system" as appropriate for site activities.
- Posting the location and route to the nearest medical facility and arranging for emergency transportation to the nearest medical facility.
- Posting the telephone numbers of local public emergency services.
- Entering the exclusion zone, for rescue of personnel only, after emergency services have been notified and appropriate precautions taken. Response effort must be within the level of training of the SHSO and appropriate equipment must be available.
- Observing field team members for signs of exposure, stress, or other conditions related to pre-existing physical conditions or site work activities.

1.2.4 Project Field Staff Responsibilities

The project field staff is responsible for ensuring that activities are performed in accordance with the approved SSHP, and that deviations from the SSHP are based upon encountered field conditions that are well documented in field notes and approved by the SHSO. The project field staffs' health and safety responsibilities include:

- Following the SSHP and the direction of the SHSO.
- Reporting any unsafe conditions or practices to the SHSO.

- Reporting all facts pertaining to incidents that result in injury or exposure to toxic materials to the Project Manager and SHSO.
- Reporting any equipment malfunctions or deficiencies to the Project Manager.
- Reviewing the SSHP as necessary.

It is the responsibility of individual organizations involved in field activities to ensure understanding of and compliance to the SSHP by its on-site employees or representatives working in controlled areas. Failure by any person to adhere to this SSHP may result in their removal from the site.

1.2.5 Subcontractor Responsibilities

Battelle is the lead and prime contractor for the activities associated with this project and, therefore, is responsible for subcontractor health and safety while under contract with Battelle and engaged in work. Battelle will inform subcontractors of the site emergency response procedures, and any potential fire, explosion, health, safety, or other hazard by making this SSHP and site information available on-site. All Battelle subcontractors are responsible for:

- Attending the health and safety briefing given by the SHSO covering the requirements of this SSHP
- Providing their own, company provided, PPE
- Providing documentation that their employees have been trained in health and safety in accordance with applicable federal, state, and local laws and regulations
- Providing evidence of medical surveillance and medical approvals for their employees
- Designating their own Site Safety Officer (SSO) responsible for ensuring that their employees comply with their own Health and Safety Plan (HASP) and taking any other additional measures required by their site activities
- Signing the Safety Compliance Agreement Form (Attachment 1) as a part of standard safety protocol. All field personnel performing on-site work will sign the Safety Compliance Agreement Form. Individuals who refuse to sign this agreement will be prohibited from working on this project.

1.2.6 Site-Specific Safety Briefing

A site-specific safety/pre-entry briefing will be held daily prior to the start of any site activities, and at other times as necessary to ensure that all field personnel and visitors are aware of the health and safety hazards at the site.

2.0 PROJECT TASKS

The major Battelle tasks associated with this contract include, but not limited to, the following:

- Mobilization
- Excavations
- Pipeline Installation
- System Installation
- Well Rehabilitation
- Water Treatment
- Demobilization

Subcontractors are required to prepare their own SSHP for construction activities. The Battelle HSO will review the subcontractors' HASP to ensure the HASP covers all aspects of the subcontractors' responsibilities for this project. The hazard risk assessment provided in the following section is for risks Battelle field personnel might encounter while working on-site during the drilling and well installation activities. Subcontractors are expected to follow their individual HASPs as well as guidelines included in this SSHP.

3.0 HAZARD/RISK ASSESSMENT

This section discusses chemical, physical, and environmental hazards to workers on the site. Section 3.1 discusses hazards associated with the project tasks listed in Section 2.0. Table 1 lists major hazards associated with these tasks and methods to mitigate the hazards. Section 3.2 discusses the chemicals of interest and includes information such as exposure limits and signs and symptoms of exposure. Table 2 lists the primary health hazards and exposure limits for chemicals covered in Section 3.2. Material Safety Data Sheets (MSDSs) information for compounds listed in Table 2 is provided in Attachment 6. Permissible Exposure Levels (PELs) are Occupational Safety and Health Administration (OSHA) permissible exposure limits for airborne concentrations of toxic substances measured as an 8-hour Time-Weighted Average (TWA). The OSHA PELs are the recognized levels to which the site monitoring will adhere. Short-Term Exposure Limits (STELs) are OSHA short-term limits measured as a 15-minute TWA. OSHA requires that controls be implemented when employee exposure exceeds these limits. The Threshold Limit Values (TLVs) are health and safety guidelines recommended by the American Conference of Governmental Industrial Hygienists (ACGIH). If contaminant levels exceed 50% of the TLV or PEL and persist for greater than 10 minutes, engineering and/or administrative control measures will be implemented.

Section 3.3 discusses physical hazards identified with this site including those associated with fire, use of heavy equipment, slip/trip/fall, lifting, tool and equipment, and heat stress. Section 3.4 discusses biological hazards associated with the physical location of the site.

Daily tailgate safety meetings will be held at the start of each workday to discuss potential chemical, physical and environmental hazards and preventative safety measures. Attendance will be mandatory for all employees and a Tailgate Safety Meeting Form (Attachment 1) will be completed. Task Hazard Analyses have been developed for each major field activity/work phase and are presented in Table 1. The following sections describe the specific hazards anticipated in more detail, and the control measures to be implemented to minimize or eliminate each hazard. This information will be used to augment daily safety meetings intended to heighten safety and hazard awareness on the job.

3.1 Hazards Associated with Tasks

Due to the geographic location of Pasadena, CA, heat stress may be a potential hazard to workers performing work associated with all tasks in the summer months. Heat stress hazards will be assessed in detail in Section 3.4.7. Other hazards associated with Battelle tasks are analyzed as follows.

3.1.1 Hazards Associated with Mobilization and Demobilization

The main hazards associated with mobilization and demobilization of field personnel and equipment are electrical shock from system setup, objects striking the heads of field personnel, and general site hazards such as heat and biological hazards. Methods of mitigating these hazards are listed in Table 1.

Table 1. Hazard Sources and Mitigation During Field Activities at MHTS

Hazard	Project Tasks	Mitigation Methods
Slip/trip/ fall	All tasks	Maintain good housekeeping. Limit work area with boundary marking tape and signs. Slip/trip/fall hazards will be addressed through an ongoing proactive housekeeping program that eliminates elements in the work area that have potential for causing loss of footing.
Electrical shock	Mobilization, excavation, confined space entry and demobilization	All major electrical work (wiring, control panel construction, etc.) will be subcontracted to a qualified electrical contractor. Ground fault circuit interrupter (GFCI) will be used where appropriate. Care will be taken to de-energize and ground any electrical equipment prior to any necessary repair work. Before undertaking any repair work, the energy source will be either permanently disconnected or temporarily tagged and kept locked to prevent the equipment from accidentally energizing. Personnel performing repair work shall have been trained on LO/TO and will be responsible for complying with all applicable LO/TO procedures.
Flying particulate	Excavation	All site personnel will wear hard hats and safety glasses with side shields during drilling.
Objects striking head	Mobilization, excavation and demobilization	Hard hats will be worn in the vicinity of overhead hazards (e.g., in the drilling rig area).
Explosion/Fire	All tasks	Open-flame ignition sources will be restricted from the work area (smoking, etc.). No smoking is permitted in the work zones. Any free-phase petroleum or gasoline will be stored in appropriate containers. Signs indicating flammable liquids will be posted where appropriate. Appropriate fire extinguishers will be available to site personnel during field activities.
Inhalation and contact of organic vapors	Excavation and any confined space entry	If conditions require upgrading to air-purifying respirations (Level C PPE), an addendum to this SSHP will be submitted for review and approval. Remain upwind whenever possible. Wear disposable gloves and safety glasses with side shields when handling soil and sampling waters.
Weather extremes	All tasks	Use dress consistent with conditions. Implement worker rotation and rest period schedules. Adjust work day to take advantage of the cooler parts of the day. Maintain periodic telephone communication between on-site and off-site personnel to ensure good physical condition of on-site personnel. Frequently consume water or an electrolytic beverage to avoid dehydration.

LO/TO = lockout/tagout.

3.1.2 Hazards Associated with Well Systems

The municipal well system has several associated hazards that will be mitigated using the following precautions:

- Electrical shock – All major electrical work (wiring, control panel maintenance, etc.) will be subcontracted to a qualified electrical contractor. GFCIs will be used where appropriate, e.g., in wet locations. Care will be taken to de-energize and ground any electrical equipment prior to any necessary repair work. Before undertaking any repair work, the energy source will be either permanently disconnected or temporarily tagged and kept locked to prevent the equipment from accidentally energizing. Personnel performing repair work shall have been trained on Lock Out/Tag Out (LO/TO) procedures as specified in the OSHA citation 29 CFR 1910.333 and will be responsible for complying with all applicable LO/TO procedures.
- Moving Parts – Before equipment is used, it will be inspected, tested and certified to be in safe working condition. All moving parts of the equipment will be guarded when exposed to contact by field personnel or when the equipment poses a hazard.
- Pressurized Lines – All pressurized equipment and systems will be maintained and operated in accordance with EM 385-1-1 Section 20 (USACE, 2003).
- Hot Surfaces – All field personnel will be advised of the potential for moving parts on the system which become hot during operation. Easily accessible surfaces will be labeled with a sign reading “Caution Hot Surface”.

3.2 Hazards Associated with Chemicals Substances in Groundwater

A list of the chemicals identified to be in the groundwater and their associated exposure limits are presented in Table 2. Table 2 lists the primary health hazards associated with each of these chemicals.

Table 2. Primary Health Hazards and Exposure Limits for Chemical Substances at Jet Propulsion Laboratory (JPL)

Compound (CAS #)	PEL-TWA^(a)	PEL-STEL^(a)	TLV TWA^(b)	TLV STEL^(b)	Primary Health Hazard
Carbon tetrachloride (56-23-5)	10 ppm	25 ppm	5 ppm	10 ppm	Liver; cancer
1,1-Dichloroethylene (75-35-4)	—	—	5 ppm	—	Harmful if ingested, inhaled or absorbed through the skin; Reproductive; cancer
1,2-Dichloroethane (107-06-2)	50 ppm	100 ppm	10 ppm	—	Skin irritant; liver; cancer
Tetrachloroethene; PCE (127-18-4)	100 ppm	200 ppm	25 ppm	100 ppm	Irritation; CNS
Trichloroethene (79-01-6)	100 ppm	200 ppm	10 ppm	50 ppm	CNS; headache; liver
Perchlorates	NA	NA	NA	NA	Skin irritant; respiratory
Chromium (hexavalent) All forms all compounds	0.005 mg/m ³	—	--	—	Respiratory, lung and stomach cancer.
Chromium (hexavalent) Inorganic, soluble compounds	--	--	0.05 mg/m ³	--	Respiratory, lung and stomach cancer.
Chromium (hexavalent) Inorganic, insoluble compounds	--	--	0.01 mg/m ³	--	Respiratory, lung and stomach cancer.
Chromium (III) (7440-47-3)	0.5 mg/m ³	—	0.5 mg/m ³	—	Irritation; dermatitis; liver; kidney; respiratory;
1,4-Dioxane (123-91-1)	100	—	20 ppm	—	Irritation; liver; kidney

PEL = permissible exposure limit

TWA = time-weighted average

STEL = short-term exposure limit

(a) 29 CFR 1910.1000 Table Z (OSHA Z Table).

(b) TLVs and BEIs (ACGIH, 2008).

NA = Not applicable.

3.2.1 Carbon Tetrachloride

Carbon tetrachloride (CCl₄) is a colorless liquid with a melting point of -23°C and a boiling point of 77 °C. Its vapor pressure is 91 mmHg at 20 °C. CCl₄ is classified as B2, a probable human carcinogen. Inhalation and ingestion of CCl₄ can be fatal. It is an irritant that could lead to dermatitis if contacted with the skin. Kidney or liver damage may result from long-term use of CCl₄. It can also affect the central nervous system (CNS) and cause damage or cancer to the eyes, skin, and lungs. CCl₄ is incompatible with alkali metals, chemically active metals, strong oxidizing agents, allyl alcohol, fluorine, and strong

bases. It should be kept away from heat and possible sources of ignition due to potentially toxic decomposition products.

3.2.2 1,1-Dichloroethylene (CAS 75-35-4)

1,1-dichloroethylene (1,1-DCE) is a colorless liquid at room temperature with a mild, sweet odor.. It is also known as vinylidene chloride. Its boiling and melting points are 31.7 °C and –122.5°C, respectively. It has a vapor pressure of 591 mmHg at 25°C and density of 1.213 g/cm³ at 20°C. The main use of 1,1-DCE is to produce copolymers such as polyvinylidene chloride, acrylonitrile, vinyl chloride, and methacrylonitrile. The copolymers are used in flexible films, such as SARAN and VELON, and as a flame retardant for fiber, carpet backing and piping. They are also used in flexible packaging materials and as an adhesive.

1,1-DCE is classified as a group C carcinogen meaning it is a possible human carcinogen (Faust, 1993). Inhalation of 1,1-DCE at low levels over a long period of time can cause damage to the CNS, liver and lungs. High-level exposure health effects include loss of breath and fainting, effects on the CNS and death from hepatotoxicity and nephrotoxicity.

3.2.3 1,2-Dichloroethane (CAS 107-06-2)

1,2-dichloroethane (1,2-DCA) is a colorless, heavy and flammable liquid that evaporates quickly at room temperature and has a sweet odor and taste. It is also known as ethylene dichloride. Its vapor pressure at 25°C is 79.1 mmHg and density is 1.23 g/cm³ at 20°C. Its melting and boiling points are –35.5°C and 83.5°C, respectively.

1,2-DCA is classified as group B2, which means it is a probable human carcinogen through the oral and inhalation routes (Opresko, 1994). The routes of exposure to humans are absorption through the lungs, gastrointestinal system and skin. It is distributed throughout the body, but concentrates in the adipose tissue and is generally excreted with soluble urinary metabolites. Some health effects caused by exposure to 1,2-DCA are bronchitis, central nervous system depression, dizziness, vomiting, partial paralysis, liver and kidney damage, hemorrhages throughout the body, and death (Opresko, 1994).

1,2-DCA is mainly used in the manufacturing of vinyl chloride and other compounds including tetrachloroethene (PCE), TCE, and 1,1,1-trichloroethane. Other uses are as a solvent to degrease metals, as well as a fumigant and lead-scavenging agent in gasoline. It is also used in paints, coatings, adhesives, varnishes, finish removers, soaps, and scouring agents (Opresko, 1994).

3.2.4 Tetrachloroethene (PCE)(CAS 127-18-4)

Tetrachloroethene

Tetrachloroethene (PCE) is a nonflammable, colorless liquid at room temperature with a sweet odor. It is also known as perchloroethylene (PCE) and tetrachloroethylene. Its vapor pressure at 25°C is 18.47 mmHg and density is 1.6227 g/mL. Its melting and boiling points are –19°C and 121°C, respectively (Agency for Toxic Substances and Disease Registry [ATSDR], 1997b). PCE is used as a solvent in dry-cleaning operations and for degreasing metals (ATSDR, 1997a). It is also used to dissolve greases, fats, waxes and oils without harming fibers. It is a chemical intermediate and has also been used to treat hookworm and some nematode infestations (ATSDR, 1997b).

PCE has been classified as group B2 to C, which means it is a possible to probable human carcinogen. PCE enters the body through the lungs and digestive tract, but not through the skin. Oral and inhalation

exposure to PCE target the liver and kidney and the central nervous system is also affected by inhalation of PCE. Exposure to high concentrations can cause headache, nausea, sleepiness, difficulty speaking and walking, dizziness, confusion, unconsciousness, and death. Some women have also experienced menstrual problems and spontaneous abortion when exposed to PCE (Daugherty, 1993).

3.2.5 Trichloroethene(CAS 79-01-6)

TCE is a nonflammable, colorless liquid at room temperature which has a sweet odor and evaporates easily. It is also known as trichloroethylene. Its vapor pressure at 25°C is 74 mmHg and density at 20°C is 1.465 g/mL. Its melting and boiling points are -87.1°C and 86.7°C, respectively. Currently, TCE is primarily used as a solvent to degrease metals and for fats, waxes, resins and oils (Faust, 1993). It is used in the manufacturing of other chemicals. It can also be found in paint removers, spot removers, adhesives, and typewriter correction fluid. It was once used as an anesthetic, fumigant, disinfectant and to extract caffeine from coffee (Faust, 1993). Production of TCE naturally occurs from marine macroalgae and microalgae.

TCE is classified in group 2A, which means it is a probable human carcinogen. Humans are exposed to TCE through oral, inhalation and dermal routes. The primary target organs are the liver, kidney, central nervous system, cardiovascular system, hematopoietic system, and reproduction. Some health effects of TCE include headaches, dizziness, poor concentration, impaired heart function, unconsciousness, nerve, kidney and liver damage, and death (Faust, 1993).

3.2.6 Perchlorate

Perchlorate (ClO_4^-) is the most oxygenated member in a series of four anions made up of chlorine and oxygen (Office of Environmental Health Hazard Assessment [OEHHA], 2002). The anion has a charge of negative one, and can form an acid or salt in combination with H^+ or another cation such as sodium, potassium, or ammonium ion (OEHHA, 2002). Perchlorate salts dissociate completely in water. Ammonium perchlorate (NH_4ClO_4) is a white, crystalline solid used as an oxidizer in rocket propellant fuel. Perchlorate salts are also used in explosives, pyrotechnics and flares, in tanning and finishing leather, as a mordant for fabrics and dyes, and in electroplating, aluminum refining, rubber manufacture, and the production of paints and enamels (Hazardous Substances Database [HSDB], 2002; OEHHA, 2002).

Potassium perchlorate was used in the late 1950s and 1960s as an antithyroid agent in the treatment of hyperthyroidism (i.e., Graves' disease) until reports of severe hematological effects occurred. European physicians began using it again in the 1980s as long as the dose remained below 1,000 mg/day. A serious human health effect is the disruption of thyroid hormone production because perchlorate blocks the transport of iodine to the thyroid gland. Two hormones, triiodothyronine (T3), and thyroxine (T4), help regulate the body's metabolism and physical growth. When blockage occurs, the thyroid's iodide reserves are reduced, thus decreasing production of T3 and T4. When levels of T3 and T4 decrease, the pituitary gland and the hypothalamus gland, which regulate thyroid hormones, increase their own hormone production to compensate for the low levels of T3 and T4. Too much or too little thyroid hormone can lead to disease (OEHHA, 2002). Perchlorate can cross the placenta, thus affecting a developing fetus. For children in utero and up to three years of age, thyroid hormone is critical to normal brain and physical development.

3.2.7 Hexavalent Chromium

The properties of hexavalent chromium vary with the different compounds. It is a solid at room temperature and is typically orange, red or yellow in color. Hexavalent chromium is generally soluble in

water; however, the degree of solubility is dependent on the compound. For example, the solubility of lead chromate is 5.8 µg/L and sodium dichromate has a solubility of 230 g/100 cc at 0°C. Zinc chromate, on the other hand, is insoluble in water. Melting and boiling points also vary widely among the compounds. Some compounds decompose at temperatures between 170°C and 500°C (ASTDR, 2000).

The use of hexavalent chromium can be found in many industries including chrome plating, electroplating, stainless steel welding, leather tanning, wood preserving and chemical manufacturing (ATSDR, 2000). It is used to make stainless and heat resisting steel, astringents and antiseptics, dyes and pigments, batteries, candles, paints, rubber and cement and for corrosion resistance, high temperature research, and industrial water treatment (United States Department of Health and Human Services [USDHHS], 2001; ASTDR, 2000).

Hexavalent chromium enters the body through inhalation, ingestion and dermal contact. Exposure to chromium can cause nosebleeds, ulcers and holes in the nasal septum, upset stomach, ulcers, kidney, liver and lower respiratory tract damage, gastrointestinal irritation, dizziness, headaches, burns on the skin, blisters, skin ulcers, labored breathing, cancer and death (ATSDR, 2000). Chromium (VI) is classified in group A, which means it is a known human carcinogen. Exposure to hexavalent chromium usually causes respiratory system, lung or stomach cancer (ATSDR, 2000).

3.2.8 Trivalent Chromium

The properties of trivalent chromium vary among the different chromium compounds. The color varies from blue-green to purple to brown or black. It is a solid at room temperature with a melting point between 60°C (for chromium [III] nitrate) and 2,266°C (chromium [III] oxide). At high temperatures, chromium compounds decompose (e.g., chromium [III] nitrate at 100°C), sublime (e.g., chromium [III] chloride at 1300°C), or boil (e.g. chromium [III] oxide at 4,000°C). Trivalent chromium compounds are primarily insoluble, but some compounds are soluble or slightly soluble (ATSDR, 2000).

Trivalent chromium is used in the production of metals and alloys, as brick lining for high-temperature furnaces, in manufacturing chemicals, for chrome plating, leather tanning, wood preserving, and in dyes and pigments (ATSDR, 2000). It generally enters the atmosphere through emissions from coal and oil burning or steel production (ATSDR, 2000). Atmospheric fallout and precipitation are the primary means of removing trivalent chromium from the atmosphere. In water, trivalent chromium is precipitated and then buried in sediment. In soil, it is transported by runoff or as dust (U.S. EPA, 1998).

Trivalent chromium is classified in group D which means it is not classified as a human carcinogen (U.S. EPA, 1998). Trivalent chromium can enter the body through inhalation, ingestion and dermal contact. The body does not generally absorb large amounts of trivalent chromium (Daugherty, 1992). Health effects caused by exposure to trivalent chromium include coughing, wheezing, asthma, and inhibits DNA replication.

3.2.9 1,4-Dioxane (CAS 123-91-1)

1,4-dioxane is a colorless, flammable liquid at room temperature and has a pleasant odor. It has boiling and melting points of 101.5°C and 11.8°C, respectively (OEHHA, 2002) Its vapor pressure is 30 mmHg at 20°C (U.S. EPA, 2002). 1,4-dioxane is miscible with water, aromatic solvents and oils (OEHHA, 2002).

Uses of 1,4-dioxane include a degreasing agent, a component of paint and varnish removers, and a wetting and dispersion agent in the textile industry. It is also used as a solvent in chemical synthesis, a

fluid for scintillation counting, and a dehydrating agent in the preparation of tissue sections of histology (OEHHA, 2002). It is a solvent for cellulose acetate, ethyl cellulose, benzyl cellulose, resins, oils, waxes, dyes, and other organic and inorganic compounds (U.S. EPA, 2002). It is also a solvent for specific applications in biological procedures and a stabilizer for chlorinated solvents such as 1,1,1-trichloroethane. It is a reagent for laboratory research and testing. In the past it was used as a solvent in coatings, sealants, adhesives, cosmetics and pharmaceuticals (USDHH, 2001).

1,4-dioxane is classified as group B2 which means it is a probable human carcinogen. Exposure to 1,4-dioxane is generally from inhalation, ingestion or dermal contact. It is very mobile in the environment due to its volatility and solubility in water. 1,4-dioxane may cause drowsiness, vertigo, headache, irritation of the eyes, nose, throat, lungs and skin, nausea, vomiting, hepatic and renal lesions, coma, or death (U.S. EPA, 2002). The target organs used to determine the hazard index are the alimentary system, kidney, and circulatory system (OEHHA, 2002).

3.3 Physical Hazards

3.3.1 Flammability/Explosive Nature

It is unlikely that explosive atmospheres will be encountered during field activities. However, the following standard safety procedures will be implemented:

- All field vehicles and heavy equipment will be equipped with type-ABC fire extinguishers. Fire extinguishers will be mounted on vehicles where field personnel can easily access them. A fire extinguisher check, including inspecting gauges, hoses, and tanks, must be completed monthly to verify proper condition of the equipment. An annual maintenance check on each fire extinguisher must be conducted and documented.
- When necessary, a fire watch and fire extinguisher or other fire-fighting equipment should be made available.
- Hot work permits will be obtained, as needed.
- Open fires and burning are prohibited. Smoking will be prohibited in all areas where flammable, combustible, or oxidizing materials are stored or in use.

The following procedures should be implemented for refueling of vehicles:

- Refuel only in pre-designated outdoor areas.
- Shut off vehicle engines when not in use.
- No smoking is allowed.
- Do not over-fill fuel tanks.

The following apply to the storage and dispensing of flammable materials:

- All tanks containing flammables should be labeled with the contents in 4-inch-high letters.
- All flammable chemicals should be stored in flammable-chemical storage cabinets.

- Oxygen should be stored at least 25 feet from combustible liquids, flammable materials, heat sources, or in an area with a fire barrier having a ½ hour rating.
- Oxygen storage areas should be vented.

3.3.2 Hazards Associated with Heavy Equipment

The hazards associated with the operation of heavy equipment can be effectively managed through adequate training and constant awareness. Consistent visual or verbal contact with the equipment operator will facilitate such awareness. All mobile equipment operators will have had the required training and should demonstrate the necessary skills to operate heavy equipment. Mobile equipment will not obstruct roadways, walkways, electrical lines, etc. Proper distance from overhead power lines should be observed. All personnel working around heavy equipment will wear hard hats, safety-toed boots, and orange vests.

3.3.3 Hazards Associated with Excavation Activities

Surface Encumbrances

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

Underground Installations

The location of sewer, telephone, fuel, electric, and water lines as well as any other underground installations that may be encountered during excavation work must be located and marked prior to opening the excavation. Arrangements must be made as necessary by the person with the appropriate utility agency for the protection, removal, shutdown, or relocation of underground installations.

If it is not possible to establish the exact location of underground installations, the work may proceed with caution provided detection equipment or other safe and acceptable means (e.g., using hand tools) are used to locate the utility as the excavation is opened and each underground installation is approached.

Excavation work will be conducted in a manner that does not endanger underground installations or employees engaged in the work. Utilities left in place must be protected by barricades, shoring, suspension, or other means as necessary to protect employees.

Vehicular Traffic

Employees exposed to vehicular traffic must be provided with, and will wear, warning vests or other suitable garments marked with or made of reflectorized or high-visibility material. Warning vests worn by flagmen must be red or orange and be of reflectorized material if worn during night work.

Falling Loads

No employee will be permitted underneath loads handled by lifting or digging equipment. Employees will be required to stand away from any vehicle being loaded or unloaded. Vehicle operators may remain in the cabs of vehicles being loaded or unloaded when the vehicle provides adequate protection for the operator during loading and unloading operations.

Mobile Equipment

When mobile equipment is operated adjacent to the edge of an excavation, a warning system will be used when the operator does not have a clear and direct view of the edge of the excavation. The warning system must consist of barricades, hand or mechanical signals, or stop logs. If possible, the surface grade

Hazardous Atmospheres

Atmospheric testing must be conducted in excavations over 4 feet deep where hazardous atmospheres could reasonably be expected to exist (e.g., landfill areas, near hazardous substance storage, gas pipelines).

Adequate precautions will be taken to prevent employee exposure to atmospheres containing less than 19.5 percent oxygen or other hazardous atmospheres. These precautions include providing appropriate respiratory protection or forced ventilation. Forced ventilation or other effective means will be used to prevent exposure to an atmosphere containing a flammable gas in excess of 10 percent of the lower flammable limit.

Atmospheric monitoring will be performed using a properly calibrated direct reading instrument with audible and visual alarms. Monitoring will be continuous where controls are used to reduce the level of atmospheric contaminants. Monitors will be maintained and calibrated in accordance with manufacturer's specifications.

Water Accumulation

Employees will not work in excavations that contain or are accumulating water unless precautions have been taken to protect employees from hazards posed by water accumulation. The precautions taken could include, for example, special support or shield systems to protect from cave-ins, water removal to control the level of accumulating water, or use of safety harnesses and lifelines.

If water is controlled or prevented from accumulating by the use of water removal equipment, the water removal equipment and operation must be monitored by a person trained in the use of the equipment.

If excavation work interrupts the natural drainage of surface water (such as streams), diversion ditches, dikes, or other suitable means will be used to prevent surface water from entering the excavation. Precautions will also be taken to provide adequate drainage of the area adjacent to the excavation. Excavations subject to runoff from heavy rains must be reinspected by the Project Manager to determine if additional precautions should be taken.

Adjacent Structures

Support systems (such as shoring, bracing, or underpinning) must be used to ensure the stability of structures and the protection of employees where excavation operations could affect the stability of adjoining buildings, walls, or other structures.

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

- A support system, such as underpinning, is provided to ensure the safety of employees and the stability of the structure; or
- The excavation is in stable rock; or

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

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

Where review or approval of a support system by a registered professional engineer is required, the Department will secure this review and approval in writing before the work is begun.

Loose Rock or Soil

Adequate protection must 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 will consist of:

- Scaling to remove loose material;
- Installation of protective barricades, such as wire mesh or timber, at appropriate intervals on the face of the slope to stop and contain falling material; or
- Benching sufficient to contain falling material.

Excavation personnel will not be permitted to work above one another where the danger of falling rock or earth exists.

Employees must be protected from excavated materials, equipment or other materials that could pose a hazard by falling or rolling into excavations.

- Protection will be provided by keeping such materials or equipment at least 2 feet from the edge of excavations, by the use of restraining devices that are sufficient to prevent materials or equipment from falling or rolling into excavations, or by a combination of both if necessary.
- Materials and equipment may, as determined by the Project Manager, need to be stored further than 2 feet from the edge of the excavation if a hazardous loading condition is created on the face of the excavation.
- Materials piled, grouped or stacked near the edge of an excavation must be stable and self-supporting.

Fall Protection

Barricades, walkways, lighting and postings must be provided as necessary prior to the start of excavation operations.

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

Wells, holes, pits, shafts, and all similar excavations must be effectively barricaded or covered and posted as necessary to prevent unauthorized access. All temporary excavations of this type must be backfilled as soon as possible.

Walkways or bridges protected by standard guardrails must be provided where employees and the general public are permitted to cross over excavations. Where workers in the excavation may pass under these walkways or bridges, a standard guardrail and toeboard must be used. Information on the requirements for guardrails and toeboards may be obtained by contacting EHSS.

3.3.4 Slip/Trip/Fall Hazards

While it is difficult to prevent slip/trip/fall hazards, these hazards can be minimized through the use of appropriate footwear, good housekeeping, proper site control measures and keeping the work area free of obstructions. Personnel will be required to perform fieldwork in pairs (buddy system) so that immediate assistance will be available should a slip/trip/fall occur. Slip/trip/fall hazards will be addressed through an ongoing proactive housekeeping program that eliminates elements in the work area that have potential for causing substantial loss of footing. Emphasis will be placed on the good housekeeping around all excavation areas to prevent all harmful falls.

3.3.5 Lifting Hazards

Field operations often require that physical labor tasks be performed. All employees should employ proper lifting procedures. Additionally, employees should not attempt to lift bulky or heavy objects (over 40 pounds) without assistance.

3.3.6 Tool and Equipment Hazards

Hazards present while using tools and equipment are generally associated with improper tool handling and inadequate maintenance. Management of these hazards requires a rigorous maintenance of tools and equipment and effective training of employees in the proper use of these tools. Electrically powered tools have inherent physical hazards. Hand-held power tools, including jackhammers, should be held firmly. This equipment will create vibrations during operation. Proper safety procedures will be implemented during their operation.

Electrical cords should have unbroken insulation and should not be exposed to water or other liquids. A ground fault circuit interrupter (GFCI) outlet or cord must be used in any area where water may be present. Large power tools and equipment should be lifted properly to prevent back injuries.

Safety glasses with side shields, ear protection, and safety-toed boots will be worn while operating powered tools or equipment.

3.3.7 Heat Stress Hazards

Work under this project may be required in hot environments depending on the time of year. During hot or humid days, or during the performance of strenuous work, extra precautions will be necessary to reduce the potential for heat stress. Implementation of worker rotation and rest period schedules and adjustment of the workday to take advantage of the cooler parts of the day may be used to prevent exposure to heat stress hazards. Whenever possible, shade will be utilized or provided to field personnel to help mitigate heat stress hazards. Any adjustments to workday schedules that deviate from normal business hours will be cleared with the appropriate personnel. Also, frequent consumption of water or an electrolytic beverage is necessary to prevent dehydration (drink about 16 ounces before starting work, and

5 to 7 ounces every 15 to 20 minutes while working). The levels of heat stress are characterized in Table 3.

Factors which increase the risk of heat induced problems:

- High physical exertion.
- Being unaccustomed to working in heat.
- Wearing protective clothing that traps body heat.
- Age (older people may have less body water and lower sweat gland efficiency).
- Being overweight, this makes the body work harder to perform tasks.
- Medications that can interfere with normal body reactions to heat.

Table 3. Signs and Symptoms of Heat Related Illnesses and Treatments

Heat Induced Problems			
Problem	Body Response	Signs and Symptoms	Treatment
Heat Cramps	<ul style="list-style-type: none"> • The body loses too much salt from heavy exertion in heat. 	<ul style="list-style-type: none"> • Painful spasms of muscles used during work. 	<ul style="list-style-type: none"> • Increase fluid intake with electrolytes (Unless otherwise indicated by a doctor). • Take frequent breaks, preferably in a cool area.
Heat Exhaustion	<ul style="list-style-type: none"> • The body can't replace fluids and/or salt lost in sweating. • Perspiration in heat is important because it cools the body as it evaporates. 	<ul style="list-style-type: none"> • Weakness, dizziness, nausea. • Pale or flushed appearance. • Sweating, moist and clammy skin. 	<ul style="list-style-type: none"> • Move to a cool place. • Loosen clothes and apply cool compresses. • Drink water slowly. • Elevate feet 8-12 inches.
Heat Stroke	<ul style="list-style-type: none"> • The body no longer sweats and holds so much heat that body temperature reaches dangerous levels. • Heat stroke is a medical EMERGENCY and can lead to delirium, convulsions, unconsciousness, or death. 	<ul style="list-style-type: none"> • DRY, hot reddish skin, and LACK OF SWEATING! • High body temperature and strong, rapid pulse. • Chills • Confusion 	<ul style="list-style-type: none"> • Treat as a MEDICAL EMERGENCY! • Call for EMS or a doctor immediately! • Move to a cool area immediately. • Use cool water to soak person's clothes and body. • Fan the body. • Don't give fluids if victim is unconscious.

EMS = Emergency Medical Services

3.3.8 General Site Safety

The following PPE and clothing will be used during field activities:

- Safety-toed boots.
- Goggles or safety glasses with side shields.
- Standard work clothing or chemical resistant Tyvek® coveralls, as needed.
- Nitrile or equivalent laboratory/exam gloves, as needed.
- Hearing protection, as needed.

Hard hats, hearing protection, and other PPE listed above are required during most operations.

3.4 Biological Hazards

There are several biological hazards to which personnel may be exposed while performing work at the city of Pasadena site. These hazards may include snake bites (a variety of snakes are present, but not all are poisonous), insect bites (i.e., mosquitoes, deer flies, chiggers, and ticks) and stings (i.e., bees, wasps) and exposure to pathogenic (disease producing) microorganisms. Animal and bird droppings often contain mold, fungus, bacteria or viruses that represent a significant respiratory hazard. If encountered, personnel will be instructed to avoid touching droppings.

Paramedics will be summoned for serious injuries. First aid procedures for biological hazards will follow the program set up by the American Red Cross.

3.5 Confined Space Entry Hazards

1. Atmospheric Hazards

Atmospheric hazards generally cannot be seen and, in most cases, it is too dangerous to assume that the sense of smell will serve as an "early warning system". Many of the typical hazards of confined spaces do not have reliable warning properties. Some of these hazards can completely incapacitate a person in a matter of seconds. In addition, as mentioned earlier, conditions can change very quickly in confined spaces. Because of such factors, air monitoring is usually required if atmospheric hazards are suspected.

There are three general classes of atmospheric hazards:

- a) oxygen deficiency,
- b) combustible/flammable materials and
- c) toxic gases.

a) Oxygen Deficiency

Humans can survive for weeks without food, days without water, but only minutes without air. Air contains a mixture of gases but is composed primarily of nitrogen (78%) and oxygen (21%). The remainder of the mixture is comprised of small quantities of hydrogen, argon, neon, krypton, carbon dioxide and hydrogen. The oxygen component of air is essential for life.

Oxygen is consumed by a variety of cellular chemical processes that produce carbon dioxide as a waste product. All cells die when deprived of oxygen but some are more critically affected than others. For example, brain cells begin to die within 4 to 6 minutes of being deprived of oxygen and since the brain

does not produce new cells, the damage is permanent. Skin and liver cells, however, are less critically affected by oxygen deficiency because of their ability to generate new cells to replace those that die.

Oxygen levels must be maintained within well-defined limits — too much or too little is catastrophic for life. The effects of oxygen deficiency, listed in Table 4, are primarily health-based, whereas oxygen enrichment increases the risk of fire. If the oxygen levels deviate above 22% or below 19%, it is considered a hazard. **Oxygen deficiency (< 19%) is probably the most common type of confined space hazard.**

Table 4. Effects of Oxygen Deficiency

<i>OXYGEN CONTENT</i>	<i>SYMPTOMS</i>	<i>PHYSICAL EFFECTS</i>
18 - 23 %	none	none
12 - 16 %	increased pulse rate	lack of "fine" co-ordination in fingers and hands
10 - 12 %	rapid pulse rate, nausea, headache	breathing difficulties, lack of co-ordination
6 - 10 %	-	complete lack of coordination, inability to react to danger, loss of consciousness
0 - 6 %	-	death

In confined spaces, oxygen deficiency may result from either consumption or displacement of the oxygen present. Activities or processes that can "consume" oxygen include combustion (welding and cutting torches), decomposition of organic matter (rotting food or plant life) or oxidation of metals (rusting). Oxygen can be "displaced" when inert gases such as nitrogen, carbon dioxide, helium or steam are used to purge a space of residual chemicals, gases or vapors.

b) Flammable/Combustible Materials

Flammable and combustible materials are an important concern with regards to fires and explosions in confined spaces. In this situation, it is important to remember that for a fire or explosion to occur, four components are required: the proper proportions of

1. Fuel (such as a flammable vapor) and
2. Oxygen (from the air),
3. A source of ignition (such as a spark or flame) and
4. A chain reaction.

The proper mixture of fuel and oxygen varies from gas to gas, but the explosive range is defined as the area between the lower explosive limit (LEL) and the upper explosive limit (UEL). When the fuel and air mixture is below the LEL, ignition will not take place because the mixture is "too lean". Ignition will also

not occur if the fuel and air mixture is above the UEL because the mixture is "too rich". When the mixture is above the UEL, it can readily move into the flammable range with the addition of dilution air.

<i>Explosive Range for Methane</i>	
<i>Methane Content</i>	-
0 - 5 % (LEL)	TOO LEAN
5 - 15 % (UEL)	EXPLOSIVE RANGE
15 - 100 %	TOO RICH

Potential sources of ignition that could be found in confined spaces include: open flames, arcs from electrical equipment, hot surfaces, static electricity and frictional sparks.

Workers must also be aware that the hazards resulting from gases can exist at any level. Differences in temperature and atmospheric pressure can cause the gases to become stratified within the confined space. Many flammable gases and vapors are heavier than air. If they flow into a pit, a tank opening or other confined space, they will present a serious fire and explosion hazard. This concept will also be discussed in more detail in the Air Monitoring section.

In confined spaces, a common working limit for flammables and combustibles is 10% of the lower explosive (or flammable) limit (the LEL). This applies for "cold work" only, where sparks or welding will not occur. For hot work, the working limit is 0 to 1% of the LEL.

Oxygen enrichment is the term used to describe a situation where the oxygen concentration is greater than 22%. This represents a serious fire hazard. While not flammable itself, oxygen does alter the burning characteristics of many materials, making them both easier to ignite and faster burning once ignited. In addition, atmospheres enriched with oxygen also permit flammable gases and vapors to ignite over a much wider range of concentrations than is possible in ordinary air.

In confined spaces, care must be taken to ensure that oxygen lines or cylinders are not taken into the space and to ensure that there are no oxygen leaks and potential sparks. Occasionally, oxygen-enriched atmospheres have been created when workers used oxygen to ventilate a space or to power pneumatic hand tools under the mistaken belief that oxygen and air were the same thing. Fires that occur under these conditions will burn with great speed and intensity.

c) Toxic Gas Hazards

Toxic (or poisonous) gases present two kinds of risks in a confined space:

1. Irritation and
2. Asphyxiation

Asphyxiates are gases that can cause asphyxiation by either displacing the oxygen in the atmosphere or interfering with the body's ability to use oxygen. Those gases that are physiologically inert (i.e., produce no effect on the body) and are present in sufficient quantity to displace the air and, therefore, an adequate oxygen supply are called simple asphyxiates. Examples include nitrogen and methane.

Substances that incapacitate the body's ability to utilize an adequate oxygen supply are called chemical asphyxiates. Carbon monoxide is a toxic, colorless and odorless gas that combines with the hemoglobin of red blood cells. Carbon monoxide has a much higher affinity for hemoglobin than oxygen does so it will attach preferentially and exclude oxygen. This greatly reduces the amount of oxygen available for life processes and can lead to death due to chemical asphyxiation.

Carbon monoxide is one of the most common asphyxiants encountered. It is formed by incomplete combustion wherever fuel containing carbon is burned. In addition to its presence as a byproduct in many industrial situations, it is also produced in large amounts by internal combustion engines such as automobiles, fuel powered compressors, generators and fork lifts.

Hydrogen sulfide is another chemical asphyxiate that is very toxic, colorless and combustible and is commonly found in confined spaces such as sewers, oil and gas refineries and many industrial environments. Hydrogen sulfide is easily detected at low concentrations by a strong foul odor, similar to rotten eggs. This odor **cannot** be used as an early warning sign however since hydrogen sulfide can quickly desensitize the sense of smell. After prolonged exposure, even at low concentrations, an individual may fail to smell the presence of hydrogen sulfide even if the concentration suddenly increases. Hydrogen sulfide enters the blood stream and paralyzes the nerve centers in the brain. The lungs cease to function and the individual is asphyxiated.

The University Confined Space Program suggests the working limit for carbon monoxide is 10 parts per million (ppm), and for hydrogen sulfide is 5 ppm. If these materials are detected, try to locate the source. It may be possible to control the source, or, if it is not feasible, at least being aware of the likely location of the source can influence how the work can best proceed in the confined space.

2. Mechanical/Electrical

The unexpected movement of mechanical parts or the unexpected discharge of electrical energy in a confined space presents a potentially hazardous situation for anyone within the space. Commonly encountered equipment includes blenders, stirrers, mixers and agitators. Augers and conveyors may also be found in spaces where solid materials like grain, coal and fertilizer are handled, processed or stored.

When equipment is serviced or maintained in a confined space, lockout/tagout procedures must be applied to prevent unexpected release of energy in that equipment or system.

3. General Safety

Other confined space hazards to be wary of include: means of access and egress, temperature extremes, poor visibility and noise. Also, because of moisture, condensation, slime growths or deposits or other materials, the danger of slipping and falling is high. Deterioration of the structure, rusting of ladder rungs, grating and railings can result in falls and head injuries. The worker may also be exposed to pathogenic diseases. The presence of rats or other vermin is also a potential danger. Improper handling of tools and equipment can result in cuts, bruises and back injuries.

Since many of the areas are quite small, head protection and protective gloves should be worn when using hand tools and the footing should be secure to avoid back injuries, slips, trips or falls in the area. The attendant at the surface must ensure that the surface in the vicinity of the access is kept clear of all objects that might fall into the confined space.

4. Engulfment

The movement or shifting of material within a confined space has been responsible for many injuries and fatalities. Of particular concern are loose, granular materials that can act like quicksand when walked upon or withdrawn from the space. Silos with grain inside are a prime example of this type of hazard.

4.0 SITE CONTROL

4.1 Work Area Control

Proximity to field activities will be limited to reduce the probability of occurrence of physical injury and chemical exposure of field personnel, visitors, and the public.

Work area control will be achieved through the use of zones (exclusion zone, contamination reduction zone, and support zone). All three zones will be established for drilling and well installation activities, but for the operation and maintenance (O&M) of the remediation system, there will only be a designated exclusion zone that will be surrounded by a locked, fenced area. The area outside of the exclusion zone will be considered the support zone. Access to the remediation system will be limited to authorized personnel only.

During field activities, the equipment will be oriented to minimize impact to surrounding vehicles, buildings, and operations. The area surrounding each excavation and inspection equipment will be the exclusion zone. Non-project personnel will be directed away from the immediate area of the equipment. The area outside of the exclusion/contaminant reduction zone will be considered the support zone. The first aid kit and PPE will be kept in the support zone.

4.2 Traffic Control

Each temporary traffic control zone is different. Many variables, such as location of work, road type, geometrics, vertical and horizontal alignment, intersections, road user volumes, road vehicle mix (bus, trucks, and cars), and road user speeds affect the needs of each zone. The goal of temporary traffic control in work zones is safety with minimum disruption to road users. The key factor in promoting temporary traffic control zone safety is proper judgment.

During planned field activities requiring traffic control, a Traffic Control Plan will be established and approved prior to the start of work.

5.0 PERSONNEL PROTECTION

The possibility of exposure to chemicals in groundwater presents a minimal potential health risk to site workers and proximate base personnel. The primary personal protective clothing used will be disposable nitrile gloves and safety glasses with rigid side shields. If necessary, based on the exposure limits listed in Table 2, respiratory protection and engineering or work-practice controls will be used to minimize exposure and to protect workers. The level of protection to be utilized throughout the duration of this Task Order will be U.S. EPA Level D, as based on known contaminant levels and previous work performed. It is the responsibility of the field personnel to inspect all PPE prior to use. Evaluation of the effectiveness of the Battelle PPE program will be examined by the SHSO following the guidelines established in the Battelle PPE Program Manual (Battelle, 2004).

5.1 OSHA Levels of Protection

There are four levels of OSHA-mandated personnel protection: Levels A, B, C and D. Levels A, B, and C are not anticipated for this task order. If site conditions change and a higher degree of protection is required, the SHSO will consult the HSO/CIH and the required changes in PPE will be made. A change in the level of PPE will result in this SSHP being amended and reviewed by the HSO/CIH.

Level D protection will consist of the basic work clothing, plus the following depending on activities to be performed:

- Hard hat
- Coveralls/standard work clothing
- Safety glasses with protective side shields
- Safety-toed boots
- Nitrile gloves (or equivalent)
- Available hearing protection
- Available protection against ultraviolet (UV) rays (i.e., sun block, hats, or long sleeves).
- For emergency purposes or in the event of PPE upgrade, an available half-face or full-face, air purifying respirator with National Institute for Occupational Safety and Health (NIOSH) approved combination organic vapor/acid gases/P-100 cartridges (yellow/magenta)*

*All personnel who may be required to wear a respirator will be enrolled in an employer medical surveillance and respiratory protection program and have their assigned respirator fit-tested before wearing it on the project.

6.0 GENERAL SAFETY RULES

6.1 Recommended Equipment Safety Guidelines

Equipment maintenance and safety is the responsibility of the operator. The following information is provided as general guidelines for safe site practices:

- Inspect the route of travel before moving equipment off-road. Note rocks, trees, erosion, and uneven surfaces.
- Approach changes in grade squarely to avoid shifting loads or unexpected imbalance.
- Use a spotter (person at grade) to provide guidance when vertical and lateral clearance is questionable.
- Locate overhead and buried utilities prior to removal operations. Treat overhead electrical lines as if they were energized.
- Contact the appropriate utility agencies to deactivate overhead or underground services that may interfere with sampling operations. Only authorized and trained personnel should attempt to handle utilities.
- Note wind speed and direction to prevent unshielded overhead utility lines from contacting equipment.
- Allow at least 20 feet of clearance from overhead utility lines.
- Contact appropriate utility agencies to survey, mark, and flag locations of buried utility lines.
- Maintain orderly housekeeping
- Store tools, materials, and supplies properly and in a secure area.
- Maintain working surfaces free of obstructions or potentially hazardous substances.
- Store fuels in approved safety containers only.

7.0 EMERGENCY PROCEDURES

7.1 Communication

A communication program will be implemented during the project. Workers are to use the buddy system at all times and be cognizant of the reduction of communication abilities in high-noise areas. The specific hand signals to be used during the project will be discussed in the tailgate safety meeting and will include, but are not limited to, the following:

- Closed fist – Stop work
- Hand crossed above head – Personal injury
- Hand gripping throat – Cannot talk; Having difficulty breathing
- Grip partner's wrist – Cannot talk; Leave area immediately
- Hands on top of head – Need assistance
- Thumbs up – OK, I am all right, I understand
- Thumbs down – No, negative

7.2 Site Evacuation Procedures

In case of an emergency, an air horn, or an equivalent device that can generate at least 80 dBA of noise, will be used as the evacuation warning. One long blast from the horn will be understood to mean immediate evacuation from the exclusion zone. Personnel working on the site will immediately make their way to the designated gathering point for a "head count". The gathering point will be site and activity dependent and therefore will vary. The SHSO will determine the gathering point and notify all site personnel at the daily tailgate meeting.

In the event that an emergency requires the evacuation from the site, the parking lot of the Huntington Memorial Hospital will be the designated emergency gathering location. The route to the hospital is presented in Figure 1. Driving distance is approximately 2.4 miles with an approximate travel time of six minutes. The emergency evacuation plan will be discussed in the first pre-entry tailgate meeting and as necessary when new personnel arrive on-site.

7.3 First Aid

A fire extinguisher and a first aid kit, containing the American Red Cross first aid manual, will be stationed in each field vehicle. A blood-borne pathogen clean-up kit will also be available. This kit will consist of, at minimum, household bleach, empty spray bottle, disposable gloves, disposable towels, red biohazard disposal bags. The following personnel are trained in first aid, CPR, and blood borne pathogens:

- David Conner, SHSO
- Ben Headington, SHSO
- Linc Remmert, HSO

If an injured individual requires further attention, the individual will be immediately transported to the nearest hospital. A map illustrating the route to the off-base emergency medical facility is presented in Figure 1. If necessary, the victim will be decontaminated prior to transport to the facility; if the injury is serious, decontamination is of secondary importance. A copy of this SSHP will accompany the injured workers to the medical facility. All accidents, without regard to severity, will be documented by the SHSO on the Accident/Incident Analysis Form (Attachment 1). The Accident/ Incident Form will be forwarded to the HSO and Project Manager within 24 hours. An analysis of the accident will be conducted by the HSO/CIH following the guidelines in the *Battelle Safety and Industrial Hygiene Manual* (Battelle, 2005d).

General first aid procedures are outlined below:

- **Skin Contact:** Use copious amounts of soap and water. Wash/rinse affected area thoroughly, then provide appropriate medical attention. An eyewash station and an emergency shower or drench system will be located in the contamination reduction zone and/or support zone as appropriate. Eyes should be rinsed for 15 minutes upon chemical contact.
- **Inhalation:** Move to fresh air and, if necessary, decontaminate and transport to hospital. Any loss of consciousness or exposure to airborne toxic substances, even if the individual appears to have fully recovered, will require immediate treatment by a qualified physician.
- **Ingestion:** Notify Poison Control Center and emergency medical facility and transport to nearest emergency medical facility immediately.
- **Puncture Wound or Laceration:** Decontaminate and transport to emergency medical facility. Apply direct compression to stop or slow the flow of blood.
- **Biological Hazard:** Identify the specific animal responsible for the injury (if possible), notify the nearest emergency medical facility and transport the affected worker immediately.

7.4 Decontamination During Medical Emergencies

If emergency first aid and/or medical treatment are required, decontamination procedures may be limited or omitted. If the contamination does not present a hazard to the rescue personnel, life-saving care may be instituted immediately. If contamination will present a risk to rescue personnel, minimal decontamination should be performed to allow initiation of aid. If contamination presents a significant risk to rescue personnel, then decontamination will need to be performed until the contamination no longer poses a risk.

Medical personnel should be notified prior to transporting the victim if the victim may be contaminated. Assurance must be made that the medical personnel at the receiving area are able and willing to handle a victim who is contaminated. Site personnel will accompany contaminated victims to the medical facility to advise on matters involving decontamination. A copy of this SSHP including applicable MSDSs will be brought along with the victim.

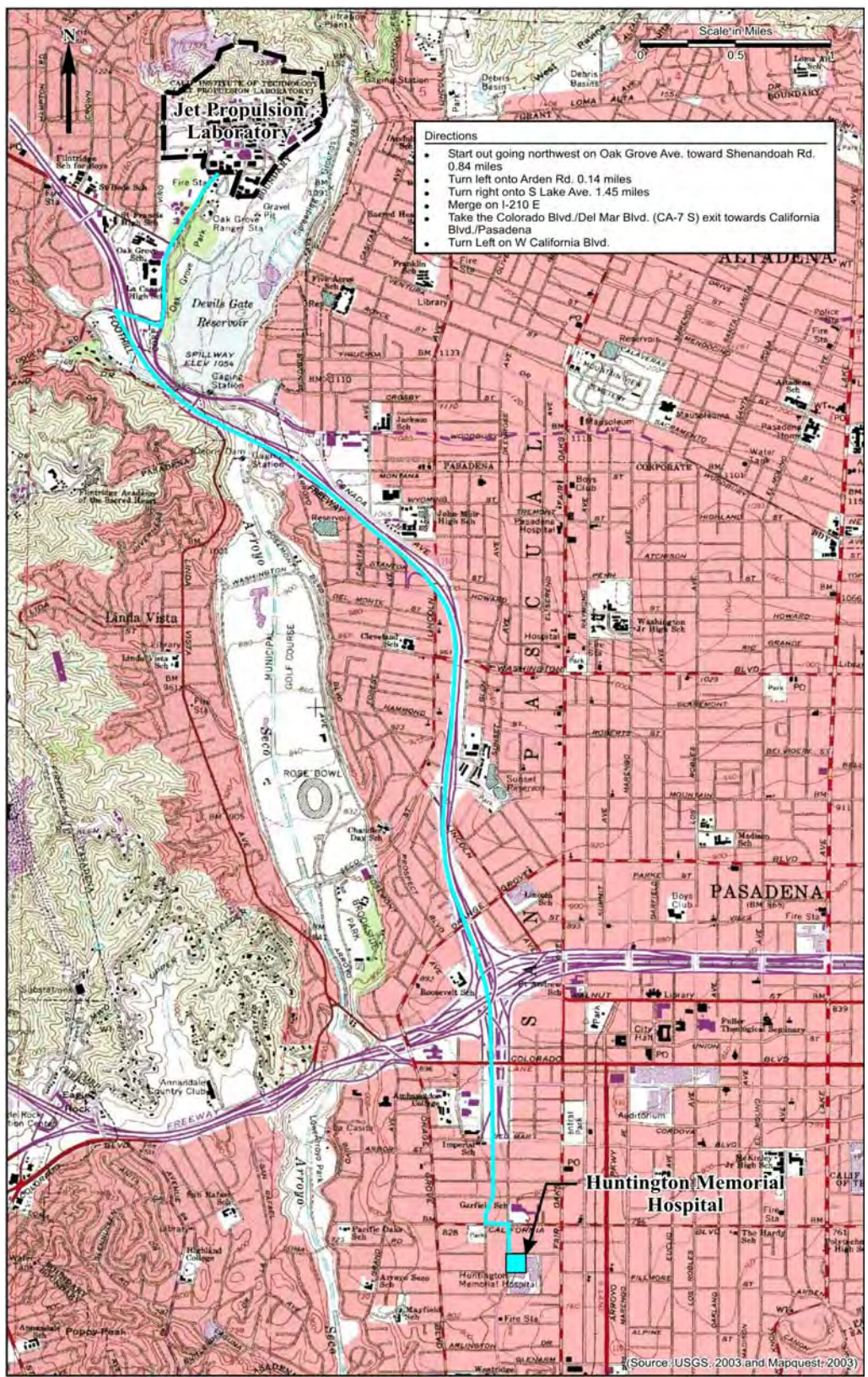


Figure 1. Hospital Location Map and Site Evacuation Route

Heat-related illnesses range from heat fatigue to heat stroke. Heat stroke requires prompt treatment to prevent irreversible damage or death. Protective clothing must be promptly removed. Less serious forms of heat stress also require prompt attention. Hazards associated with cold stress are not anticipated due to the project's geographic location.

Decontamination may be omitted or minimized and treatment begun immediately, unless the victim is obviously grossly contaminated. Only a qualified physician is allowed to treat inhalation exposure cases. If the contaminant has entered through the skin or the eyes, an emergency shower will be used for at least 15 minutes to rinse the affected area with water.

7.5 Emergency Assistance

The name, telephone number, and location of police, fire, and other emergency response agencies will be posted in the support zone. If emergency personnel are called to the site, efforts will be made to accommodate their safety operations.

Emergency Services

Ambulance	911
Fire Department	911
Highway Patrol	911
Police	911
Poison Control Center	(800) 222-1222
Dept. of Environmental Health Services	(800) 258-6942
National Response Center, Toxic Chemicals and Oil Spills	(800) 424-8802
NASA Security and Safety Officer	(818) 354-3530

Medical Centers

Huntington Memorial Hospital 100 W California Blvd. Pasadena, CA 91105-3010	(626) 397-5000
---	----------------

Verdugo Hills Hospital 1812 Verdugo Blvd Glendale, CA 91208-1407	(818) 790-7100
--	----------------

Battelle Personnel

Keith Fields, Project Manager	Office: (614) 424-7723 Mobile: (614) 778-2618
-------------------------------	--

Bernard Himmelsbach, CIH	Office: (614) 424-4302 Mobile: (614) 348-3408
--------------------------	--

Linc Remmert, HSO	Office: (614) 424-3678 Mobile: (614) 348-7279
-------------------	--

Dave Conner, SHSO	Office: (619) 574-4827 Mobile: (619) 726-7311
-------------------	--

Battelle (JPL) Field Office:	Phone: (626) 345-0598 Fax: (626) 345-0698
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8.0 SPILL AND DISCHARGE CONTROL

Spill and Discharge Control has been developed to prevent the contamination of soils, water, uncontaminated areas/surfaces, equipment or material by the unauthorized release of a hazardous substance or material. The California EPA Office of Emergency Services will be notified immediately of any spills or releases at (800) 260-3972.

The following spill control equipment will be made available at all times:

- Clay, kitty litter, or other appropriate spill absorbent material.
- 55-gallon drums.
- Shovels.
- Decontamination supplies and protective clothing.
- Eyewash station.

Regardless of the type of spill (liquid or solid), the following measures will be taken to isolate the spilled material(s):

- Isolate and contain the hazardous spill area.
- Restrict access of unauthorized personnel.
- Prevent contact with the spilled material.
- Relocate upwind and upgradient of the spilled material.

9.0 MEDICAL SURVEILLANCE

Battelle's Medical Surveillance Program is based on the requirements outlined in 29 CFR 1910.120 and 1910.1030.

9.1 Contents of Medical Examination

All Battelle and subcontractor project personnel working on-site will have undergone either a baseline or annual medical monitoring examination within 12 months prior to participation in fieldwork.

Medical screening is conducted prior to employment and annually thereafter, and consists of the following:

- Medical and occupational history
- Physical examination, with particular attention to the cardiopulmonary system, general physical fitness, skin, blood forming, hepatic, renal, and nervous systems:
 - Urinalysis
 - Blood analysis
 - Pulmonary function test.
- Additional tests, including:
 - Audiometric test
 - Vision test.

Medical approval is required for personnel who need to wear respiratory protection equipment. During the annual physical, the medical evaluator will determine an individual's physical fitness for respirator usage. Based on this examination, the physician will certify in writing whether the individual is capable of full participation in the program, or whether that person must work within certain restrictions. Personnel may be excluded from this project for medical reasons. Any person suffering a lost-time injury or illness must have medical approval prior to returning to work.

9.2 Record Keeping

All medical records must be maintained by the employer for a period of at least 30 years after the employee's termination of employment, in accordance with OSHA regulations on confidentiality and record keeping.

Prior to the initiation of work, subcontractors will submit copies of medical fitness certifications for each employee to be assigned to the site to the Battelle HSO/CIH. The certifications will state that the employee has received a medical examination within the previous 12 months and has been determined fit to perform on-site work.

10.0 TRAINING

As required by OSHA regulations (29 CFR 1910.120), all Battelle and subcontractor personnel involved in hazardous waste site operations are required to receive an initial 40 hours of health and safety training and receive refresher training annually. All site personnel will complete this general (not site-specific) training before assignment to the project. Battelle is responsible and accountable for ensuring that Battelle staff are trained and qualified to carry out their assigned responsibilities on this project.

In addition, the on-site management, supervisors and the SHSO will receive additional specialized hazardous waste operations management training. This training will include, but shall not be limited to, the following:

- The employer's Health and Safety program.
- Hazard Communication Program.
- Associated employee-training program.
- PPE program.
- Spill containment program.
- Health hazard monitoring procedures and techniques.
- CPR/First Aid Training and blood borne pathogens control.
- Fire Extinguisher Training.

The HSO or the SHSO will keep copies of the certification for the completion of all training for all site workers on-site in a file. Workers without such certification will not be allowed to work at the site. Prior to commencement of field operations at the project site, personnel will receive site-specific training (briefed in the tailgate safety meeting), this training will include a review of all information contained in this SSHP with particular emphasis on the following:

- Types and anticipated levels of hazardous substances known to be present on-site, their PELs, health effects, and exposure routes.
- The need for PPE.
- The importance of maintenance and attention to proper fit of PPE.
- Prescribed decontamination procedures.
- Safe work practices, such as proper site entry and egress, and proper hygiene during meal and rest breaks.
- Recognition, in oneself and others, of physical conditions requiring immediate medical attention, especially heat stress, and simple first aid application measures.
- Procedures to be followed in case of emergencies.

In addition to the 40-hour training, Battelle personnel involved in the field operations will have had at least three (3) days of supervised field experience, on similar kinds of projects.

11.0 ADVERSE WEATHER CONDITIONS

In case of adverse weather conditions, the Project Manager or SHSO will determine if work can continue without endangering the health and safety of the field workers. The SHSO will monitor the weather during the morning and afternoon hours and will document it in the field logbook. A battery-operated weather radio will be kept on-site.

Some of the items to be considered prior to determining the continuance of work are:

- Potential for heat/cold stress and heat/cold-related injuries.
- Dangerous weather-related working conditions (high winds, dust storms).
- Limited visibility.
- Potential for electrical storms/thunder lightening. No outdoor activities will be permitted during electrical storms.

12.0 REFERENCES

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- American Red Cross, Community First Aid and Safety Manual.
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- Opresko, D.M. 1994. Toxicity Summary for 1,2-Dichloroethane. Chemical Hazard Evaluation Group, Biomedical and Environmental Information Analysis Section, Health Sciences Research Division, Oak Ridge National Laboratory.
- United States Army Corps of Engineers (USACE). 2003. Safety & Health Requirements Manual, 385-1-1. November.
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- United States Environmental Protection Agency (U.S. EPA). 1992. *Standard Operating Safety Guides*. OSWER Directive 9285.1-01B, U.S. EPA, Office of Emergency and Remedial Response, Washington, D.C. June.
- United States Navy. 2001. *Navy/Marine Corps Installation Restoration Manual*, Revised April.

ATTACHMENT 1
HEALTH AND SAFETY FORMS

TAILGATE SAFETY MEETING FORM

Date: _____ Time: _____ Job Number: _____

Site Location: _____

Scope of Work: _____

SAFETY TOPICS PRESENTED

Projective Clothing/Equipment: _____

Chemical Hazards: _____

Physical Hazards: _____

Equipment Used: _____

Emergency Procedures: _____

Hospital: _____ Phone: _____ Ambulance Phone: _____

Hospital Address and Route: _____

Noise Impacts and Mitigation: _____

Odor Impacts and Mitigation: _____

Permits Required: _____

ATTENDEES

NAME PRINTED

SIGNATURE

Meeting Conducted by: _____

Signed by: _____

Site Safety Officer: _____

Construction Manager: _____

Daily Issues and Lessons Learned: _____

Daily Site Closure Actions: _____

Accident Incident Analysis

NOTE: This section to be filled in by Safety Health & Emergency Response and/or Environmental Protection		
Event Report Number:	IA Report Number:	OSHA Case Log Number:
OSHA Recordable: <input type="checkbox"/> Yes <input type="checkbox"/> No	Type of recordable: <input type="checkbox"/> LWD <input type="checkbox"/> RD <input type="checkbox"/> Other;	OSHA Reportable: <input type="checkbox"/> Yes <input type="checkbox"/> No
EPA Reportable Incident: <input type="checkbox"/> Yes <input type="checkbox"/> No	Mercury spill <input type="checkbox"/> Yes <input type="checkbox"/> No	Oil spill <input type="checkbox"/> Yes <input type="checkbox"/> No

SECTION I	Date of Incident (dd/mm/yyyy):	Time of Incident: AM PM	Date Reported:
Did Incident result in Injury to Battelle Staff or a Battelle supervised person <input type="checkbox"/> Yes <input type="checkbox"/> No (If yes fill out ALL sections. If no omit Section II.)			

SECTION II	Staff Member's Name:	Employee Identification Number:
Reporting Location:		Division:
Treatment at Time of Incident: <input type="checkbox"/> First Aid <input type="checkbox"/> EMT <input type="checkbox"/> Battelle Health Services <input type="checkbox"/> Other Medical Provider <input type="checkbox"/> No treatment at time of incident		Organization Code:
Injury Type (cut, bruise, strain, etc)		Location of Injury (hand, foot, etc)

SECTION III	Type of Incident: <input type="checkbox"/> Near-miss <input type="checkbox"/> Chemical Spill <input type="checkbox"/> Environmental Release <input type="checkbox"/> Property Damage <input type="checkbox"/> Injury/Illness <input type="checkbox"/> Other		
Name(s) of staff members involved:			
Job Assignment at Time of Incident:		Was this a routine part of the job? <input type="checkbox"/> Yes <input type="checkbox"/> No	
Time in Job Assignment: <input type="checkbox"/> 0-14 days <input type="checkbox"/> 15-90 days <input type="checkbox"/> 3 months to 1 year <input type="checkbox"/> 1 to 3 years <input type="checkbox"/> 4-10 years <input type="checkbox"/> more than 10 years			
Name(s) of witnesses:			
Describe What Happened: Describe in sufficient detail to allow the scene to be visualized by a reader. Attach additional pages if necessary.			

SECTION IV	
Causes(s)	Proposed/Planned Corrective Action(s)

SECTION V		
Manager's Comments/Actions:		
Staff Member Name and Date	Supervisor's Name and Date	Witness Name and Date
Other Investigator's Name and Date	Other Investigator's Name and Date	Witness Name and Date
SH&ER/Environmental Protection Comments/Actions:		
Manager (final review) Name and Date:	SH&ER/Environmental Protection Name and Date	

ATTACHMENT 2
SUBCONTRACTOR SAFETY OPERATIONS

INJURY & ILLNESS PREVENTION PROGRAM

**R C FOSTER CORPORATION
264 Corporate Terrace
Corona, CA 92882**

(951) 738-8211

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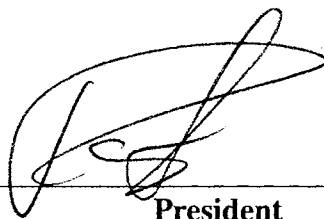
MANAGEMENT COMMITMENT

POLICY STATEMENT

We recognize that the safety of our employees is of the utmost importance. The Safety Program is designed to aid employees and management in adhering to safe standards in our work place. The ultimate company objective is to prevent accidents and injuries to all employees.

While it is the responsibility of management to maintain an effective level of compliance to safety standards, it is also the responsibility of all our employees to perform their jobs and conduct themselves in accordance with such standards. Working together, we can insure safe and healthy conditions for all employees. Therefore, each and every employee must be aware of, understand and participate in the Safety Program.

Our management is dedicated to the health and safety of all its employees. To this end, we will respond to unsafe conditions or practices. The successful operation of R C Foster Corporation will depend not only on sales and service, but also on how safely each job is performed. There is no job so important nor any service so urgent that we cannot take time to work safely. We consider the safety of our personnel to be of prime importance, and we expect your full cooperation in making our program effective.



President

DATE: 10-6-00

SAFETY PROGRAM

I. SAFETY PROGRAM OBJECTIVES

It is the Company's objective to provide a safe and healthful work environment through the prevention of occupational injuries and illness.

Our objective for the Safety Program will be to reduce injuries and illness to a minimum, with an ideal goal of ZERO accidents and injuries. Our Safety Program will include:

1. Establish and maintain a safe environment for employees
2. Conduct safety inspections to locate and correct unsafe working conditions or practices, to control health hazards, and to comply fully with the safety and health standards for every job
3. Training all employees in good safety and health practices
4. Providing, if necessary, personal protective equipment and instructions for its use and care
5. Providing mechanical and physical safeguards to the maximum extent possible
6. Developing and enforcing safety rules, and requiring that our employees observe these rules as a condition of employment
7. Investigating promptly and thoroughly every accident to locate the cause and correct the problem so it won't happen again
8. Promote and recognize safety consciousness and responsibility
9. Improve channels of communication
10. Establishment of procedures for emergency evacuation

II. RESPONSIBILITIES & INVOLVEMENT

We recognize that the responsibility for safety and health is a shared responsibility. As your employer, we accept the responsibility for leadership of the safety program and for its effectiveness and improvement, and for providing the safeguards to ensure safe working conditions.

Our Supervisors and management personnel are responsible for developing appropriate attitudes toward safety, and for ensuring that all operations are performed with the utmost regard for the safety of all personnel involved.

III. EMPLOYEE COMPLIANCE

As employees, you are responsible for cooperating with all aspects of the safety program, including complying with all rules and regulations, and continuously practicing safety while performing your duties.

To ensure the effective implementation of our program, employees must understand the following:

- No employee is expected to undertake a job until he or she has received instructions on how to perform it properly and safely, and has been authorized to perform the job.
- No employee should use chemicals without fully understanding their toxic properties, and without the knowledge required to work with them safely.
- Mechanical safeguards must always be in place and kept in place.
- Employees must report to a Supervisor or designated individual all unsafe conditions encountered during work without fear of reprisal.
- Any work-related injury or illness must be reported to your Supervisor immediately.
- Employees' duties consist of the following:
 1. Work in a safe manner by following safety rules and instructions.
 2. Be considerate of others in the workplace.
 3. Report hazards as seen by bringing safety matters to the attention of a Supervisor.
 4. Report to work rested and physically able to perform the work.
 5. Report to management any and all injuries you sustain.
 6. Support the safety effort by performing all duties in a safe manner.

Employees who follow safe and healthy work practices will have this fact recognized and documented on their performance reviews.

Disciplinary measures are progressive and involve four steps:

1. Should a safety and health violation be noted, the Supervisor will informally discuss the behavior with the employee, reviewing the potential for a dangerous result and outlining the correct procedure, then retraining the employee to ensure understanding.
2. A second violation should generate either a formal verbal warning or a written warning to the employee, depending on the severity.
3. The third infraction results in a formal written warning or suspension of the employee.
4. A fourth violation may lead to employee termination.

Willful violations of safe work practices may result in disciplinary action in accordance with Company policy.

IV. CORRECTING HAZARDS

Unsafe or unhealthy work conditions, practices or procedures shall be corrected in a timely manner based on the severity of the hazards. Hazards shall be corrected according to the following procedures:

1. When observed or discovered.
2. When an imminent hazard exists which cannot be immediately abated without endangering employee(s) and/or property, we will remove all exposed workers from the area except those necessary to correct the existing condition. Workers necessary to correct the hazardous condition shall be provided with the necessary protection.
3. All such actions taken and dates they are completed shall be documented on the appropriate forms.

When a hazard is discovered, no unauthorized employee is to correct the hazard. It should be reported at once to the management.

Imminent hazards are to be reported at once to management. No individual is to take it upon himself or herself to correct an imminent hazard.

V. COMMUNICATIONS

We recognize that open, two-way communication between management and staff on health and safety issues is essential to an injury-free, productive workplace. The following system of communication is designed to facilitate a continuous flow of safety and health information between management and staff in a form that is readily understandable and consists of one or more of the following items:

- New employee orientation including a discussion of safety and health policies and procedures.
- Review of our Injury & Illness Prevention Program.
- Workplace safety and health training programs.
- Regularly scheduled safety meetings.
- Effective communication of safety and health concerns between employees and supervisors, including translation where appropriate.
- Posted or distributed safety information.
- A system for employees to anonymously inform management about workplace hazards.

The results of the investigation of any employee safety suggestion or report of hazard will be distributed to all employees affected by the hazard or posted on appropriate bulletin boards.

We encourage employee participation and involvement by notifying department heads either in writing or verbally of any helpful suggestion, recommendation, or observation regarding safety without fear of reprisal. Your suggestion may be beneficial not only for your department, but may be applicable throughout the entire Company.

A SUGGESTION BOX for safety and health concerns is located _____
(location of box)

All safety and health suggestions will remain anonymous.

VI. INSPECTIONS

Each Supervisor and/or Safety Representative will conduct an inspection and/or investigation to identify unsafe work conditions and practices:

Periodic inspections are performed according to the following schedule:

1. Quarterly for Facility inspections.
2. Daily inspections when required for Equipment.
3. Daily inspections for required Construction tasks/operations.
4. Daily inspections of jobsite hazards.
5. When we initially established our Injury & Illness Prevention Program.
6. When new substances, processes, procedures or equipment, which present potential new hazards, are introduced into our workplace/jobsite.
7. When new, previously unidentified hazards are recognized.
8. When occupational injuries and illnesses occur.
9. When we hire and/or reassign permanent or intermittent employees to processes, operations, or tasks for which a hazard evaluation has not been previously conducted.
10. Whenever workplace/jobsite conditions warrant an inspection.

Periodic inspections consist of identification and evaluation of workplace hazards utilizing applicable sections of the Hazard Assessment Checklist/Inspection Forms and any other effective methods to identify and evaluate workplace hazards.

VII. TRAINING

All employees, including managers and supervisors, shall have training and instruction on general and job-specific safety and health practices. Training and instruction shall be provided as follows:

1. When the Injury & Illness Prevention Program is first established.
2. To all new employees.
3. To all employees given new job assignments for which training has not been previously provided.
4. Whenever new substances, processes, procedures or equipment are introduced to the workplace and represent a new hazard.
5. Whenever the Company is made aware of a new or previously unrecognized hazard.
6. To supervisors to familiarize them with the safety and health hazards to which workers under their immediate direction and control may be exposed.
7. To all employees with respect to hazards specific to each employee's job assignment.

Workplace safety and health training practices include, but are not limited to, the following:

1. Explanation of the Company's Injury & Illness Prevention Program, emergency action plan and fire prevention plan, and measures for reporting any unsafe conditions, work practices, and injuries.
2. Uses of appropriate clothing, including gloves, footwear, and personal protective equipment.
3. Information about chemical hazards to which employees could be exposed and other hazard communication program information.
4. Availability of toilet, hand-washing and drinking water facilities.
5. Provisions for medical services and first aid including emergency procedures.

In addition, the Company provides specific instructions to all employees regarding hazards unique to their job assignment, to the extent that such information was not already covered in other training.

The Safety Director or designee shall ensure that Supervisors receive training to familiarize them with the safety and health hazards to which employees under their immediate direction and control may be exposed.

New employee training is to be done by a competent Foreman/Supervisor. All employees are to be oriented on the checklist in the Orientation section of this manual. This checklist must be signed by a Supervisor. Where further training is needed or requested, the training form in the Training section of this manual shall be used.

No employee is allowed to work before training is completed. This includes completion of the new employee checklist, which is to be signed by the Supervisor/Foreman.

All new employees are to be provided an employee handout describing their rights and disciplinary action procedures if necessary.

A competent Supervisor/Foreman shall instruct all personnel assigned a new job on the possible hazards of the new assignment before the task is begun. If the new work involves any new substances, equipment, processes, or procedures, it is the responsibility of management or the Supervisor/Foreman to train all employees on the new hazards, substances, equipment, processes, or procedures.

New hazards are to be reviewed by management and the Supervisor/Foreman and a new code of safe practice is to be written. Training in this new hazard will be completed before an employee is involved in the task. All employees are to have full knowledge of the safety procedures of the task. All employees are to sign the attendance sheet of the training session of this new hazard.

Management and the Supervisor/Foreman are responsible for all training on the new hazard.

Supervisors are responsible to see that those under their direction receive training on general workplace safety as well as specific instructions with regard to hazards unique to any job assignment.

VIII. RECORD KEEPING

The Program Administrator or designee shall also keep documentation of safety and health training, attended by each employee, including employee name or other identifier, training dates, type(s) of training, and training providers. This documentation shall be maintained for three (3) years.

The Program Administrator or designee shall maintain the Log of Work-Related Injuries and Illnesses (Form 300, 300A and Form 301) to classify work-related injuries and illnesses and to note the extent and severity of each case. The Form 300A (Summary) will be posted by February 1 of the year following the year covered by the form and keep it posted until April 30 of that year.

ACCIDENT INVESTIGATION

The purpose of an investigation is to find the cause of an accident and prevent further occurrences, not to fix the blame. An unbiased approach is necessary to obtain objective findings.

I. ACCIDENT INVESTIGATION PROCEDURES

An accident investigation is the most important single tool for identifying the cause(s) of any accident. Accident investigations are after-the-fact attempts to determine why something went wrong. They are a systematic approach to establish relevant facts and interpretation regarding how and why an accident or injury occurred.

The accident facts revealed by a thorough accident investigation have both an immediate and a delayed value. The immediate value is in their usefulness in planning and implementing corrective action designed to prevent recurrence of the same or a similar accident. The delayed value lies in the cumulative knowledge of safety hazards and its use for prevention of future accidents.

Further, through the maintenance of accident and injury statistics and records, the Company intends to gather information and data necessary in determining accident causes and sources so as to formulate and/or revise policies and procedures for effective loss control.

Specific procedures should be developed to ensure accident investigations are conducted effectively and consistently. The following items should be considered when establishing accident investigation procedures.

- A. Most investigations are conducted by the injured employee's immediate Supervisor; however, management and committee or team investigations also are effective.
- B. If an incident occurs during working hours, an Incident Notification Form must be completed along with a State of California Employer's Report of Occupational Injury or Illness and Employee's Claim for Worker's Compensation Benefits. All three forms must be turned in to the Safety Director.
- C. Investigate all accidents, regardless of whether or not an injury resulted; non-injury accidents are considered near misses and provide valuable statistical information.
- D. Investigate the accident as soon after the occurrence as circumstances permit; the first concern of course is the treatment of the injured employee.
- E. Any accident, injury, or illness will be investigated by utilizing the Accident, Injury, and Illness Investigation Form along with the Analysis of Factors Contributing to Cause of Accident Form.
- F. The immediate Supervisor will review all accident investigations and recommendations generated to prevent recurrence and forward relevant forms to the Safety Director for processing.

INCIDENT NOTIFICATION

This form must be completed when an employee has been involved in an accident during work hours that might require medical treatment.

DATE OF INCIDENT _____

EMPLOYEE'S NAME _____
(print)

EXPLANATION OF INCIDENT:

Initial

I do feel that medical treatment is necessary at this time.

Initial

I do not feel that medical treatment is necessary at this time.

Employee's Signature _____ Date _____

Supervisor's Signature _____ Date _____

**ACCIDENT, INJURY & ILLNESS
INVESTIGATION FORM**

Person(s) Conducting Investigation: _____

Title(s): _____

Date of Accident/Injury/Illness: _____

Name(s) of Affected Employee(s): (1) _____

(2) _____ (3) _____

Nature of Accident/Injury/Illness: _____

Part(s) of Body Affected: _____

What Workplace Condition, Work Practice, or Protective Equipment Contributed to the Incident:

Was a Code of Safe Practice Violated? _____ If so, Which One? _____

What Corrective Accounts will Prevent Another Occurrence? _____

Was the Unsafe Condition, Practice, or Protective Equipment Problem Corrected Immediately? _____

If No, What Has Been Done to Ensure Correction? _____

Until Corrected, What Actions Have Been Taken to Prevent Recurrence? _____

Will the Inspection Checklist for the Area Require Modification to Prevent Recurrence? _____

If so, What Will Be Added? _____

Signature of Investigator _____ Date _____

Person Responsible for
Corrective Actions _____

SAFETY DIRECTOR

R C Foster Corporation has named Cathy Fernandez to have the overall responsibility of our Injury & Illness Prevention Program. The responsibilities are listed on the following page.

_____ is R C Foster Corporation's Competent Person.

The Safety Director's primary purpose is to create and maintain safety interest at all levels of employment. The Safety Director is also involved in continually monitoring and evaluating overall Company loss prevention efforts. The Safety Director will be responsible for reviewing all accident investigation reports and implementing needed controls to prevent recurrence. In addition, he/she will also be responsible for monitoring and evaluating employees and supervisory safety training activities. Permanent records, including minutes of all meetings, will be maintained by the Safety Director to permit a fair assessment of the effectiveness of the Safety Program.

The Safety Director's responsibility is to commit to implement an effective Injury and Illness Prevention Program and integrate it into the entire business operations. The Safety Director will oversee the program in its entirety and implement the Program into day-to-day business operations. Other supervisory personnel will be required to work closely with the Safety Director to ensure that the program is implemented throughout the Company.

Communications concerning occupational safety and health will include provisions for Management communication to employees and for employee communication to Management. Management will communicate safety information to employees in the form of Postings, Safety Meetings, and written documentation on company safety policies, company safety goals, office and shop safety guidelines, Hazard Communication guidelines and safety practices with outside vendors and contractors.

RESPONSIBILITIES

SUPERVISORS

Our Supervisors are the foundation of the safety program. Their responsibilities are to:

- 1. Familiarize themselves with company safety policies, programs, and procedures.**
- 2. Provide complete safety training to employees prior to the assignment of duties.**
- 3. Be aware of all safety considerations when introducing a new process, procedure, machine or material to the worker.**
- 4. Consistently and fairly enforce all company safety rules.**
- 5. Give maximum support to all programs and committees whose function is to promote safety and health.**
- 6. Investigate injuries to determine cause, then take action to prevent repetition.**
- 7. See that all injuries, no matter how minor, are treated immediately and referred to the Director of Safety to insure prompt reporting to the insurance carrier.**
- 8. Review serious accidents to ensure that proper reports are completed, and appropriate action is taken to prevent repetition.**
- 9. Inspect work areas often to detect unsafe conditions and work practices**
- 10. Attend all company safety meetings**

EMPLOYEES:

Our employees are responsible for safety including the following:

- 1. Adhere to all safety rules and regulations**
- 2. Wear appropriate safety equipment as required**
- 3. Maintain equipment in good condition with all safety guards in place when in operation.**
- 4. Report all injuries, no matter how minor, immediately to a Supervisor.**
- 5. Encourage co-workers to work safely.**
- 6. Report unsafe acts and conditions to the Director of Safety or a Supervisor.**

ACCESS TO MEDICAL AND EXPOSURE RECORDS

**BY CAL/OSHA REGULATION
- GENERAL INDUSTRY SAFETY ORDER 3204 -
YOU HAVE THE RIGHT TO SEE AND COPY:**

- **Your medical records and records of exposure to toxic substances or harmful physical agents.**
 - **Records of exposure to toxic substances or harmful physical agents of other employees with work conditions similar to yours.**
 - **Material Safety Data Sheets or other information that exists for chemicals or substances used in the workplace, or to which employees may be exposed.**
-
-

THESE RECORDS ARE AVAILABLE AT:

**R C FOSTER CORPORATION
264 Corporate Terrace
Corona, CA 92882**

**A COPY OF GENERAL INDUSTRY
SAFETY ORDER 3204 IS AVAILABLE FROM:**

Posting the above information is required by GISO 3204. This posting may be done by using of this placard or any similar method the employer chooses.

NOTICE TO EMPLOYEES

THIS EMPLOYER IS REGISTERED UNDER THE CA. UNEMPLOYMENT INSURANCE CODE, AND IS REPORTING WAGE CREDITS THAT ARE BEING ACCUMULATED FOR YOU TO BE USED AS A BASIS FOR

UNEMPLOYMENT INSURANCE

(Paid for entirely by EMPLOYERS' taxes)

DISABILITY INSURANCE

(Paid for entirely by WAGE EARNERS' taxes)

- **WHEN YOU ARE UNEMPLOYED AND READY, WILLING AND ABLE TO WORK, YOU MAY BE ELIGIBLE TO RECEIVE UNEMPLOYMENT INSURANCE.**

You must file a claim for Unemployment Insurance at the nearest Employment Development Department Office, and register for work.

- **IF YOU WORK LESS THAN YOUR NORMAL FULL-TIME HOURS, YOU MAY ALSO BE ELIGIBLE TO RECEIVE BENEFITS.**

You must file a claim for Unemployment Insurance at the nearest Employment Development Department Office.

- **WHEN YOU ARE UNABLE TO WORK BECAUSE OF SICKNESS, INJURY, OR PREGNANCY, YOU MAY BE ELIGIBLE TO RECEIVE DISABILITY INSURANCE BENEFITS.**

1. If this firm operates under an approved Voluntary Plan of Disability Insurance and you have chosen to be covered by it, claim forms should be obtained from your employer.
2. For state Disability Insurance, claim forms may be obtained from your doctor, hospital, or any Employment Development Department Office. The "First Claim" must be mailed not later than the 41st day after the first day for which benefits are payable if you are to receive credit from the time you first became disabled. Earlier filing will speed your payment.

- **GET FULL INFORMATION AT YOUR LOCAL EMPLOYMENT DEVELOPMENT DEPARTMENT OFFICE.**

CLAIMS SHOULD BE FILED PROMPTLY. YOU MAY LOSE BENEFITS TO WHICH YOU WOULD OTHERWISE BE ENTITLED IF YOU DELAY FILING OF YOUR CLAIM.

CODE OF SAFE PRACTICES

It is our policy that everything possible will be done to protect employees, customers and visitors from accidents. Safety is a cooperative undertaking requiring participation by every employee. Failure by any employee to comply with safety rules will be grounds for corrective discipline. Supervisors shall insist that employees observe all applicable Company, State and Federal safety rules and practices and take action, as it is necessary to obtain compliance.

To carry out this policy, employees shall:

GENERAL PRACTICES

1. Report all unsafe conditions and equipment to their supervisor or safety coordinator.
2. Report all accidents, injuries and illnesses to their supervisor or safety coordinator immediately.
3. Anyone known to be under the influence of intoxicating liquor or drugs shall not be allowed on the job while in that condition.
4. Horseplay, scuffling, and other acts which tend to have an adverse influence on the safety or well-being of the employees are prohibited.
5. Means of egress shall be kept unblocked, well lighted and unlocked during work hours.
6. In the event of fire, call for supervisor or sound alarm and evacuate.
7. Upon hearing the alarm, stop work safely, turn off machines and evacuate to the parking lot immediately. If the way is blocked evacuate to the street through the office area.
8. Only trained workers may attempt to respond to a fire or other emergency.
9. Exit doors must comply with fire safety regulations during business hours.
10. Stairways should be kept clear of items that can be tripped over and all areas under stairways that are egress routes should not be used to store combustibles.
11. Materials and equipment will not be stored against doors or exits, fire ladders or fire extinguisher stations.
12. Aisles must be kept clear at all times.
13. Work areas should be maintained in a neat, orderly manner. Trash and refuse are to be thrown in proper waste containers.
14. All spills shall be wiped up promptly.
15. Always use the proper lifting technique. Never attempt to lift or push an object that is too heavy. You must contact your supervisor when help is needed to move a heavy object.

(Continued on next page)

(GENERAL PRACTICES continued)

16. Never stack material precariously on top of lockers, file cabinets or other relatively high places.
17. When carrying material, caution should be exercised in watching for and avoiding obstructions, loose material, etc.
18. Do not stack material in an unstable manner.
19. Report exposed wiring and cords that are frayed or have deteriorated insulation so that they can be repaired promptly.
20. Never use a metal ladder where it could come in contact with energized parts of equipment, fixtures or circuit conductors.
21. Maintain sufficient access and working space around all electrical equipment to permit ready and safe operations and maintenance.
22. Do not use any portable electrical tools and equipment that are not grounded or double insulated.
23. All electrical equipment should be plugged into appropriate wall receptacles or into an extension of only one cord of similar size and capacity.
24. All cords running into walk areas must be taped down or inserted through rubber protectors to preclude them from becoming tripping hazards.
25. Inspect motorized vehicles and other mechanized equipment daily or prior to use.
26. Shut off engine, set brakes and block wheels prior to loading or unloading vehicles.
27. Inspect pallets and their loads for integrity and stability before loading or moving.
28. Do not store compressed gas cylinders in areas which are exposed to heat sources, electric arcs or high temperature lines.
29. Do not use compressed air for cleaning off clothing unless the pressure is less than 10 psi.
30. Identify contents of pipelines prior to initiating any work that affects the integrity of the pipe.
31. Wear hearing protection in all areas identified as having high noise exposure.
32. Face Shields must be worn when grinding.
33. Do not use any faulty or worn hand tools.
34. Guard floor openings by a cover, guardrail, or equivalent.
35. Do not enter into a confined space unless tests for toxic substances, explosive concentrations, and oxygen deficiency have been taken.
36. Always keep flammable or toxic chemicals in closed containers when not in use.
37. Do not eat in areas where hazardous chemicals are present.

(Continued on next page)

(GENERAL PRACTICES continued)

38. **Be aware of the potential hazards involving various chemicals stored or used in the workplace.**
39. **Cleaning supplies should be stored away from edible items on kitchen shelves.**
40. **Cleaning solvents and flammable liquids should be stored in appropriate containers.**
41. **Solutions that may be poisonous or not intended for consumption should be kept in well-labeled containers.**

CODE OF SAFE PRACTICES

AIR / JACKHAMMER (Electric/Air powered)

JOB SUMMARY: Use Jackhammer.

SKILLS REQUIRED: Able to follow directions. Basic knowledge of compressed air.

JOB HAZARDS: Repetitive wrist, shoulder and arm movements.
Lifting, twisting and turning motions.

SAFETY

EQUIPMENT

REQUIRED: Hard-toed boots. Goggles. Gloves. Earplugs/muffs. Hard hat may be required.

SAFE CONDITIONS:

Employees shall be properly instructed on the hazards of their work and of safe practices by bulletins, printed rules, verbal instructions and periodic safety meetings.

SAFE PRACTICES

1. Appropriate footwear should be worn (hard-toed boots).
2. Make sure compressor is in good working order.
3. All hoses to be secured and without leaks.
4. 3 minute breaks should be taken every 15 minutes.
5. Back stretching exercise to be done every break.
6. Prior to starting work, check for underground utilities.
7. Follow all Company safety rules and policies.
8. Employees must report all unsafe conditions immediately to a Supervisor.
9. No horseplay is permitted.
10. Clean worksite conditions must be maintained at all times.
11. All Personal Protective Equipment (PPE) required by State or Federal Regulation must be worn.
12. All equipment guards required by State and Federal Regulations must be in place.
13. Report all accidents immediately to a Supervisor.
14. Use Lockout/Tagout/Blockout procedures when required by State or Federal Regulation.
15. Inspect equipment prior to each use.
16. Only operate equipment that you have been trained and authorized to use.
17. All electrical wiring shall be to code and maintained in safe condition.
18. Use proper lifting techniques.
19. Only qualified personnel can perform maintenance services.
20. Follow all Manufacturers safety guidelines.
21. Do not operate equipment under the influence of altering prescription drugs, illegal drugs and/or alcohol.
22. Ensure that all Warning, Caution and Danger signs are in place.

CODE OF SAFE PRACTICES

CRANES (ALL TYPES)

1. Do not stand or walk under loads suspended from cranes.
2. Do not stand or walk under the empty hook of a crane.
3. Do not go on any crane or crane runway for any purpose without permission from the supervisor in charge of crane operations, and then follow the procedure established for going on such cranes or such runways.
4. No one except those employees authorized or designated shall be allowed to operate cranes.
5. Wherever practicable, hookers shall walk ahead of loads carried by cranes.
6. Crane man and hookers shall see that workmen are in the clear before making or placing a lift.
7. A crane man shall not make a lift nor move his crane regardless of signals if someone is in a position to be injured.
8. No lift shall be made with wire rope or chain slings while magnet or other lifting equipment is still attached to the hook being used for the lift.
9. No crane load shall be moved without standard hand signals from a properly designated person. He shall take signals from one man only. Pictures showing standard crane signals are on the following pages.
10. When loads are being unloaded or loaded by crane, the workman shall maintain a minimum clearance of 8' from the lift at all times while the lift is in motion until such time as the lift is stationary and no higher than one foot above the blocking.
11. The movement of the lift shall be made at right angles to the side of the car being loaded or unloaded and never directly toward the workman in the car.
12. If there is less than 8' clearance between the workman and the lift, the workman shall get out of the car.
13. If material is being loaded or unloaded with a magnet, the workman shall get out of the car.
14. All hookers and other employees shall be outside the car when dirt boxes, pans, clamshells, or similar equipment is being hoisted from, or lowered into cars. The only time workman are permitted in the car is when they are resetting or hooking up equipment. This covers operations of all cranes handling this equipment.
15. Shall not ride on crane hooks, bails, or loads being carried by cranes.
16. Wire rope and chain slings shall not be knotted or twisted for lifting purposes.
17. LISTEN for the siren or other signaling devices; their purpose is to warn you of approach of the crane.

(Continued on next page)

(CRANES continued)

18. Hookers of other employees giving crane signals shall see that no one is in a position to be injured before signaling for lifts to be raised or lowered and shall keep anyone from getting close to lift while operations are being performed.
19. Keep all parts of the body in the clear of lifts while tension is being applied. After tension is placed on the lift, everyone shall get in the clear.
20. Shall not use their feet to hold cables or chains in place while hoist is being raised or lowered or to steady or guide lifts.
21. When on duty, remain in the crane cab ready for prompt service.
22. Never go on top of the crane, or permit any one else to do so, without first opening the main power disconnect switch and locking it "off" with a padlock.
23. Before traveling the trolley or the crane bridge, be sure that the hook is high enough to clear obstacles.
24. Never permit your crane to bump into another crane.
25. Examine the crane at the start of every shift for loose or defective gears, keys, runways, railings, warning bells, signs, switches, sweep-brushes, cables, etc., and report defects. Make sure the crane is kept clean and well lubricated.
26. While hoisting equipment is in operation, the operator should not be permitted to perform any other work, and he should not leave his position at the controls until the load has been safely landed or returned to ground level.
27. Do not carry a load over men on the floor; sound the gong or siren when necessary.
28. If the power goes off, move the controller to OFF position until power is available again.
29. See that the fire extinguisher on the crane is kept filled and in good condition.
30. Do not operate a crane if you are not physically fit to do so. If you are ill report to your foreman.
31. Do not drag slings, chains, or load block. After the load is taken off, do not move the crane until you have lowered the hook and the hook-on man has hooked up the chain or sling.
32. If you are asked to do something that seems unsafe, call your foreman or the repairman in charge for advice.
33. Before leaving the cab, open the main switch. Make sure the magnet or hook is empty and the magnet-controller (if any) is off. Lock, or otherwise secure equipment, to prevent starting by unauthorized persons.
34. When parking an outside crane at the end of the shift, always set the brake or chain the crane to the track. Lower booms to ground level or secure them against displacement by wind or other outside forces.

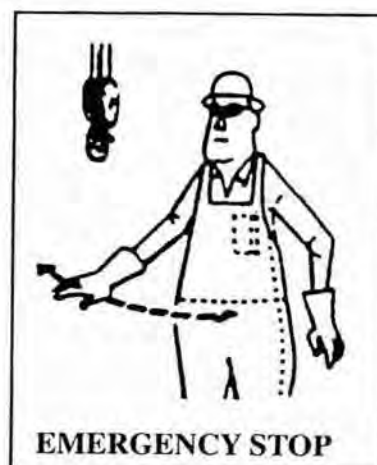
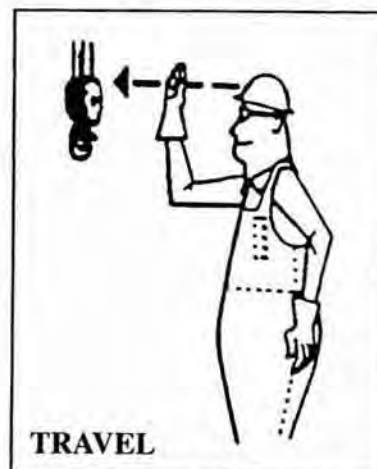
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(CRANES continued)

35. **Stop operation and open the power switch if your crane fails to respond correctly. Then call your foreman. Attempting to get out of difficulty by repeated operation may make the condition worse instead of better.**
36. **Whenever a slack line condition occurs, prior to further operations, check the proper seating of the rope in the sheaves and on the drum.**
37. **Never pick up a load beyond the rated load capacity of the crane. In case of doubt, call the foreman.**
38. **Never move the load or the crane unless you are sure that you understand the floor signal.**
39. **When there are several hook-on men, obey the signals of the head hooker only.
(Obey an EMERGENCY stop signal given by anyone.)**
40. **When raising or lowering the load, see that it safely clears adjacent stockpiles or machinery.**
41. **Never leave a load suspended.**

CODE OF SAFE PRACTICES

STANDARD CRANE SIGNALS

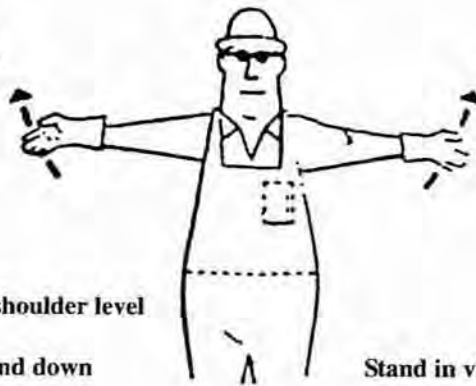


CODE OF SAFE PRACTICES

STANDARD CRANE SIGNALS



OPEN CLAMSHELL



- Arms extended shoulder level
- Hands cupped
- Move arms up and down

Stand in view of crane operator



POWER OFF



- Left arm extended overhead
- Hands open
- Palm, front
- Hold position rigidly

Stand in view of crane operator

CODE OF SAFE PRACTICES

STANDARD CRANE SIGNALS

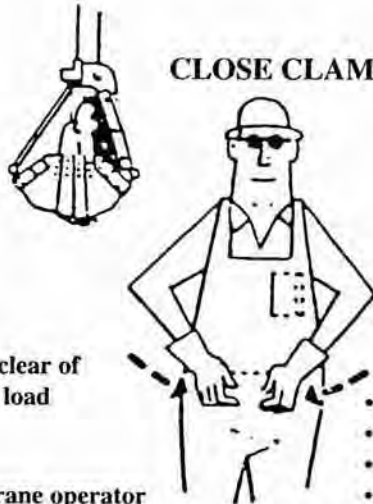
POWER ON



Make sure all men are clear of boom, block, hook and load

- Left arm extended overhead
- Hands clenched
- Fingers front
- Hold position rigidly

CLOSE CLAMSHELL



Make sure all men are clear of boom, block, hook and load

Stand in view of crane operator

- Forearms front
- Hands cupped
- Finger tips touching
- Swing arms open and closed

CODE OF SAFE PRACTICES

STANDARD MOBILE CRANE SIGNALS

RAISE HOOK

- Left arm extended
- Forearm vertical
- Forefingers pointing up
- Move hand in small horizontal circle



Stand in view of crane operator

LOWER HOOK

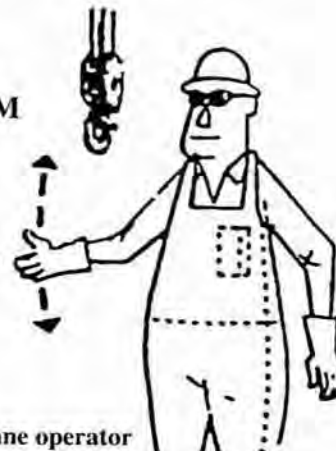
- Left arm extended
- Hand below hip
- Palm down
- Wave forearm down and up



Make sure all men are clear of boom, block, hook and load

RAISE BOOM

- Right arm extended shoulder level
- Fingers clenched
- Thumb pointing upward
- Move arm up and down



Stand in view of crane operator

CODE OF SAFE PRACTICES

STANDARD MOBILE CRANE SIGNALS

LOWER BOOM

- Right arm extended shoulder level
- Fingers clenched
- Thumb pointing downward
- Move arm down and up



SWING BOOM

- Right arm extended shoulder level
- Forefinger pointing direction of swing



Stand in view of crane operator

RAISE BOOM – LOWER HOOK

- Right arm extended shoulder level
- Fingers clenched
- Thumb pointing upward
- Move arm up and down
 - Left arm extended
 - Hand below hip
 - Palm down
 - Wave forearm down and up



Make sure all men are clear of boom, block, hook and load

CODE OF SAFE PRACTICES

STANDARD MOBILE CRANE SIGNALS

LOWER BOOM – RAISE HOOK



Make sure all men are clear of boom, block, hook and load

- Right arm extended shoulder level
- Fingers clenched
- Thumb pointing downward
- Move arm down and up
 - Left arm extended
 - Forearm vertical
 - Forefinger pointing up
 - Move hand in small horizontal circle

RAISE BOOM – HOLD HOOK



- Right arm extended shoulder level
- Fingers clenched
- Thumb pointing upward
- Move arm up and down
 - Left arm extended
 - Hand open
 - Palm down level with hip
 - Hold left arm position rigidly

Stand in view of crane operator

CODE OF SAFE PRACTICES

STANDARD MOBILE CRANE SIGNALS



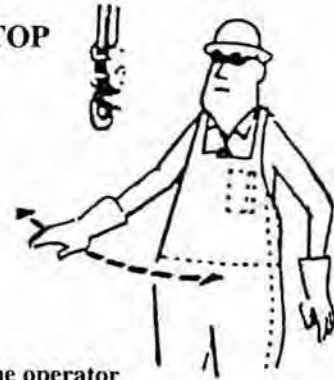
STOP

- Right arm extended
- Hand open
- Palm down level with hip
- Hold position rigidly

Make sure all men are clear of boom, block, hook and load

EMERGENCY STOP

- Right arm extended
- Hand open
- Palm down level with hip
- Move forearm rapidly right and left



Stand in view of crane operator









TRAVEL

- Right arm extended slightly
- Forearm raised
- Hand open
- Wave forearm in direction of travel while facing in that direction

Make sure all men are clear of boom, block, hook and load

CODE OF SAFE PRACTICES

RATED CAPACITIES

RATED CAPACITIES FOR IMPROVED PLOW STEEL, INDEPENDENT WIRE ROPE CORE, WIRE ROPE AND WIRE ROPE SLINGS.																		
Nominal Size of Wire Rope (in.)	Choker Hitch 			Single Vertical Hitch 			Basket Hitch 			2 Leg Hitch								
										60° 			45° 			30° 		
6 x 37 Classification																		
	A	B	C	A	B	C	A	B	C	A	B	C	A	B	C	A	B	C
1 1/4"	9.9	9.2	7.9	13.	12.	10.	26.	24.	21.	23.	21.	18.	19.	17.	15.	13.	12.	10.
1 3/8"	12.	11.	9.6	16.	15.	13.	32.	29.	25.	28.	25.	22.	22.	21.	18.	16.	15.	13.
1 1/2"	14.	13.	11.	19.	17.	15.	38.	35.	30.	33.	30.	26.	27.	25.	21.	19.	17.	15.
1 3/4"	19.	18.	15.	26.	24.	20.	51.	47.	41.	44.	41.	35.	36.	33.	29.	26.	24.	20.
2"	25.	23.	20.	33.	30.	26.	66.	61.	53.	57.	53.	46.	47.	43.	37.	33.	30.	26.
2 1/4"	31.	29.	25.	41.	38.	33.	83.	76.	66.	72.	66.	57.	58.	54.	47.	41.	38.	33.

(A) Socket or Swaged Terminal Attachment.
 (B) Mechanical Sleeve Attachment.
 (C) Hand Tucked Splice Attachment.

Reference – Union Wire Rope

CODE OF SAFE PRACTICES

WELDING AND BURNING EQUIPMENT AND COMPRESSED GASES

1. No employee is permitted to operate a hand or machine torch, a lance, or electric arc welding equipment until he or she has been trained and authorized to perform each of the individual operations. Exceptions would be during training.
2. Gas, oil, and other lines or containers which contained flammable material must be thoroughly purged and tested for explosibility by approved testing equipment before any burning or welding is done on such lines or containers.
3. When burning or welding, never use any container as a workbench or support that holds or held a flammable material.
4. Oxygen, acetylene, air, or any others gas cylinders must be placed in storage racks or securely fastened to equipment at all times. These cylinders must never be stored near stoves, radiators, or furnaces, where they could be subjected to high temperatures.
5. Gas cylinders must be stored and used in a vertical position with the valve end up. They must not lie flat.
6. All oxygen, acetylene, or any other gas cylinders must be kept free of oil or grease.
7. Always replace caps on oxygen and other compressed gas cylinders after gauges have been removed. This includes full and empty cylinders. This will protect the valve from being damaged, and may prevent a serious accident, which could occur as a result of a broken valve.
8. Oxygen and acetylene cylinders must be stored a distance of at least 20 feet from each other.
9. Flash arrestors must be used to prevent back flow on oxygen and acetylene type cylinders and/or other reactive or flammable cylinders respectively.
10. Proper ventilation must be maintained at all times.
11. Do not take welding cylinders into confined space areas.
12. Remove all flammables and combustibles from welding and burning areas when possible.
13. Perform fire watch when flammables and combustibles cannot be removed from the welding and burning areas.

CODE OF SAFE PRACTICES

CONFINED SPACE

(HAZARDOUS WORK ATMOSPHERES AND OXYGEN DEFICIENCY/COMBUSTIBLE/TOXIC)

- 1. No person is permitted to enter a confined space without the required training and a confined space entry permit. The permit is an authorization and approval in writing that specifies the location and type of work to be performed. It also certifies that existing hazards be evaluated by an authorized person and necessary protective measures taken to ensure workers safety.**
- 2. A confined space is defined as space that is large enough for a person to enter and perform work, may have limited or restricted means for entry and exit, and is not designed for continuous human occupancy.**
- 3. It contains, or has known potential to contain, a hazardous atmosphere, a material with the potential for engulfment, any other recognized, or potentially serious safety or health hazard.**
- 4. Confined spaces include, but are not limited to, tanks, process vessels, pits, boilers, ventilation and exhaust ducts, sewers, tunnels and trenching pipe lines.**

CODE OF SAFE PRACTICES

GENERAL RULES FOR CONSTRUCTION

1. All conditions from construction, alteration, demolition and/or repair including painting and decorating that no contractor or sub-contractor for any part of contract work shall require any laborer or mechanic employed in the performance of the contract to work in surroundings or under working conditions which are unsanitary, hazardous, or dangerous to his/her health or safety.
2. All equipment, materials and job sites should be regularly inspected for safety.
3. All employees must be competently trained and/or have experience to operate equipment or machinery.
4. All employees should be aware of hazards presented by materials, equipment and job sites.
5. Personal protective devices - all employees must wear the proper equipment for the job site and task at hand.
6. All employees must wear hearing protection on job sites exceeding 85 DBA. (Decibel level.)
7. All employees must wear respiratory protection when dust exceeds limits specified by General Industry Safety Order.
8. All employees should be aware of occupational hazards in construction industry.
9. First Aid kits shall be provided on all job sites.
10. All job sites must supply potable drinking water and adequate washing facilities.
11. One toilet is required for every 20 employees where there if no transportation. Toilets must be cleaned and supplied with toilet paper.
12. Fire protection materials must be portable and located 75 feet from all working areas: fire extinguisher must meet specifications for job at hand.
13. Construction site must have person certified in First Aid.

CODE OF SAFE PRACTICES

PERMITS, CERTIFICATIONS AND LICENSES

DOSH PERMIT IS REQUIRED FOR:

(California Only)

1. Construction of trenches or excavation 5 feet or more in depth into which a person is required to descend.
2. Construction of buildings, structures, scaffolding or false work more than 3 stories high (36 feet).
3. Operation of tower cranes or erection, climbing and dismantling.
4. Demolition of buildings or structures or dismantling of scaffolding or false work more than 3 stories.
5. Any handling use or disruption of asbestos exceeding .05%.
6. Any use of carcinogens.
7. Check with the closest DOSH office for additional permits.

CERTIFICATION:

1. Forklift operators.
2. Cranes and derricks exceeding 3 tons rated capacity.
3. Powder activated tool - must be valid operator.
4. Check with the closest DOSH office for additional requirements.

TO CARRY ON-SITE:

1. Job-Site Safety Manual (IIPP) with Code of Safe Practices.
2. MSDS-Hazard Communication Program.
3. Contingency Plan.

CODE OF SAFE PRACTICES

CONSTRUCTION HOUSEKEEPING

1. **Scrap lumber and debris must be kept reasonably cleared from work surfaces passageways and stairs. Combustible debris must be removed at regular intervals.**
2. **Ground areas within 6 feet of buildings must be reasonably free from irregularities.**
3. **Piles of debris must be stacked in a safe manner preventing falling, slipping or collapsing. Not to exceed 15 feet in height (5 feet for cement).**
4. **Keep flammables and chemical products stored in compliance with Local, State and Federal regulations.**
5. **Maintain compliance with all Storm Water regulations.**
6. **All nails shall be removed from debris.**

CODE OF SAFE PRACTICES

CONSTRUCTION SIGNS, SIGNALS AND BARRICADES

1. **Danger signs should be used when an immediate hazard exists.**
2. **Caution signs should be used only to warn against potential hazards or to caution against unsafe practices.**
3. **Construction sites that may be hazardous to the laymen must be posted with "Authorized Personnel Only" where barricades are not feasible.**
4. **Signaling must be done when there is auto traffic or foot traffic that would be moving in a hazardous job site location. The flagmen must use and wear the proper equipment (orange vest) and materials (ANSI standards).**
5. **Barricades for protection of employees, pedestrians and vehicles must be used to obstruct passage in hazardous areas.**
6. **Ensure that all Warning, Caution and Danger signs are in place for compliance with Local, State and Federal regulations.**

CODE OF SAFE PRACTICES

EXTENSION LADDERS

1. Do not use defective ladders. All portable ladders must be equipped with safety shoes, metal spikes, or spurs, whichever is applicable to the condition under which the ladder is being used, or else the bottoms of the ladders must be held, tied or securely anchored to prevent slipping.
2. Since they are conductive, metal ladders must not be used around electrical circuits or in places where they may come in contact with such circuits. Metal ladders must be marked with signs or decals reading "Caution - Do Not Use Near Electrical Equipment."
3. Use ladders properly. Hold on with both hands when going up or down. Always face the ladder when ascending or descending. Do not climb higher than the third rung from the top on straight or extension ladders or the second tread from the top on stepladders.
4. Inspect Ladders Carefully Before Use:
 - Check rungs, rails, and feet for damage or missing parts.
 - Check surfaces for grease, oil or the like.
 - Check all working parts.
 - Check all hinges, bolts, ropes, etc. for safe working condition.
 - Tag all defective ladders.
5. Setting Up A Ladder Safely:
Extension Ladders and Stepladders
 - The base should be one foot away from vertical support for every 4 feet of height. (extension)
 - Check for sturdy support.
 - Check for level and secure footing.
 - Make sure ladder is tied down properly (extension ladder).
 - If in high traffic area, use barricades.
 - Be sure the ladder is not near power lines. No use of metal ladders near electricity.
 - Make sure all locking devices are set.
 - Don't set up ladder or climb unless you are qualified and trained.
6. Climbing Safely With Ladders:
 - Clean hands and shoes off all slippery substance.
 - Use both hands and face forward and grasp rungs not the side-rails. (extension ladder)
 - Take one step at a time.
 - Carry small tools in a work belt or hoist larger tools with a hand-line.
7. General Safety For Ladders:
 - Keep one hand on ladder at all times or use a safety harness. (3 points of contact.)
 - Never reach too far to one side. Keep your body within side rails.
 - Never climb higher than second rung from the top of a stepladder - third rung on extension ladders. Ladders must extend three rungs above the point being accessed.
 - One person on a ladder at a time.
 - Don't use a ladder in strong winds.
 - Don't try to shift ladder to another position while you are on it.
 - Don't use metal ladder near electrical circuits. Metal ladders should be marked with a caution sign about working near electricity.

CODE OF SAFE PRACTICES

COMPRESSOR

JOB SUMMARY: Compresses air.

JOB HAZARDS: Compressed air.

**SAFETY
EQUIPMENT
REQUIRED:** Safety glasses. Earplugs when applicable.

SAFE CONDITIONS:

Employees shall be properly instructed on the hazards of their work and of safe practices by bulletins, printed rules, verbal instructions and periodic safety meetings.

SAFE PRACTICES

1. Compressors on wheels must be prevented from rolling.
2. Safety valves must be popped weekly on portable compressors.
3. Tank must be drained daily on portable compressors.
4. Air tanks require DOSH permit.
5. Do not exceed P.S.I. levels for compressor or type of work being performed.
6. Follow all Company safety rules and policies.
7. Employees must report all unsafe conditions immediately to a Supervisor.
8. No horseplay is permitted.
9. Clean worksite conditions must be maintained at all times.
10. All Personal Protective Equipment (PPE) required by State or Federal Regulation must be worn.
11. All equipment guards required by State and Federal Regulations must be in place.
12. Report all accidents immediately to a Supervisor.
13. Use Lockout/Tagout/Blockout procedures when required by State or Federal Regulation.
14. Inspect equipment prior to each use.
15. Only operate equipment that you have been trained and authorized to use.
16. All electrical wiring shall be to code and maintained in safe condition.
17. Use proper lifting techniques.
18. Only qualified personnel can perform maintenance services.
19. Follow all Manufacturers safety guidelines.
20. Do not operate equipment under the influence of altering prescription drugs, illegal drugs and/or alcohol.
21. Ensure that all Warning, Caution and Danger signs are in place.

CODE OF SAFE PRACTICES

CEMENT MIXER

- JOB SUMMARY:** Mixes cement.
- SKILLS REQUIRED:** Able to follow directions. Good attitude. Safety conscious.
- EMOTIONAL STANDARDS:** Detail oriented. Ability to count pieces. Ability to mentally handle repetitive work.
- PHYSICAL STANDARDS:** Ability to stand for long periods on hard surfaces.
- JOB HAZARDS:** Repetitive wrist, shoulder and arm movements. Twisting and turning motions.
- SAFETY EQUIPMENT REQUIRED:** Safety glasses. Respirators. Earplugs when applicable.

SAFE CONDITIONS:

Employees shall be properly instructed on the hazards of their work and of safe practices by bulletins, printed rules, verbal instructions and periodic safety meetings.

SAFE PRACTICES

1. The auger must be fully guarded and 5 inches away from the guard when auger is rotating.
2. Follow all Company safety rules and policies.
3. Employees must report all unsafe conditions immediately to a Supervisor.
4. No horseplay is permitted.
5. Clean worksite conditions must be maintained at all times.
6. All Personal Protective Equipment (PPE) required by State or Federal Regulation must be worn.⁷⁶
7. All equipment guards required by State and Federal Regulations must be in place.
8. Report all accidents immediately to a Supervisor.
9. Use Lockout/Tagout/Blockout procedures when required by State or Federal Regulation.
10. Inspect equipment prior to each use.
11. Only operate equipment that you have been trained and authorized to use.
12. All electrical wiring shall be to code and maintained in safe condition.
13. Use proper lifting techniques.
14. Only qualified personnel can perform maintenance services.
15. Follow all Manufacturers safety guidelines.
16. Do not operate equipment under the influence of altering prescription drugs, illegal drugs and/or alcohol.
17. Ensure that all Warning, Caution and Danger signs are in place.

CODE OF SAFE PRACTICES

FRAMERS LAYOUT

- JOB SUMMARY:** Chalking lines to help guide builders.
- SKILLS REQUIRED:** Ability to follow instructions. Safety conscious. Good attitude.
- EMOTIONAL STANDARDS:** Detail oriented. Ability to stay with job until completed. Repetitive work.
- PHYSICAL STANDARDS:** Must have strong physical capacity. Agility needed to lift with legs rather than back.
- HAZARDS:** Repetitive lifting, twisting, pushing, or pulling. Bending over. Continuous standing on hard surfaces. Repetitive shoulder and arm motions.
- SAFETY EQUIPMENT REQUIRED:** Fall protection. Harness when required.

SAFE CONDITIONS:

Employees shall be properly instructed on the hazards of their work and of safe practices by bulletins, printed rules, verbal instructions and periodic safety meetings.

SAFE PRACTICES

1. When using ladders make sure to inspect and secure ladder before using. Know ladder safety.
2. Do not climb higher than the third rung from the top of straight ladders, second step on step ladders.
3. Warning: When working alone and snapping lines, one has a tendency to walk backwards looking back at secure end. Do not walk backwards.
4. Secure end of snap line, walk with line at your side with your eyes focused at the end where you will need to snap the line.
5. Make sure your body is evenly placed within a 90-degree angle of area to be snapped.
6. Follow all Company safety rules and policies.
7. Employees must report all unsafe conditions immediately to a Supervisor.
8. No horseplay is permitted.
9. Clean worksite conditions must be maintained at all times.
10. All Personal Protective Equipment (PPE) required by State or Federal Regulation must be worn.
11. All equipment guards required by State and Federal Regulations must be in place.
12. Report all accidents immediately to a Supervisor.
13. Use Lockout/Tagout/Blockout procedures when required by State or Federal Regulation.
14. Inspect equipment prior to each use.
15. Only operate equipment that you have been trained and authorized to use.
16. All electrical wiring shall be to code and maintained in safe condition.
17. Use proper lifting techniques.
18. Only qualified personnel can perform maintenance services.
19. Follow all Manufacturers safety guidelines.
20. Do not operate equipment under the influence of altering prescription drugs, illegal drugs and/or alcohol.
21. Ensure that all Warning, Caution and Danger signs are in place.

CODE OF SAFE PRACTICES

FRAMERS FLOOR AND CEILING JOIST

- JOB SUMMARY:** Supports for floor and ceiling.
- SKILLS REQUIRED:** Ability to follow instructions. Safety conscious. Good attitude.
- EMOTIONAL STANDARDS:** Detail oriented. Ability to stay with job until completed. Repetitive work.
- PHYSICAL STANDARDS:** Must have strong physical capacity.
Agility needed to lift with legs rather than back.
- HAZARDS:** Repetitive lifting, twisting, pushing, or pulling. Repetitive shoulder/arm motions.
Bending over. Continuous standing on hard and uneven surfaces.
- SAFETY EQUIPMENT REQUIRED:** Fall Protection. Harness when required. Eye and ear protection when applicable.

SAFE CONDITIONS:

Employees shall be properly instructed on the hazards of their work and of safe practices by bulletins, printed rules, verbal instructions and periodic safety meetings.

SAFE PRACTICES

1. Electrical extension cords to be in good condition.
2. When using ladders make sure to inspect and secure ladder before using. Know ladder safety.
3. Do not climb higher than the third rung from the top of straight ladders and second step on step ladder.
4. When stacking wood or parts be sure to stack properly, checking for proper height and stability. Do not put excessive weight on joist, rafters.
5. When working with joist, always try to walk on doubled headers, doubled floor joists or girder.
6. Make sure skill saw is secure and extension cord is out of the way of traffic or path.
7. Skill saw to have guard on at all times. Do not pin guard.
8. Extension cords to be in good physical shape.
9. Make sure no one is below when cutting, so the excessive wood won't fall on someone. Caution tape area when required.
10. Always make sure joists on the top plate fall on the center of a stud.
11. Joists are to be rolled out from center of floor to joist header.
12. Use Fall Protection when required.
13. Stack all material securely.
14. Walk on secure platforms or top plate only.
15. Follow all Company safety rules and policies.
16. Employees must report all unsafe conditions immediately to a Supervisor.

(Continued on next page)

CODE OF SAFE PRACTICES

FRAMERS ROOF FRAMING/STACKING/SHEATHER

- JOB SUMMARY:** Places rafters and sheets of plywood on rafters.
- SKILLS REQUIRED:** Ability to follow instructions. Safety conscious. Good attitude.
- EMOTIONAL STANDARDS:** Detail oriented. Ability to stay with job until completed. Repetitive work.
- PHYSICAL STANDARDS:** Must have strong physical capacity.
Agility needed to lift with legs rather than back.
- HAZARDS:** Repetitive lifting, twisting, pushing, or pulling. Repetitive shoulder/arm motions.
Bending over. Continuous standing on hard and uneven surfaces.
- SAFETY EQUIPMENT REQUIRED:** Fall Protection. Harness when required. Eye and ear protection when applicable.

SAFE CONDITIONS:

Employees shall be properly instructed on the hazards of their work and of safe practices by bulletins, printed rules, verbal instructions and periodic safety meetings.

SAFE PRACTICES

1. When using ladders make sure to inspect and secure ladder before using. Know ladder safety.
2. Do not climb higher than the third rung from the top of straight ladders and second step on step ladder. Place ladder 3 steps beyond roof plate.
3. Exercise care to avoid overexertion.
4. Be especially careful of people below you. Add caution tape to area below when required.
5. When stacking wood or parts be sure to stack properly, checking for proper height and stability. Do not put excessive weight on joist, rafters.
6. Caution: If roof is at a 7 to 12 pitch all precautions should be taken. Proper Fall Protection should be used.
7. All roof framers should work inside; never extend body outside of building.
8. Keep skill saw blades sharp and clean of any sap.
9. Guards to be on saws at all times. Do not pin guard.
10. When rolling out truss, a plank of a 2 by 12 board should be secured to plates with 16 penny nails for a walking platform or other suitable platforms that meet or exceed OSHA standards.
11. When at all possible with truss being over 10 feet, three people should roll out the truss with one person on the plank and the others walking the top plate.
12. There should be no over-reaction of any worker on the top plate, as it could propel the person on the other side to fall.
13. When carrying out the truss, it should be carried low to the top plates.

(Continued on next page)

(Framers Roof Framing/Stacking/Sheather continued)

14. **Sheets should be placed by the Reachlift, as close as possible to area to be sheathed.**
15. **Sheathers should evaluate area where sheets are to be placed. i.e.: Are rafters secure and strong enough? What form of Fall Protection is required?**
16. **Make sure when rolling out the truss that the end truss common rafter is secure with a support 2 by 4.**
17. **Place ridge on truss as soon as possible for support.**
18. **Make sure all extension cords are in good shape.**
19. **Follow all Company safety rules and policies.**
20. **Employees must report all unsafe conditions immediately to a Supervisor.**
21. **No horseplay is permitted.**
22. **Clean worksite conditions must be maintained at all times.**
23. **All Personal Protective Equipment (PPE) required by State or Federal Regulation must be worn.**
24. **All equipment guards required by State and Federal Regulations must be in place.**
25. **Report all accidents immediately to a Supervisor.**
26. **Use Lockout/Tagout/Blockout procedures when required by State or Federal Regulation.**
27. **Inspect equipment prior to each use.**
28. **Only operate equipment that you have been trained and authorized to use.**
29. **All electrical wiring shall be to code and maintained in safe condition.**
30. **Use proper lifting techniques.**
31. **Only qualified personnel can perform maintenance services.**
32. **Follow all Manufacturers safety guidelines.**
33. **Do not operate equipment under the influence of altering prescription drugs, illegal drugs and/or alcohol.**
34. **Ensure that all Warning, Caution and Danger signs are in place.**

CODE OF SAFE PRACTICES

SAWZALL/RECIPROCATING SAW

- JOB SUMMARY:** Power tool saw.
- SKILLS REQUIRED:** Able to follow directions.
Understanding of the safety issues involved in operating this power tool.
- EMOTIONAL STANDARDS:** Ability to mentally handle repetitive work.
- PHYSICAL STANDARDS:** Ability to stand for long periods on hard surfaces. Strong back and arms.
- JOB HAZARDS:** Repetitive wrist, shoulder and arm movements. Twisting and turning motions.

SAFETY EQUIPMENT REQUIRED: Safety glasses. Ear protection when exceeding 85 dba.

SAFE CONDITIONS:

Employees shall be properly instructed on the hazards of their work and of safe practices by bulletins, printed rules, verbal instructions and periodic safety meetings.

SAFE PRACTICES

1. Make sure teeth of saw are clear of sap/pitch.
2. Disconnect power when changing blades.
3. Keep hands clear of the area being cut.
4. Saw to be held with both hands. Do not hang or handle by cord.
5. Never turn saw upside down.
6. Check area below cutting surface for potential hazards.
7. When cutting, work from a secure position. Do not reach. Beware of swinging saw into body.
8. Follow all Company safety rules and policies.
9. Employees must report all unsafe conditions immediately to a Supervisor.
10. No horseplay is permitted.
11. Clean worksite conditions must be maintained at all times.
12. All Personal Protective Equipment (PPE) required by State or Federal Regulation must be worn.
13. All equipment guards required by State and Federal Regulations must be in place.
14. Report all accidents immediately to a Supervisor.
15. Use Lockout/Tagout/Blockout procedures when required by State or Federal Regulation.
16. Inspect equipment prior to each use.
17. Only operate equipment that you have been trained and authorized to use.
18. All electrical wiring shall be to code and maintained in safe condition.
19. Use proper lifting techniques.
20. Only qualified personnel can perform maintenance services.
21. Follow all Manufacturers safety guidelines.
22. Do not operate equipment under the influence of altering prescription drugs, illegal drugs and/or alcohol.
23. Ensure that all Warning, Caution and Danger signs are in place.

CODE OF SAFE PRACTICES

EXTENSION CORDS

1. **If at all possible, go directly to outlet or have equipment hard wired.**
2. **Extension cords are for a portable work. Not for permanent locations.**
3. **OSHA can write violations if the extension cord is being used at a permanent location.**
4. **All extension cords are to be grounded.**
5. **NEVER cut off the ground prong.**
6. **Cords and sheathing to be in good condition.**
7. **Never have cord on ground in high traffic areas.**
8. **Be aware of people in the area and place extension cord in area that will be out of others way.**
9. **Never yank or pull an extension cord. There is a reason why it's caught!**
10. **Do not use electrical tape to mend extension cords. The cord must be replaced or cut and repaired.**

CODE OF SAFE PRACTICES

ROOFERS - LOADERS & UNLOADERS ROLLS / TILES

JOB SUMMARY: Move loads.

SKILLS REQUIRED: Ability to follow directions. Safety conscious. Good attitude.

EMOTIONAL STANDARDS: Ability to handle heights. Detail oriented.
Ability to stay with job until completed. Repetitive work.

PHYSICAL STANDARDS: Must have strong physical capacity.

HAZARDS: Repetitive lifting, twisting, pushing, or pulling.
Continuous standing on hard surfaces. Bending over.
Repetitive motion with arms and wrists due to unloading process.

SAFETY EQUIPMENT REQUIRED: Fall Protection system. Gloves. Eye protection when applicable.

SAFE CONDITIONS:

Employees shall be properly instructed on the hazards of their work and of safe practices by bulletins, printed rules, verbal instructions and periodic safety meetings.

SAFE PRACTICES

1. When lifting - use your leg muscles and not your back; bend knees before lifting up.
2. When cutting boxes or material loads, use proper care in using sharp cutting devices.
3. When stacking bundles, boxes or cases, tiles, roll or parts, be sure to stack properly, checking for proper height and stability. Mount shelving correctly and observe shelf load capacity.
4. Always use a forklift when possible to help stack, load or unload. (Authorized Personnel Only)
5. Rolls should be stacked/secured so they will not roll.
6. Follow all Company safety rules and policies.
7. Employees must report all unsafe conditions immediately to a Supervisor.
8. No horseplay is permitted.
9. Clean worksite conditions must be maintained at all times.
10. All Personal Protective Equipment (PPE) required by State or Federal Regulation must be worn.
11. All equipment guards required by State and Federal Regulations must be in place.
12. Report all accidents immediately to a Supervisor.
13. Use Lockout/Tagout/Blockout procedures when required by State or Federal Regulation.
14. Inspect equipment prior to each use.
15. Only operate equipment that you have been trained and authorized to use.
16. All electrical wiring shall be to code and maintained in safe condition.
17. Use proper lifting techniques.
18. Only qualified personnel can perform maintenance services.
19. Follow all Manufacturers safety guidelines.
20. Do not operate equipment under the influence of altering prescription drugs, illegal drugs and/or alcohol.
21. Ensure that all Warning, Caution and Danger signs are in place.

CODE OF SAFE PRACTICES

ROOFING CONSTRUCTION

I. SAFE WORKPLACE CONDITIONS

- 1. Portable power saw blade upper half must be permanently guarded, bottom half must have a hinged guard.**
- 2. Radial arm and table saws must have anti-kickback devices installed.**
- 3. Exposed saw teeth must be covered by hoods or guards.**
- 4. Radial arm saws must not pass the front edge and return to the table back when released.**
- 5. Safety devices must be installed on all pneumatic nailers and staplers operating at over 100 psi.**

II. SAFE WORK PRACTICES

- 1. Employees must be trained in proper saw use and safety before working unsupervised.**
- 2. Employees shall not block or remove any guard or safety device.**
- 3. Employees must disconnect pneumatic tools from air supplies when not in use.**

III. PERSONAL PROTECTIVE EQUIPMENT

- 1. Safety glasses with side shields must be worn at all times.**

CODE OF SAFE PRACTICES

CRANE HOIST TRUCK

JOB SUMMARY: Places material.

JOB HAZARDS: Repetitive wrist, shoulder, arm and back movements.
Sitting for long periods of time.

**SAFETY
EQUIPMENT
REQUIRED:** Hard-toed shoes suggested. Hard-hat.

SAFE CONDITIONS:

Employees shall be properly instructed on the hazards of their work and of safe practices by bulletins, printed rules, verbal instructions and periodic safety meetings.

SAFE PRACTICES

1. Make sure back up bell/sound is working on truck.
2. Stop Crane if articles get caught or any malfunction.
3. Warning: All hands, feet, body parts away from any moving parts.
4. If there is a hydraulic leak, stop and call maintenance.
5. Make sure when placing supplies on top plate that top plate is secure or if placed on common rafter, make sure hangers are in place for support.
6. When placing sheets on roof make sure all personnel is clear from area.
7. Stop operation and open the power switch if your crane fails to respond correctly. Then call your Foreman. Attempting to get out of difficulty by repeated operation may make the condition worse instead of better.
8. Whenever a slack line condition occurs, prior to further operations, check the proper seating of the cable in the sheaves and on the drum.
9. Never pick up a load beyond the rated load capacity of the crane. In case of doubt, call the Foreman.
10. Never move the load or the crane unless you are sure that you understand the floor signal.
11. When there are several hook-on men, obey the signals of the head hooker only.
(Obey an **EMERGENCY** stop signal given by anyone).
12. When raising or lowering the load, see that it safely clears adjacent stockpiles or machinery.
13. Never leave a load suspended.
14. **KNOW WHERE ALL OVER-HANGS OF ELECTRICAL POWER ARE - KEEP A MINIMUM OF 10 FEET.**
15. **ALWAYS KNOW WHERE POWERLINES BOTH ABOVE AND ON GROUND ARE.**
16. **STOP WORK AND CALL THE POWER COMPANY IF YOU EVER HAVE A QUESTION ON POWERLINES!**
17. Follow all Company safety rules and policies.
18. Employees must report all unsafe conditions immediately to a Supervisor.
19. No horseplay is permitted.

(Continued on next page)

(CRANE HOIST TRUCK continued)

20. **Clean worksite conditions must be maintained at all times.**
21. **All Personal Protective Equipment (PPE) required by State or Federal Regulation must be worn.**
22. **All equipment guards required by State and Federal Regulations must be in place.**
23. **Report all accidents immediately to a Supervisor.**
24. **Use Lockout/Tagout/Blockout procedures when required by State or Federal Regulation.**
25. **Inspect equipment prior to each use.**
26. **Only operate equipment that you have been trained and authorized to use.**
27. **All electrical wiring shall be to code and maintained in safe condition.**
28. **Use proper lifting techniques.**
29. **Only qualified personnel can perform maintenance services.**
30. **Follow all Manufacturers safety guidelines.**
31. **Do not operate equipment under the influence of altering prescription drugs, illegal drugs and/or alcohol.**
32. **Ensure that all Warning, Caution and Danger signs are in place.**

CODE OF SAFE PRACTICES

CONVEYER TRUCK

- JOB SUMMARY:** Places material supplies on roof.
- SKILLS REQUIRED:** Knowledge of the safe operation of Conveyor Truck and all components.
- EMOTIONAL STANDARDS:** Ability to handle repetitive work and still be safety conscious.
- PHYSICAL STANDARDS:** Strong back and arms. Able to sit for long periods.
Good eyesight. Able to judge distances.
- JOB HAZARDS:** Repetitive wrist, shoulder, arm and back movements.
- SAFETY EQUIPMENT REQUIRED:** Hard hat.

SAFE CONDITIONS:

Employees shall be properly instructed on the hazards of their work and of safe practices by bulletins, printed rules, verbal instructions and periodic safety meetings.

SAFE PRACTICES

1. Always stay 10 feet from any electrical power. (See further instructions on following pages.)
2. Do not lean on or unload while truck is running.
3. Do not turn conveyor in a direction where people are not paying attention.
4. Make sure back up bell sound is working on truck.
5. Hard-hat required.
6. Stop conveyor if articles get caught or any malfunction.
7. Warning: Keep all hands, feet, and body parts away from any moving parts.
8. If there is a hydraulic leak, stop and call maintenance.
9. Make sure when placing supplies on conveyor that the belt is secure and paddles are in place.
10. Stop operation and open the power switch if your conveyor fails to respond correctly, then call your Foreman. Attempting to get out of difficulty by repeated operation may make the condition worse instead of better.
11. Never pick up a load beyond the rated load capacity of the conveyor. In case of doubt, call the Foreman.
12. Never leave a load on conveyor.
13. **KNOW WHERE ALL OVER-HANGS OF ELECTRICAL POWER ARE - KEEP A MINIMUM CLEARANCE OF 10 FEET.**
14. **ALWAYS KNOW WHERE POWERLINES BOTH ABOVE AND ON GROUND ARE.**
15. **STOP WORK AND CALL THE POWER COMPANY IF YOU EVER HAVE A QUESTION ON POWERLINES!**

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(CONVEYOR TRUCK continued)

Your conveyor is a big time and money saver. Like all other machinery, however, any time the conveyor is used near overhead or underground electrical lines or other electrical sources, it can become a conductor of electricity and cause death.

This equipment is only as smart and as safe as its owners and operators. If neglect or carelessness is used when operating the conveyor, it may cost your life.

OSHA mandates that you not operate any conveyor within ten feet of power lines. A conveyor is often classified as a crane, and it is a federal regulation for all cranes to stay at least ten feet from all power lines. It is illegal for any part of a crane to come within ten feet of power lines.

Many people don't realize the danger of operating equipment around power lines, both over-head and underground. Death can result when current passes through a person's body.

Here's why.....

Electricity constantly seeks the ground to complete its circuit. It always takes the fastest, easiest path. As it travels, it passes through some materials more easily than others. These are said to be efficient "conductors". A metal conveyor is an excellent conductor of electricity.

Materials such as rubber, plastic, glass or wax resist electricity, and are therefore the least efficient conductors.

Your body can become an electrical conductor when you form the link between electricity and the ground. You can be off the ground, on a truck, for example, yet become the deadly connection between electrical current and the ground.

If you, or something conductive you are touching get too close to an overhead power line, current may pass through the conveyor, you and the truck to the ground.

You can't see, smell or hear electricity. But you can see overhead lines if you will look for them, or you can be aware there's buried cable in the area if it is supplied by underground service.

Remember

- A) You, or the conveyor, don't need to actually touch an over-head power line to get a possible fatal shock! Under certain conditions, electricity can jump from a line carrying high voltage to a nearby conductor such as a conveyor. How far the current can jump depends mainly on the voltage (the force of the current) and atmospheric conditions.**

This is why you should not operate a conveyor within ten feet of power lines.

- B) High voltage overhead lines are not insulated. Perching birds are not electrocuted because they do not link the line with the ground.**
- C) Assume that all overhead and buried lines are carrying electricity. Also assume that a line which has fallen to the ground is energized (LIVE) and can kill.**

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(CONVEYOR TRUCK continued)

Using your Conveyor

When raising a conveyor or getting on a roof for any reason, look around for power lines. A lifesaving rule to remember is to keep at least ten feet away from all overhead power lines. A partner should always be on the ground to signal when the conveyor is getting anywhere near overhead power lines. Remember, it is illegal for any part of a "crane" to come within ten feet of power lines.

In case of an electrical accident

A fallen line - Don't touch or go near the wire. Assume it is energized (LIVE). Don't touch anything the wire is resting upon. Call the local power company and emergency services immediately.

An energized line on the conveyor or truck - If a power line should fall on the conveyor or truck while you are on it, stay put until help arrives. You are safe as long as you do not try to get off the truck or conveyor, because you are protected by the insulating action of the conveyor or truck's rubber tires. If you step off while you are still in contact with any metal part of the truck or conveyor, you will complete the circuit from the power line to the ground and the full electrical current will pass through your body.

Have someone call the local power company and emergency services immediately. Do not jump off the truck or conveyor. Remember that electricity can also jump, and pass through your body as it travels to the ground. Even if you are alone, stay put for as long as it takes for someone to come by and get help.

If the truck or conveyor bursts into flames - Your life is in danger and you will need to get away from the truck or conveyor immediately. JUMP and ROLL. Jump out as far as possible from the truck or conveyor, and roll as you hit the ground. Leave the area, and make sure all other persons leave the area immediately, as an explosion can occur. Contact the local power company and emergency services immediately. Take no other actions until trained help arrives.

Under no circumstances let anyone but trained authorities near the truck or conveyor. If a bystander comes in contact with any metal part of the truck or conveyor, they will complete the circuit from the power line to the ground, and thus receive the full impact of the electrical current.

If the conveyor grazes a power line - If you are not hurt and the conveyor is still operable, check and make sure there is no damage to the power line, the power pole or any cross-members. If there is damage, observe if any danger might occur as a result of moving the conveyor, such as a line falling, a pole snapping, etc. If there is any danger present, do not move the conveyor. Follow the procedures outlined above for an energized line on the conveyor or truck.

If there is no damage to the power line, poles or cross-members, if the conveyor is operable, and you are sure there's no danger of further accidents occurring, carefully move the conveyor from the power line. Remove the truck and/or conveyor from the area to insure the accident does not recur. Even if there is no damage, notify the power company of contact with their equipment. You might have tripped a power circuit, even though there appears to be no damage to the facilities. This could save the local power company a great deal of time in restoring service.

A person in contact with a downed line, energized truck or conveyor - Don't touch the person, the wire, the truck or the conveyor. Call the local emergency services immediately, and inform the power company.

If help is not available and you accept the risk of trying to help the victim or push a power line away, remember that only materials such as rubber and plastic, or perhaps a totally dry broom handle are safe for

(continued on next page)

(CONVEYOR TRUCK continued)

this purpose. NEVER try to pull a victim loose by hand. Find something nonconductive to break the electrical contact. Do not use a limb or stick to push away a downed line; if there is any moisture in the wood it can conduct the current through you, too.

What current can do to a body

Death - Can occur as a result of paralysis of heart and breathing muscles.

Contraction of chest muscles - Interferes with breathing. Can cause asphyxiation if prolonged.

Paralysis of nerve centers - Can result in failure of respiration.

Upsets normal heart rhythm - Can cause blood circulation to stop.

Hemorrhages and destruction of tissues, nerves and muscles can result from the heat of heavy current.

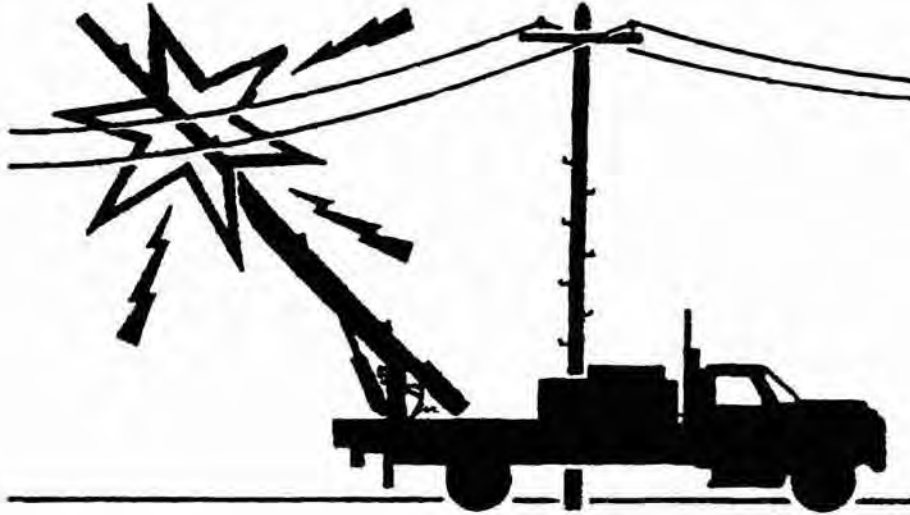
First Aid - Taking Action

Heart Failure - GET MEDICAL AID. Apply CPR immediately until help arrives.

Asphyxiation - GET MEDICAL AID. Apply artificial respiration, either mouth-to-mouth or chest pressure/arm lift.

Traumatic Shock - GET MEDICAL AID. If medical aid is delayed for an hour or more, give fluids - water, or salt, soda and water - unless victim is unconscious, nauseated, or has a penetrating abdominal wound.

Burns - GET MEDICAL AID. Cut away loose clothing. Cover burned area with sterile dressing to keep out air. Treat for shock.



- **BEWARE OF POWER LINES AND POLES.
CONTACT WITH LIVE LINES COULD COST YOU YOUR LIFE!**
- **TENGA CUIDADO CON LINEAS DE ALTA VELOCIDAD.
LE PUEDE COSTAR SU VIDA.**

CODE OF SAFE PRACTICES

ROOF LOADING

- JOB SUMMARY:** Places material supplies on roof/supports personnel.
- SKILLS REQUIRED:** Ability to use proper equipment. Able to follow directions.
Good attitude. Safety conscious.
- EMOTIONAL STANDARDS:** Ability to handle heights.
Ability to handle repetitive work and still be safety conscious.
- PHYSICAL STANDARDS:** Strong back and arms. Able to stand for long periods of time.
Good eyesight. Able to judge distances.
- JOB HAZARDS:** Repetitive wrist, shoulder, arm and back movements.
Able to climb in and out of tractor.
- SAFETY EQUIPMENT REQUIRED:** Fall Protection system when applicable. Gloves.
Hard-toed shoes suggested. Hard hat. Safety glasses.
- SAFE CONDITIONS:**

Employees shall be properly instructed on the hazards of their work and of safe practices by bulletins, printed rules, verbal instructions and periodic safety meetings.

GENERAL ROOF LOADING RESPONSIBILITIES

1. All roofs are to be loaded safely and without damage to property.
2. Material must be loaded so that it will not roll/fall off of the roof.
3. Prior to loading roofs, driver will physically pre-walk the roof for the following:
 - a. The condition of sheeting. Avoid all areas where sheeting is weak or soft. This will help avoid stepping through the roof.
 - b. The condition of the roofing - loose granules, broken wood shingles, loose composition - areas where one could lose footing.
 - c. Unseen dry rot.
 - d. Height of job. Check if Fall Protection is required.
 - e. If driver feels the roof is unsafe or presents a hazardous situation, he is to report those conditions to the office and await instructions. **REMAIN OFF OF THE ROOF.**
4. Never drop materials onto the roof deck. Materials are to be set down on the deck as gently as possible to avoid damage to material or deck.

Note steepness - do not load roofs over a 6 and 12 pitch because the material will not stay safely in place on roof once loaded.

(continued on next page)

(ROOF LOADING continued)

5. Material to be loaded by the following generally-accepted methods:
 - a. Tile, Clay & Cement - to be distributed evenly over entire roof area in accordance with the manufacturer's specifications.
 - b. Fire-free Shakes, Cemwood Shakes, and other similar materials - this material must be loaded in stacks of 2 bundles evenly distributed along the entire ridge line of both the house and garage and in a single row of 1 bundle set side by side, evenly placed halfway between the ridge and eave and running from rake to rake. Starter bundle to be placed along the eaves and ridge bundles placed near the ridge. If contractor wants loading differently, contact office for confirmation.
 - c. Shakes and Wood Shingles - evenly distribute this material in stacks of 2 squares along the entire ridge line with the house and garage. Starter bundles to be placed 4-5 feet from the eaves and ridge bundles placed near the ridge.
 - d. Composition Shingles - evenly distribute in stacks of 2 squares along the entire ridgeline of the house and garage.
 - e. Residential Roll Roofing (*i.e.*, - Shakefelt, MSR, etc.) - this material, if laid down, must be blocked on both sides so that it cannot roll off the roof. NOTE: All rolls loaded on any roof must be secured so that they cannot roll off. Block against pipe or material or lay in valley.

The above are recommended guidelines. Some contractors may want their material loaded slightly differently. In this case, if you have any doubts as to the safety, contact the office immediately.

COMMERCIAL ROOF LOADING METHODS:

1. Material is to be loaded by the following generally-accepted methods:
 - a. Base and Ply Rolls - stand up on end and distribute evenly over entire roof.
 - b. Cap Sheet - stand on end and load along the entire center line of the roof.
 - c. Asphalt - is to be dropped on the ground at a spot designated by the contractor near where the contractor will set up his kettle.
 - d. Rock - load in stacks of 5 bags each. Spread stacks over entire roof area to distribute weight of material. Make sure stacks are over supporting beams.

SPECIFIC COMMERCIAL LOADING CONDITIONS

1. In some cases, contractors want their material loaded on the roof on pallets and covered with plastic wrap to prevent moisture from entering the rolls. In this case, load as follows:
 - a. Base and Ply Rolls - load together on pallets. Pallets must be placed over a structural beam of building to support the weight. Distribute these pallets over entire roof, but always over a structural beam. Cover rolls on pallets with plastic cover and secure down with stretch wrap so that cover cannot come off at any time (including high winds). Secure stretch wrap to pallet itself to prevent blow off.
 - b. Cap Sheet - load cap sheet together on pallets material is delivered on. Load 20 rolls of cap sheet on each pallet. Distribute these pallets along the entire center line of the roof. Remember, all pallets must be place over a structural beam of building to support the weight. Cover rolls with plastic cover and secure down with stretch wrap so that cover cannot come off at any time (including high winds). Secure stretch wrap to pallet itself.

CODE OF SAFE PRACTICES

BOBTAIL LIFT BED

JOB SUMMARY: Elevates material to loading surface.

JOB HAZARDS: Repetitive wrist, shoulder, arm and back movements.
Able to climb in and out of bed of truck.

**SAFETY
EQUIPMENT
REQUIRED:** Hard hat.

SAFE CONDITIONS:

Employees shall be properly instructed on the hazards of their work and of safe practices by bulletins, printed rules, verbal instructions and periodic safety meetings.

PROCEDURES PRIOR TO TRUCK LEAVING YARD

- a. Check and fill to proper fluid levels the gas, water and oil.
- b. Inflate tires to proper air pressure.
- c. Check all turn signals and brake lights. If defective, notify Supervisor.
- d. Allow truck to warm up in yard before leaving.
- e. Make sure all gauges are registering normal.
- f. Verify that all side gates are present.

SAFETY PROCEDURES DRIVING TRUCK

- a. Drive defensively - that is: at a safe, slow speed allowing plenty of space between your truck and the vehicle ahead.
- b. Obey all traffic laws and road signs.

OPERATION OF TRUCK LIFT BED; RAISING BED

- a. Apply emergency brake & engage transmission in first gear.
- b. Depress clutch and engage the power take-off unit to the "on" position.
- c. Remove safety chains from outriggers.
- d. Put down 1" x 2" x 2" wood block under outrigger foot to distribute pressure of outrigger over wider area. (*optional*)
- e. Extend outriggers down gently on 2 x 2 wood blocks on a firm surface. After all outriggers are extended, adjust their pressure to level of the bed and support the chassis of the truck.
- f. Before lifting bed - visually check the bed level from the front and back of the truck. If bed is not level, add blocks underneath outriggers.

(Continued on next page)

(BOBTAIL LIFT BED continued)

- g. After leveling bed, raise bed up two feet only. Check again the level of the bed. If bed is not level, make necessary adjustments with outriggers until bed is level. If necessary, reorganize weight of load on bed until weight evenly distributed and bed becomes level.
- h. After bed is level, raise bed to necessary height to load roof. Note: always raise bed from inside the cab of the truck.
- i. If bed cannot be made level, do not raise bed.
- j. As bed is being raised, constantly watch bed for any swaying or shifting. Also, watch for proper extension of the rams and cylinders.
- k. After bed reaches desired height, turn off engine. After engine is completely off, put truck in first gear to avoid any possible rolling.
- l. If truck is on sloped driveway from front to back, also must block rear tires to avoid movement.

OPERATION OF LIFTBED TRUCK; LOWERING BED

- a. Before lowering bed, clear all debris from chassis.
- b. Before turning on truck, depress clutch and remove transmission from first gear.
- c. While clutch is depressed, start truck.
- d. Slowly lower bed, constantly watching cylinders and rams for proper retraction.
- e. After bed is completely lowered, retract the outriggers by partially releasing pressure on each outrigger. After pressure has been released on all outriggers, fully retract them and hook on safety chains.
- f. Depress clutch and disengage the PTO Unit.
- g. Before leaving jobsite, make sure bed is clear of debris and all pallets and extra materials are securely tied down.

* Verify that no debris can leave vehicle while driving.

MOVEMENT OF BED (Raise or Lower)

- 1. Any time the bed is moving the spotter/swamper must be a safe distance away from the vehicle. **NO EXCEPTIONS.**
- 2. The ONLY activity allowed is for the spotter/swamper to assist the vehicle operator (verbally) in providing information for safe raising/lowering the lift bed.

CODE OF SAFE PRACTICES

GENERAL REQUIREMENTS FOR EXCAVATIONS

1. **Employees exposed to public vehicular traffic or earth haulage equipment must wear warning vests or other suitable garments made of reflectorized or high-visibility material.**
2. **A competent person must inspect the excavation and the adjacent areas on a daily basis for possible cave-ins, failure of protective systems and equipment, hazardous atmospheres, or other hazardous conditions. Inspections are also required after the occurrence of any natural (such as rain) or man-made events (such as blasting) that could increase the potential for hazards.**
3. **A warning system should be used to alert operators of the edge of an excavation.**
4. **Adequate protection must be provided to protect employees from falling rock, soil, or other materials and equipment.**
5. **Employees should not be permitted under loads that are handled by lifting or digging equipment. Employees should not be allowed to work in the excavation above other employees unless the lower level employees are adequately protected.**
6. **While the excavation is open, underground installations must be protected, supported or removed as necessary to safeguard employees. Adjacent structures must be supported to prevent possible collapse.**
7. **Employees should not be permitted to work in excavations where water has accumulated or is accumulating unless adequate precautions have been taken. Diversion ditches, dikes, or other means must be used to prevent surface water from entering an excavation and to provide drainage to the adjacent area.**
8. **Before an employee enters an excavation greater than 4 feet in depth, a competent person must test the atmosphere where oxygen deficiency or a hazardous atmosphere exists or could reasonably exist. Emergency rescue equipment must be readily available and must be attended when hazardous atmospheric conditions exist or may develop.**
9. **Sufficient means for exiting excavations 4 feet deep or more must be provided and must be within 25 feet of lateral travel for employees.**
10. **Guardrails must be provided if there are walkways or bridges crossing over an excavation.**
11. **Notify all utilities prior to digging.**
12. **Obtain permits from DOSH. (California only.)**
13. **Notification of activity must be given to DOSH. (California only.)**
14. **Adequate shoring system must be employed to avoid cave-ins.**

CODE OF SAFE PRACTICES

GENERAL OFFICE

1. **Never leave lower desk or cabinet drawers open that present a tripping hazard. Use care when opening and closing drawers to avoid pinching fingers.**
2. **Do not open more than one upper drawer at a time, particularly the top two drawers on tall file cabinets.**
3. **Individual heaters at work areas should be kept clear of combustible materials such as drapes or waste from wastebaskets. Newer heaters equipped with tip-over switches should be used.**
4. **Appliances such as coffee pots and microwaves should be kept in working order and inspected for signs of wear, heat or fraying of cords.**
5. **"Microwave in Use" signs are required to be posted near microwave ovens.**
6. **Fans used in work areas should be guarded. Guards must not allow fingers to be inserted through the mesh. Newer fans are equipped with proper guards.**
7. **Files and supplies should be stored in such a manner as to preclude damage to the supplies or injury to personnel when they are moved. Heaviest items should be stored closest to the floor and lightweight items stored above.**
8. **Equipment such as scissors, staples, etc., should be used for their intended purposes only and should not be misused as hammers, pry bars, screwdrivers etc. Misuse can cause damage to the equipment and possible injury to the user.**
9. **Ensure that carpet and flooring are in good condition to avoid tripping hazards.**
10. **Do not overload electrical outlets.**

CODE OF SAFE PRACTICES

COMPUTER WORKSTATION

1. When working at a computer workstation, have all pieces of furniture adjusted, positioned and arranged to minimize strain on all parts of the body.
2. Workstation should be such that it can be set up so that:
 - a. keyboard is approximately elbow height.
 - b. screen display is below eye level with primary viewing area from 0 to 60 degrees below the horizontal plane at eye level.
 - c. there is adequate space beneath desk for employees legs.
3. The front edge of the keyboard and/or the keyboard support surface where wrist or forearm contact occur, should be rounded and /or padded.
4. Shared workstations should be adjustable with adjustable keyboard heights.
5. The work surface should be sufficient to accommodate the monitor and components and other task dependent items, such as hard copy.
6. Chairs should have adjustable seat pan and back support with or without arm support. If armrests are used they should be height adjustable.
7. Easily positioned document holders should be used as well as footrests.
8. Computer users should be permitted to take at least a 3-minute break for each hour of continuous use. A "break" means time spent doing something other than work on a computer.
9. Lighting should be directed so it does not shine into operator's eyes when the operator is looking at the screen. It should be adequate to enable the operator to see the text and screen, but not bright enough to cause glare.
10. Employees must advise their supervisor if their background lighting causes glare or a reduced clarity of vision on their monitor. Screen position should be adjusted to the proper eye level.
11. The screen and document holder should be placed the same distance from the eye in order to avoid constant changes of focus. The document holder needs to stand vertically to the eyes in order to prevent excessive movement of the neck and eyes.
12. Practice good, relaxed posture, proper seating, foot support and take adequate stretch breaks.
13. Retain sensitivity of appropriate keyboard height and use proper wrist angle.
14. Employees shall follow training on preventing problems associated with computer use.

CODE OF SAFE PRACTICES

ELECTRICAL

PREVENTING SHOCK

How you are affected by electric shock depends on:

- The rate of flow of the current through your body

The rate of current flow (measured in amperes) depends on how good a conductor of electricity your body is. If you have dry hands and are standing on a non-conductive surface such as a rubber mat, you may not even feel a shock. If you are perspiring and are standing in water, you may be killed.

- The length of time the current flows through your body

If the shock causes you to freeze to the conductor, you could receive severe internal injury. The longer the electrical contact the greater the current flow and the greater the shock.

- The path the current takes through your body

The most dangerous paths through the body that the current can take are those in which the current passes through vital organs. Current, that runs from hand to hand, from hand to head, or from foot to hand or head can cause severe internal damage especially to the heart and lungs.

It is the rate of current flow through the body, more than anything else which determines how serious the shock will be. As the current increases, effects on the body range from a just noticeable shock to paralysis of the lungs and heart failure.

No work is to be done on exposed energized parts of equipment or systems until:

1. A responsible supervisor has determined that the work must be done while the part or system is energized.
2. Workers have been trained in the techniques and hazards involved in the job.
3. Personal protective equipment (including eye protection) has been issued.
4. Necessary barriers, barricades, tags, or signs are in place.
5. When the work has been completed, the supervisor is responsible to ensure that all permanent barriers and covers are reinstalled.

CLEARANCES

Make sure that there is sufficient clearance to operate and service electrical equipment safely. The chance that a worker may be shocked increases when he or she works on equipment with energized and exposed parts in a cramped space. Because of the danger posed to workers who work in cramped spaces, OSHA has established regulations setting minimum clear distances around electrical equipment rated 600 volts or less. The minimum clear distances depend on:

1. The voltage rating of the equipment
2. The nature of the work area.

(Continued on next page)

In this illustration the worker is working on a switchboard, parts of which are exposed and energized. However, because the wall to his back is well insulated, there is little danger of shock if he accidentally touches an energized part of the switchboard and the opposing wall. The minimum clearance under these conditions is 3 feet from the face of the switchboard to the opposing wall.

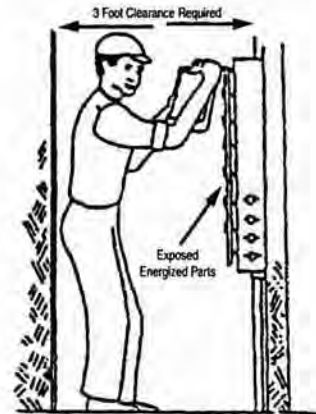


Figure 1

There are exposed, energized parts on both sides of the work area. If the worker makes contact with both sets of switches, he can become part of a short circuit with potentially fatal amounts of current flowing through him. To avoid this, minimum clearances between the switches are 3 feet for voltages of between 0 and 150, and 4 feet for voltages between 151 and 600.

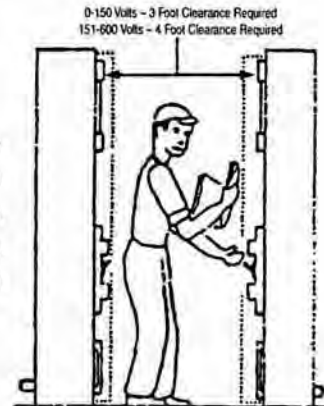


Figure 2

In this illustration the worker can touch both an energized part of the switchboard and the grounded wall. Current will flow through the worker to ground possibly causing a disabling injury or death. To prevent this from happening, minimum clearances between the face of the switchboard and the opposite wall are 3 feet for voltages up to 150 and 3½ feet for voltages between 151 and 600.



Figure 3

(Electrical continued)

PROTECTIVE DEVICES

1. Fuses & Circuit Breakers

Both fuses and circuit breakers are "overcurrent" devices used to prevent damage to wiring and equipment caused by an excessive flow of current. Their current ratings are so high (15 to 30 amperes for most residences) that they cannot protect against shock. When the current flow exceeds the rated levels, the fuse melts or the circuit breaker is tripped. In either case, the circuit is broken and current can no longer flow.

2. Grounding

There are 2 types of grounding:

- a. System Grounding in which one of the current carrying wires is connected to a grounded conductor.
- b. Equipment Grounding in which the metal frame of the equipment is grounded or bonded to another piece of equipment that is grounded.

Systems are grounded to protect the wiring and equipment against excessive flow of current. The equipment is grounded to protect the operator against shock.

If the ungrounded frame of a hand tool becomes energized, the quickest and easiest path for the current to take to ground is through the worker. Depending on the conditions, the effects of the shock will range from slight to fatal.

If the frame of the tool is grounded, the connection to ground provides an easy pathway for the current to flow. This does not mean that the worker will not receive a shock. A certain amount of current will flow through the worker. But the chances of serious injury or death are reduced because most of the current will follow the grounding wire.

3. Ground Fault Circuit Interrupters (GFCI)

The ground fault circuit interrupter is an inexpensive device that measures the difference in current levels going to and returning from a piece of electrical equipment. How does this device protect against shock? If there is a ground fault in the equipment so that the metal frame becomes energized, a certain amount of current will flow through the operator to ground. The GFCI senses this leakage, trips, and breaks the circuit within 1/40th of a second. Instead of a possible electrocution, the worst effect on the operator will be a painful shock before the circuit is broken. Workers who operate electrical equipment should be protected by GFCI's against the disabling and often fatal effects of ground faults.

OSHA regulations require the use of GFCI's on all 120 volt, AC, single phase, 15-20 ampere receptacles on construction sites when:

- the receptacles are used by workers
- the receptacles are not part of the permanent wiring of the structure

While GFCI's provide workers with the best protection from electrical shock, employers may institute an Assured Equipment Grounding Conductor Program as an alternative to installing GFCI's.

(Continued on next page)

Ground Fault Circuit Interrupters

There are three basic types of ground fault circuit interrupters (see figures 4-7 below) all of which have a test and reset button:

1. Portable adapter for existing wall outlets (convenient because it requires no installation and can be used on 2 as well as 3 outlets.
2. Replacement for wall outlets
3. Circuit breaker type of GFCI

In addition, portable multiple outlet ground fault circuit interrupters are available for use on construction sites and industrial sites where heavy duty, multiple outlet GFCI's are required.

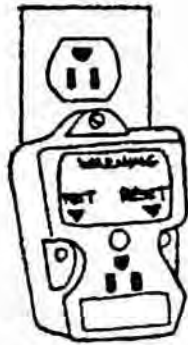


Figure 4 - Portable Adapter

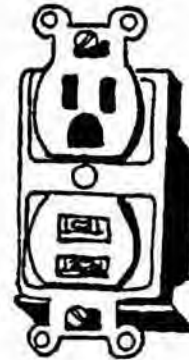


Figure 5 - Replacement

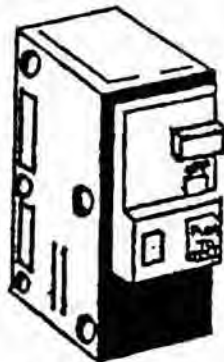


Figure 6 - Circuit Breaker Type

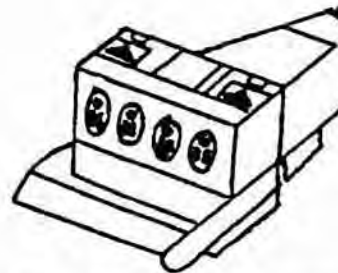


Figure 7 - Heavy Duty GFCI

(Electrical continued)

LOCKOUT

Many occupational injuries and deaths occur during the cleaning, adjusting and servicing of machinery. Here's why:

A machine needs servicing. The worker disconnects the machine from the power source and begins to service the machine. Has the worker taken the necessary precautions to prevent an accident? NO! In a few minutes another worker comes by and reconnects the machine to the power source. The servicing worker may be injured by electric shock or may be caught in the moving parts of the machine.

When you have to do the maintenance work on a machine, take these four steps to protect yourself and your co-workers from injury.

1. **De-energize the machine.** Positively disconnect it from the power source. If there is more than one source of power, disconnect them all.
2. **LOCKOUT the disconnect switches.** You must be given a lock and key for each disconnect before you begin working on the machine.
3. **Tag the disconnect switches.** Get tags or accident prevention signs from your supervisor.
4. **Keep the key with you at all times.**

Each worker who works on the machine must Lockout and Tag the electrical source at the disconnect. Never assume that the machine you are working on has been disconnected and Locked Out unless you have done it yourself.

OVERHEAD LINES

Farm workers and construction workers in particular must be concerned with the hazards posed by high voltage overhead lines. Each year workers who accidentally make contact with these lines are killed and disabled.

What precautions can you take to avoid this kind of accident? OSHA's Safety order prohibits the storage of irrigation pipe or long metal poles near high voltage overhead lines if they are long enough to reach the lines. With some exceptions work done over "live" overhead lines is against the law. The Safety Orders also forbid any work within 6 feet of lines - carrying between 600 - 50,000 volts.

Do not store tools, machinery, or equipment near "live" high voltage overhead lines if it is possible for them to come within the minimum clearance distance (6 feet) when they are being moved or used.

When you are using boom-type lifting or hoisting equipment, the minimum clearance is 10 feet from overhead lines. Post a warning sign of the equipment in clear view of the operator that says:

UNLAWFUL TO OPERATE THIS EQUIPMENT WITHIN 10 FEET OF HIGH VOLTAGE LINES OF 50,000 VOLTS OR LESS

If you don't know if a line is "live", assume that it is until whoever owns or operates the line verifies that the power is not on. If you are working near a "dead" line, make sure that it is "clearly grounded" at the work site. (A grounded line has a grounding wire clamped to it and clamped to the structure or to a grounding rod.)

(Continued on next page)

(Electrical continued)

Bull Floats (Concrete Smoothing Tools)

Handles on bull floats must be constructed of non-metallic and non-conductive material to prevent accidents caused by contact with overhead lines.

CODE OF SAFE PRACTICES

CONSTRUCTION

1. **All persons shall follow these safe practice rules and render every possible aid to safe operations, and report all unsafe conditions or practices to the Foreman or Superintendent.**
2. **Foreman shall insist on employees observing and obeying every applicable Company, State or Federal regulation and order as is necessary to the safe conduct of the work and shall take such action as is necessary to obtain compliance.**
3. **All employees shall be given frequent accident prevention instructions. Instructions shall be given at least every 10 working days in the form of a tailgate meeting.**
4. **Anyone known to be under the influence of drugs or intoxicating substances which impair the employees ability to safely perform assigned duties shall not be allowed on the job while in that condition.**
5. **No one shall knowingly be permitted or required to work while the employees' ability or alertness is so impaired by fatigue, illness, or other causes that they might unnecessarily expose the employee or others to injury.**
6. **Employees shall not enter manholes, underground vaults, chambers, tanks, silos, or other similar places that receive little ventilation unless it has been determined that it is safe to enter. In addition, proper confined space training is required.**
7. **Employees shall be instructed to ensure that all guards and other protective devices and safety equipment are in proper place and adjusted, and shall report deficiencies to Foreman or Superintendent.**
8. **Hod or cement carriers should avoid the use of extension ladders when carrying loads. Such ladders may provide adequate strength, but the rung position and rope arrangement make such climbing difficult and hazardous for this trade.**
9. **Workers shall not handle or tamper with any electrical equipment, machinery or air or water lines in a manner not within the scope of their duties.**
10. **Employ proper lifting techniques by using the large muscles of the leg rather than the smaller muscles of the back.**
11. **Inappropriate footwear or shoes with thin or badly worn soles must not be worn.**
12. **Materials, tools, or other objects shall not be thrown from buildings or structures until proper precautions are taken to protect others from the falling objects.**
13. **Cleanse yourselves thoroughly after handling hazardous substances and follow special instructions from authorized sources.**
14. **Gasoline shall not be used for cleaning purposes.**

(continued on next page)

(CONSTRUCTION continued)

15. **No burning, welding, or other source of ignition shall be applied to any enclosed tank or vessel, even if there are some openings, until it has been determined that no possibility of explosion exists and authority for the work is obtained from the Foreman or Superintendent. Follow all confined space requirements.**
16. **Any damage to scaffolds, false work, or other supporting structures shall be immediately reported to the Foreman or Superintendent.**
17. **All tools and equipment shall be maintained in good condition.**
18. **Damaged tools or equipment shall be removed from service and tagged "Defective – Danger, Do Not Use".**
19. **Only appropriate tools shall be used for a specific job.**
20. **All excavations shall be visually inspected before backfilling to ensure that it is safe to backfill.**
21. **Excavating equipment shall not be operated near tops of cuts, banks, or cliffs if employees are working below.**
22. **Tractors, bulldozers, scrapers and carryalls shall not operate where there is a possibility of overturning in dangerous areas like edges of deep fills, cut banks, and steep slopes.**
23. **When loading where there is a probability of dangerous slides or movement of material, the wheels or treads of loading equipment, other than that riding on rails, should be turned in the direction which will facilitate escape in case of danger, except in a situation where this position of the wheels or treads would cause a greater operational hazard.**

CODE OF SAFE PRACTICES

CONSTRUCTION CARPENTERS

SAFE WORKPLACE CONDITIONS

1. Portable power saw blade upper half must be permanently guarded; bottom half must have a hinged guard.
2. Radial arm and table saws must have anti-kickback devices installed.
3. Exposed saw teeth must be covered by hoods or guards.
4. Radial arm saws must not pass the front edge and return to the table back when released.
5. Safety devices must be installed on all pneumatic nailers and staplers operating at over 100 psi.

SAFE WORK PRACTICES

1. Employees must be trained in proper saw use and safety before working unsupervised.
2. Employees shall not block off or remove any guard or safety device.
3. Employees must disconnect pneumatic tools from air supplies when not in use.
4. Employees must not operate a pneumatic tool within 10 feet of another worker.

PERSONAL PROTECTIVE EQUIPMENT

1. Safety glasses must be worn at all times.

SAFE PRACTICES

1. Follow all Company safety rules and policies.
2. Employees must report all unsafe conditions immediately to a Supervisor.
3. No horseplay is permitted.
4. Clean worksite conditions must be maintained at all times.
5. All Personal Protective Equipment (PPE) required by State or Federal Regulation must be worn.
6. All equipment guards required by State and Federal Regulations must be in place.
7. Report all accidents immediately to a Supervisor.
8. Use Lockout/Tagout/Blockout procedures when required by State or Federal Regulation.
9. Inspect equipment prior to each use.
10. Only operate equipment that you have been trained and authorized to use.
11. All electrical wiring shall be to code and maintained in safe condition.
12. Use proper lifting techniques.
13. Only qualified personnel can perform maintenance services.
14. Follow all Manufacturers safety guidelines.
15. Do not operate equipment under the influence of altering prescription drugs, illegal drugs and/or alcohol.
16. Ensure that all Warning, Caution and Danger signs are in place.

CODE OF SAFE PRACTICES

YARD PERSONNEL

1. **Follow general safety rules at all times.**
2. **Be aware of vehicles, forklifts, cranes, front loaders, backhoes, trucks, etc.**
3. **Inspect ladders before using and place in secure position.**
4. **Always proceed safely, exercising pedestrian awareness.**
5. **Employ proper lifting techniques and back injury prevention.**
6. **Do not leave tools, trash or equipment around.**
7. **Make certain equipment is maintained and safe to operate.**
8. **Report faulty or unsafe conditions or equipment to supervisor.**
9. **Store flammables and chemicals in compliance with Local, State and Federal regulation.**

CODE OF SAFE PRACTICES

RESPIRATORY PROTECTION DEVICE

- TRAINING:** Employees shall be trained on the usage of the device and be fit tested when required.
- INSPECTED:** Protective equipment shall be inspected regularly and maintained in good condition. Gas mask canisters and chemical cartridges shall be replaced on a set schedule, and provided by employer.
- PROTECTION:** Previously used equipment shall be disinfected before it is issued by the employer to another employee.
- MEDICAL:** Medical questionnaires must be completed by all employees required to wear respirators. Questionnaires will be evaluated by a Physician or R.N. to determine ability to use.

CODE OF SAFE PRACTICES

DRILL

JOB SUMMARY: Drill holes.

JOB HAZARDS: Repetitive wrist, shoulder and arm movements. Twisting and turning motions.

**SAFETY
EQUIPMENT
REQUIRED:** Safety glasses and gloves if applicable.

SAFE CONDITIONS:

Employees shall be properly instructed on the hazards of their work and of safe practices by bulletins, printed rules, verbal instructions and periodic safety meetings.

SAFE PRACTICES

1. **Follow all Company safety rules and policies.**
2. **Employees must report all unsafe conditions immediately to a Supervisor.**
3. **No horseplay is permitted.**
4. **Clean worksite conditions must be maintained at all times.**
5. **All Personal Protective Equipment (PPE) required by State or Federal Regulation must be worn.**
6. **All equipment guards required by State and Federal Regulations must be in place.**
7. **Report all accidents immediately to a Supervisor.**
8. **Use Lockout/Tagout/Blockout procedures when required by State or Federal Regulation.**
9. **Inspect equipment prior to each use.**
10. **Only operate equipment that you have been trained and authorized to use.**
11. **All electrical wiring shall be to code and maintained in safe condition.**
12. **Use proper lifting techniques.**
13. **Only qualified personnel can perform maintenance services.**
14. **Follow all Manufacturers safety guidelines.**
15. **Do not operate equipment under the influence of altering prescription drugs, illegal drugs and/or alcohol.**
16. **Ensure that all Warning, Caution and Danger signs are in place.**

CODE OF SAFE PRACTICES

ELECTRICAL SPIDER BOX

JOB SUMMARY: Disperses electricity.

JOB HAZARDS: High voltage/Electric shocks.

SAFE CONDITIONS:

Employees shall be properly instructed on the hazards of their work and of safe practices by bulletins, printed rules, verbal instructions and periodic safety meetings.

SAFE PRACTICES

1. Avoid areas where water accumulates.
2. Follow all Company safety rules and policies.
3. Employees must report all unsafe conditions immediately to a Supervisor.
4. No horseplay is permitted.
5. Clean worksite conditions must be maintained at all times.
6. All Personal Protective Equipment (PPE) required by State or Federal Regulation must be worn.
7. All equipment guards required by State and Federal Regulations must be in place.
8. Report all accidents immediately to a Supervisor.
9. Use Lockout/Tagout/Blockout procedures when required by State or Federal Regulation.
10. Inspect equipment prior to each use.
11. Only operate equipment that you have been trained and authorized to use.
12. All electrical wiring shall be to code and maintained in safe condition.
13. Use proper lifting techniques.
14. Only qualified personnel can perform maintenance services.
15. Follow all Manufacturers safety guidelines.
16. Do not operate equipment under the influence of altering prescription drugs, illegal drugs and/or alcohol.
17. Ensure that all Warning, Caution and Danger signs are in place.

CODE OF SAFE PRACTICES

HAULAGE & EARTH MOVING EQUIPMENT

GENERAL:

Every vehicle (with a body capacity of 2.5 cubic yards or more) used to haul construction material must be equipped with an automatic back-up alarm which sounds immediately on backing.

All vehicles must be equipped with manually operated warning device.

All other vehicles operating in areas where backwards movement is hazardous must be equipped with an automatic back-up alarm or its equivalent.

Haulage vehicles in operation must be under operator control and must be kept in gear when descending grades.

The brakes on a haulage vehicle must meet the criteria specified by the Construction Safety Orders.

The control devices on a haulage vehicle must be inspected at the beginning of each workshift.

Exposed scissor points of front-end loaders must be guarded.

The engine must be stopped during refueling.

Lights are required for night operation.

Vehicles loaded by cranes, shovels, loaders and similar devices must have an adequate cab or canopy for operator protection.

Scrapers must have service brakes, parking brake, and an emergency stopping system.

Dust must not be allowed to seriously limit visibility. Respirators are required for drivers when air contamination becomes hazardous.

HIGHLIFT TRUCKS

The rated lifting capacity must be posted in a location readily visible to the operator.

A highlift truck must not be used to elevate employees unless a platform with guardrails, a backguard and a kill switch are provided on the vehicle.

Note: When guardrails are not possible, safety belt protection is required.

The employer must post and enforce a set of operating rules for highlift trucks.

(Continued on next page)

(HAULAGE & EARTH MOVING EQUIPMENT continued)

Basic Operating Rules:

Only trained and authorized drivers must operate forklifts.

Stunt driving and horseplay are prohibited.

Employees must not ride on the forks.

Employees must never be permitted under the forks (unless forks are blocked).

The driver must inspect the vehicle once per shift.

The operator must look in the direction of travel and must not move the vehicle until all persons are clear of the vehicle.

Forks must be carried as low as possible.

The operator must lower the forks, shut off the engine and set the brakes (or block the wheels) before leaving the forklift unattended (operator out of sight of, or 25 feet away from, vehicle).

Trucks must be blocked and have brakes set when forklifts are driven onto their beds.

Extreme care must be taken when tilting elevated loads.

Every industrial truck must have operable brakes capable of safely stopping it when fully loaded.

Industrial trucks must have parking brakes.

Industrial trucks must have an operable horn.

When the operator is exposed to possible falling objects, industrial trucks must be equipped with overhead protection (canopy).

CODE OF SAFE PRACTICES

ELEVATED PLATFORMS (SCISSOR LIFT)

JOB SUMMARY:	Lifts.
SKILLS REQUIRED:	Ability to use proper equipment. Able to follow directions. Safety conscious.
EMOTIONAL STANDARDS:	Ability to handle heights.
PHYSICAL STANDARDS:	Strong back and arms.
JOB HAZARDS:	Repetitive wrist, shoulder, arm and back movements. Twisting and turning motions.
SAFETY EQUIPMENT REQUIRED:	Safety shoes.

SAFE CONDITIONS:

Employees shall be properly instructed on the hazards of their work and of safe practices by bulletins, printed rules, verbal instructions and periodic safety meetings.

SAFE PRACTICES

- No employee shall ride, nor shall tools, materials, or equipment be allowed on a traveling elevated platform unless the following conditions are met: (EXCEPTION: TV and Movie Camera Booms.)
 - The travel speed at Maximum Travel Height does not exceed 3 feet (0.9m) per second.
 - Self-propelled units shall be equipped with electrical or other interlock means which will prevent driving them with the platform height greater than the Maximum Travel Height or at speeds greater than permitted at Maximum Travel Height.
 - The surface upon which the unit is being operated is level with no hazardous irregularities or accumulation of debris which might cause a moving platform to overturn.
- Units shall be assembled, used, and disassembled in accordance with the manufacturer's instructions.
- Units shall be assembled, and used only by personnel who have been trained in their use. Units shall be inspected for damaged and defective parts before use.
- Units shall not be loaded in excess of the design working load and shall be taken out of service when damaged or weakened from any cause. They shall not be used until repairs are completed.
- Employees shall not sit, stand or climb on the guardrails of an elevating work platform or use planks, ladders, or other devices to gain greater working height or reach.
- Employees shall not work on units when exposed to high winds, storms, or when they are covered with ice or snow (unless provisions have been made to ensure the safety of the employees).
- Employees climbing or descending vertical ladders shall have both hands free for climbing.
Note: Employees should remove foreign substances, such as mud or grease from their shoes.
- Where moving vehicles are present, the work area shall be marked with warnings such as flags, roped off areas or other effective means of traffic control shall be provided.
EXCEPTION: Aircraft service areas.
- Unstable objects such as barrels, boxes, loose brick, tools, debris, must not accumulate on the work level.
- In operations involving production of small debris, etc., and the use of small tools and materials, and where persons are required to work or pass under the equipment, screens shall be required between toe-boards and guardrails. The screen shall extend along the entire opening, shall consist of No. 18 gage U.S. Standard Wire ½ inch mesh, or equivalent.

CODE OF SAFE PRACTICES

AERIAL PLATFORM/MANUALLY PROPELLED

JOB SUMMARY:	Lifts people to elevated heights.
SKILLS REQUIRED:	Safety conscious. Complete assignments as directed. Able to work with precision. Trained Personnel Only. Good knowledge of equipment and procedures. Ability to use proper equipment.
EMOTIONAL STANDARDS:	Ability to follow directions. Ability to handle working in high places. Detail oriented and excellent working habits. Remain patient and safety conscious. Ability to stay with job until completed.
PHYSICAL STANDARDS:	Strong physical health. Able to stand for long periods on hard surfaces. Strong hands and arms. Strong back/legs/arms/wrists/hands - lifting.
JOB HAZARDS:	Lifting, twisting and turning. Pinched fingers. Flying particles, eyes.
SAFETY EQUIPMENT REQUIRED:	Safety glasses. Dust mask.

SAFE CONDITIONS:

Employees shall be properly instructed on the hazards of their work and of safe practices by bulletins, printed rules, verbal instructions and periodic safety meetings.

SAFE PRACTICES

1. Employees must report all unsafe work place conditions.
2. No horseplay is permitted.
3. Adequate aisle space shall be maintained.
4. Workplace should be maintained clean and dry. Any spills must be immediately cleaned up.
5. Appropriate footwear should be worn – open-toed shoes or sandals.
6. When carrying loads, care should be exercised to avoid over-exertion and strain. Use dollies. Back brace belts have been provided and must be worn when lifting.
7. Smoking is allowed in designated places only.
8. All operators must read the operating manual on the lift before using.
9. Outriggers must be extended and locked into place before climbing the platform.
10. Stay within railings at all times, and do not lean in railings when working.
11. Gate must be firmly locked in place when working on the elevated platform.
12. Secure gate in open position before moving aerial platform.
13. Alert another employee you are using the platform before climbing and beginning work.
14. The platform should never be moved to another location with an employee on it.
15. To prevent damage to outrigger jacks, always raise them before moving platform.

CODE OF SAFE PRACTICES

ELECTRICAL

1. The workplace electricians should be familiar with the Cal/OSHA Electrical Safety orders.
2. Workers are required to report, as soon as practical, any obvious hazard to life or property observed in connection with electrical equipment or lines.
3. Workers should be instructed to make preliminary inspections and/or appropriate tests to determine what conditions exist before starting work on electrical equipment or lines.
4. When electrical equipment or lines are to be serviced, maintained, or adjusted, necessary switches should be Locked-out and Tagged whenever possible.
5. Portable electrical tools and equipment should be grounded or of the double-insulated type.
6. Make all electrical appliances such as vacuum cleaners, polishers, and vending machines grounded.
7. All extension cords being used should have a grounding conductor.
8. The ground-fault circuit interrupters installed on each temporary 15 or 20 ampere, 120 volt AC circuit at locations where construction, demolition, modifications, alterations, or excavations are being performed.
9. All temporary circuits protected by suitable disconnecting switches or plug connectors at the junction should be with permanent wiring.
10. The exposed wiring and cords with frayed or deteriorated insulation should be repaired or replaced promptly.
11. The flexible cords and cables should be free of splices or taps.
12. Clamps or other securing means should be provided on flexible cords or cables at plugs, receptacles, tools, and equipment and the cord jacket securely held in place.
13. The cord, cable, and raceway connections should be intact and secure.
14. The location of electrical power lines and cables (overhead, underground, underfloor, other side of walls) should be determined before digging, drilling, or similar work is begun.
15. The metal measuring tapes, ropes, handlines, or similar devices with metallic thread woven into the fabric should be prohibited where they could come in contact with energized parts of equipment or circuit conductors.
16. The use of metal ladders is prohibited in areas where the ladder or the person using the ladder could come in contact with energized parts of equipment, fixtures, or circuit conductors.
17. The disconnecting switches and circuit breakers should be labeled to indicate their use or equipment served.

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(ELECTRICAL continued)

18. The disconnecting means should always be opened before fuses are replaced.
19. The interior wiring systems should include provisions for grounding metal parts of electrical raceways, equipment and enclosures.
20. All electrical raceways and enclosures should be securely fastened in place.
21. All energized parts of electrical circuits and equipment should be guarded against accidental contact by approved cabinets and enclosures.
22. Sufficient access and working space should be provided and maintained to all electrical equipment to permit ready and safe operations and maintenance.
23. All unused openings (including conduit knockouts) in electrical enclosures and fittings should be closed with appropriate covers, plugs, or plates.
24. Electrical enclosures such as switches, receptacles, junction boxes, etc. should be provided with tight-fitting covers or plates.
25. All disconnecting switches for electrical motors in excess of two horsepower capable of opening the circuit when the motor is in a stalled condition should be without exploding. (Switches must be horsepower rated equal to or in excess of the motor hp rating).
26. All motor disconnecting switches or circuit breakers located should be within sight of the motor control device.
27. Each motor located within sight of its controller or the controller disconnecting means capable of being locked in the open position or is a separate disconnecting means installed in the circuit should be within sight of the motor.
28. The controller for each motor in excess of two horsepower rated in horsepower should be equal to or in excess of the rating of the motor it serves.
29. All workers who regularly work on or around energized electrical equipment or lines should be instructed in the cardiopulmonary resuscitation (CPR) methods.
30. All workers are prohibited from working alone on energized lines or equipment over 600 volts.

CODE OF SAFE PRACTICES

GRADER

JOB SUMMARY: Moves earth.

SKILLS REQUIRED: Detail oriented.

EMOTIONAL STANDARDS: Complete assignments as directed.
Ability to handle repetitive work. Ability to follow directions.

PHYSICAL STANDARDS: Excessive reaches. Ability to sit on chairs for long periods of time.
Good eyesight with corrective lenses. Strong physical health.

JOB HAZARDS: Repetitive motions. Exposure to vibrating equipment or tools.
Posture: bent wrist or extended elbow or both.

SAFETY EQUIPMENT REQUIRED: Safety glasses suggested. Hard Hat. Seatbelts at all times.

SAFE CONDITIONS:

Employees shall be properly instructed on the hazards of their work and of safe practices by bulletins, printed rules, verbal instructions and periodic safety meetings.

SAFE PRACTICES

1. All maintenance should be done by professionals.
2. Never enter roadway or grade unless the access roadway or grade is constructed and maintained to accommodate safely the movement of the vehicles involved.
3. Every emergency access ramp and beam used by an employee shall be constructed to restrain and control runaway vehicles.
4. Brake all earth-moving equipment shall have braking systems capable of stopping and holding the equipment full load.
5. Maximum speed 15 MPH.
6. All equipment shall have rollover protection structures (ROPS).
7. Always make sure the audible alarms are working forward and when reversed.
8. Never operate with an obstructed view, front or rear.
9. Do not alter without notification to manufacturers.
10. No steering knobs.
11. Overhead guards are to be in place.
12. No unauthorized personnel shall be permitted to drive/ride.
13. Always visually inspect all equipment and fill out the daily log. Always keep a maintenance log book.
14. Follow all Company safety rules and policies.
15. Employees must report all unsafe conditions immediately to a Supervisor.

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(GRADER continued)

16. **No horseplay is permitted.**
17. **Clean worksite conditions must be maintained at all times.**
18. **All Personal Protective Equipment (PPE) required by State or Federal Regulation must be worn.**
19. **All equipment guards required by State and Federal Regulations must be in place.**
20. **Report all accidents immediately to a Supervisor.**
21. **Use Lockout/Tagout/Blockout procedures when required by State or Federal Regulation.**
22. **Inspect equipment prior to each use.**
23. **Only operate equipment that you have been trained and authorized to use.**
24. **All electrical wiring shall be to code and maintained in safe condition.**
25. **Use proper lifting techniques.**
26. **Only qualified personnel can perform maintenance services.**
27. **Follow all Manufacturers safety guidelines.**
28. **Do not operate equipment under the influence of altering prescription drugs, illegal drugs and/or alcohol.**
29. **Ensure that all Warning, Caution and Danger signs are in place.**

CODE OF SAFE PRACTICES

AERIAL LIFT

JOB SUMMARY: Lifts.

SKILLS REQUIRED: Ability to use proper equipment. Safety conscious. Able to follow directions.

EMOTIONAL STANDARDS: Ability to handle heights.

PHYSICAL STANDARDS: Strong back and arm.

JOB HAZARDS: Repetitive wrist, shoulder, arm and back movements. Twisting and turning.

SAFETY EQUIPMENT REQUIRED: Hard Hats.

SAFE CONDITIONS:

Employees shall be properly instructed on the hazards of their work and of safe practices by bulletins, printed rules, verbal instructions and periodic safety meetings.

SAFE PRACTICES

1. Follow all Company safety rules and policies.
2. Employees must report all unsafe conditions immediately to a Supervisor.
3. No horseplay is permitted.
4. Clean worksite conditions must be maintained at all times.
5. All Personal Protective Equipment (PPE) required by State or Federal Regulation must be worn.
6. All equipment guards required by State and Federal Regulations must be in place.
7. Report all accidents immediately to a Supervisor.
8. Use Lockout/Tagout/Blockout procedures when required by State or Federal Regulation.
9. Inspect equipment prior to each use.
10. Only operate equipment that you have been trained and authorized to use.
11. All electrical wiring shall be to code and maintained in safe condition.
12. Only qualified personnel can perform maintenance services.
14. Follow all Manufacturers safety guidelines.
15. Do not operate equipment under the influence of prescription drugs, illegal drugs and/or alcohol.
16. Ensure that all Warning, Caution and Danger signs are in place.
17. Only authorized persons shall operate an aerial lift.
18. Employee shall always stand firmly on the floor of the basket and shall not sit or climb on the edge of the basket or use planks, ladder, etc. for a work position.
19. Body belt shall be worn and a lanyard attached to the boom or basket when working from aerial lift.
20. The brakes shall be set and when outriggers are used they shall be in place.
21. Wheel chocks shall be installed before using an aerial lift on an incline.
22. Aerial lift truck shall not be moved when boom is elevated to a work position.
23. Lower controls should over-ride the upper controls.
24. Controls shall be in reach of the operator and be plainly marked.
25. Before moving an aerial lift the boom shall be inspected to make sure it is secure.
26. All electrical tests shall conform to the required ANSI code.
27. No machinery should be altered.

CODE OF SAFE PRACTICES

FORWARD REACHLIFT Engineering Principles

Fulcrum principle:

1. Two weights counter balance. Fulcrum point is the front tire. Data plate and angle tells you the weight you can lift and the height you can go to.
2. Larger load center = less weight
3. Capacity reach = Mass = vertical load

The capacity is based on a vertical lift and reach = the more the mass is extended, the less the capacity. You have to know your capacity chart and angle indicator.

Your center of gravity is in the middle of your reachlift as it is raised. The center of gravity is moved forward. Reachlifts have high centers of gravity and narrow wheelbase. Therefore, it is easy to overturn - You have to slow down.

Stability triangle:

1. Front tires forming a triangle center of the rear axle.
2. Reachlifts are built on the three-point suspension system. The first two points are the front tires. Third is the pivot pin of the rear axle - the pivot pin help the rear tires move over bumps. The center of gravity always has to be in the center of this triangle.
3. Outriggers extend the triangle.

If you raise a load, the center of the gravity shifts to the front tire. If you turn, the center of gravity goes to that side.

Never eat, smoke or drink on a reachlift. No rides.

When moving a load:

1. It should be as low as possible.
2. Be careful of forks and the back of the reachlift in tight areas.
3. When load blocks your vision, drive in reverse with your entire body inside the reachlift.
4. Honk your horn when going around blind spots.
5. Never drive up to a person.
6. Never walk under a load.
7. When not in use, set your fork tips on the ground and back of your fork should be as close to the ground as possible; set your brake, turn it off.

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(FORWARD REACHLIFT continued)

Loading Trucks or Trailers:

1. **Keep away from the ends of docks.**
2. **When driving onto trucks or trailers, make sure the wheels are chocked and the brakes are set.**
3. **When using a dock plate, make sure it is in good condition and is secure.**
4. **Make sure you have adequate lighting.**

Ramps:

1. **Make sure you have clearance - drive up and back down.**

Operator Maintenance Checklist

Before and After each shift:

1. **Make sure brakes, horn, parking brake and steering all work.**
2. **Look for leaks, hydraulic fluids.**
3. **Check water in battery, oil, fluids. Test brakes by seeing if the brake pedal goes to the floor.**
4. **Hand brakes: start the motor, engage the brake and put the gears in a forward movement and see if the brakes hold.**
5. **Check the steering - if there are two to three inches of play before the tires move, report it.**
6. **Check the heels of the fork for cracks.**
7. **Make sure forward moving forks have clearance on both sides.**
8. **Never have your forks extended and the forklift moving in excess of 5 M.P.H.**
9. **Always check your capacity load and never exceed it.**
10. **Never push material with the forward reaching forks.**
11. **Never drive around with the forward reach mast extended.**

CODE OF SAFE PRACTICES

OPERATING A FORKLIFT/FORWARD REACH

1. Only drivers authorized by the employer and trained in the safe operations of industrial trucks or industrial tow tractors shall be permitted to operate such vehicles. Methods shall be devised to train operators in safe operation of powered industrial trucks.
2. Stunt driving and horseplay are prohibited.
3. No riders shall be permitted on vehicles unless provided with adequate riding facilities.
4. Employees shall not ride on the forks of lift trucks.
5. Employees shall not place any part of their bodies outside the running lines of an industrial truck or between mast uprights or other parts of the truck where shear or crushing hazards exist.
6. Employees shall not be allowed to stand, pass, or work under the elevated portion of any industrial truck, loaded or empty, unless it is effectively blocked to prevent it from falling.
7. Drivers shall check the vehicle at least once per shift, and if it is found to be unsafe, the matter shall be reported immediately to a foreman or mechanic, and the vehicle shall not be put in service again until it has been made safe. Attention shall be given to the proper functioning of tires, horns, lights, battery, controller, brakes, steering mechanism, cooling system, and the lift system of forklifts (forks, chains, cable, and) limit switches).
8. No truck shall be operated with a leak in the fuel system.
9. Vehicles shall not exceed the authorized or safe speed, always maintaining a safe distance from other vehicles, keeping the truck under positive control at all times and all established traffic regulations shall be observed. For trucks traveling in the same direction, a safe distance may be considered to be approximately 3 truck lengths or preferably a time lapse - 3 seconds - passing the same point.
10. Trucks traveling in the same direction shall not be passed at intersections, blind spots, or dangerous locations.
11. The driver shall slow down and sound the horn at cross aisles and other locations where vision is obstructed. If the load being carried obstructs forward view, the driver shall be required to travel with the load trailing.
12. Operators shall look in the direction of travel and shall not move a vehicle until certain that all persons are in the clear.
13. Lifts shall not be driven up to anyone standing in front of a bench or other fixed object of such size that the person could be caught between the lift and object.

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(OPERATING A FORKLIFT/FORWARD REACH continued)

14. Grades shall be ascended or descended slowly. When ascending or descending grades in excess of 0 percent loaded lifts shall be driven with the load upgrade. On all grades the load and load engaging means shall be tilted back if applicable, and raised only as far as necessary to clear the road surface. Motorized hand and hand/rider trucks shall be operated on all grades with the load engaging means downgrade.
15. The forks shall always be carried as low as possible, consistent with safe operations.
16. When leaving a vehicle unattended, the power shall be shut off, brakes set, the mast brought to the vertical position, and forks left in the down position. When left on an incline, the wheels shall be blocked; or the power may remain on provided the brakes are set, the mast is brought to the vertical position, forks are left in the down position, and the wheels shall be blocked, front and rear. NOTE: When the operator is 25 feet from or out of sight of the industrial truck, the vehicle is "unattended".
17. Vehicles shall not be run into any elevator unless the driver is specifically authorized to do so and, before entering any elevator, the driver shall determine that the capacity of the elevator will not be exceeded. Once on the elevator, the power shall be shut off and the brakes set. Enter all confined areas with load end forward.
18. Vehicles shall not be operated on floors, sidewalk doors, or platforms that will not safely support the loaded vehicle.
19. Vehicles shall not be loaded in excess of their rated capacity.
20. A loaded vehicle shall not be moved until the load is safe and secure.
21. Extreme care shall be taken when tilting loads. Tilting forward with the load engaging means elevated shall be prohibited except when picking up a load. Elevated loads shall not be tilted forward except when the load is being deposited onto a storage rack or equivalent. When stacking or tiering, backward tilt shall be limited to that necessary to stabilize the load.
22. The load-engaging device shall be placed in such a manner that the load will be securely held or supported.
23. Special precautions shall be taken in the securing and handling of loads by trucks equipped with attachments, and during the operation of these trucks after the loads have been removed.
24. Before lifting with the forward reach forks make sure that you extend to the max to make sure equipment is working correctly.
25. Post and follow all Industrial Truck guidelines.

CODE OF SAFE PRACTICES

BACK HOE

JOB SUMMARY: Digs holes/trenches.

SKILLS REQUIRED: Ability to use proper equipment.
Able to follow directions. Good attitude. Safety conscious.

PHYSICAL STANDARDS: Strong back and arms.

JOB HAZARDS: Repetitive wrist, shoulder, arm and back movements.
Twisting and turning motions.

SAFETY EQUIPMENT REQUIRED: Ear protection above 85 dBA. Orange vest.
Gloves. Safety glasses. Seat belt. Respirators when applicable.

SAFE CONDITIONS:

Employees shall be properly instructed on the hazards of their work and of safe practices by bulletins, printed rules, verbal instructions and periodic safety meetings.

SAFE PRACTICES

1. Stop backhoe if articles get caught or any malfunction.
2. Warning: Keep all hands, feet, and body parts away from any moving parts.
3. Keep good visibility of persons working nearby. Orange vest must be worn.
4. Use danger tape to keep unauthorized people away from operations.
5. Follow all Company safety rules and policies.
6. Employees must report all unsafe conditions immediately to a Supervisor.
7. No horseplay is permitted.
8. Clean worksite conditions must be maintained at all times.
9. All Personal Protective Equipment (PPE) required by State or Federal Regulation must be worn.
10. All equipment guards required by State and Federal Regulations must be in place.
11. Report all accidents immediately to a Supervisor.
12. Use Lockout/Tagout/Blockout procedures when required by State or Federal Regulation.
13. Inspect equipment prior to each use.
14. Only operate equipment that you have been trained and authorized to use.
15. All electrical wiring shall be to code and maintained in safe condition.
16. Use proper lifting techniques.
17. Only qualified personnel can perform maintenance services.
18. Follow all Manufacturers safety guidelines.
19. Do not operate equipment under the influence of altering prescription drugs, illegal drugs and/or alcohol.
20. Ensure that all Warning, Caution and Danger signs are in place.

CODE OF SAFE PRACTICES

POWDER-ACTUATED TOOLS

SKILLS REQUIRED:	Good knowledge of equipment and procedures. Complete assignments as directed. Able to work with precision.
EMOTIONAL STANDARDS:	Detail oriented and safety conscious. Ability to follow directions.
PHYSICAL STANDARDS:	Strong physical health. Excessive reaches.
JOB HAZARDS:	Bending over. Forceful motions. Lifting, twisting and turning. Static load. Direct pressure on palms. Exposure to vibrating equipment or tools. Flying debris.
SAFETY EQUIPMENT REQUIRED:	Ear protection. Face shield when applicable. Safety glasses. Gloves. Hard-toed shoes.

SAFE CONDITIONS:

Employees shall be properly instructed on the hazards of their work and of safe practices by bulletins, printed rules, verbal instructions and periodic safety meetings.

SAFE PRACTICES

1. Only employees who have been trained in the operation of the particular tool in use shall be allowed to operate a powder-actuated tool.
2. The tool shall be tested each day before loading to see that safety devices are in proper working condition. The method of testing shall be in accordance with the manufacturer's recommended procedure.
3. Tools shall not be loaded until just prior to the intended firing time. Neither loaded nor empty tools are to be pointed at any employees. Hands shall be kept clear of the open barrel end.
4. Loaded tools shall not be left unattended.
5. Fasteners shall not be driven into very hard or brittle materials including, but not limited to, cast iron, glazed tile, surface-hardened steel, glass block, live rock, face brick or hollow tile.
6. Driving into materials easily penetrated shall be avoided unless such materials are backed by a substance that will prevent the pin or fastener from passing completely through and creating a flying missile hazard on the other side.
7. No fastener shall be driven into a spalled area caused by an unsatisfactory fastening.
8. Tools shall not be used in an explosive or flammable atmosphere.
9. All tools shall be used with the correct shield/guard or attachment recommended by the manufacturer.
10. Post signs stating "Powder-Actuated Tools are in use. Keep flammables 50 feet away."
11. Follow all Company safety rules and policies.
12. Employees must report all unsafe conditions immediately to a Supervisor.
13. No horseplay is permitted.
14. Clean worksite conditions must be maintained at all times.
15. All Personal Protective Equipment (PPE) required by State or Federal Regulation must be worn.

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(POWDER-ACTUATED TOOLS continued)

16. All equipment guards required by State and Federal Regulations must be in place.
17. Report all accidents immediately to a Supervisor.
18. Use Lockout/Tagout/Blockout procedures when required by State or Federal Regulation.
19. Inspect equipment prior to each use.
20. Only operate equipment that you have been trained and authorized to use.
21. All electrical wiring shall be to code and maintained in safe condition.
22. Use proper lifting techniques.
23. Only qualified personnel can perform maintenance services.
24. Follow all Manufacturers safety guidelines.
25. Do not operate equipment under the influence of altering prescription drugs, illegal drugs and/or alcohol.
26. Ensure that all Warning, Caution and Danger signs are in place.

Powder-actuated tools must meet ANSIA10.3-1977 or have an approved number.

- Only trained workers holding a valid operator's card can use a powder-actuated tool.
- Containers must be lockable and bear the label, POWDER-ACTUATED TOOL, on the outside.
- The container must be kept under lock and key storage.

The following must be provided with each tool:

- Operating and service manual
- Power Load chart
- Inspection-service record
- Repair and servicing tools

Limitations:

- Don't leave the tool unattended

Don't use the tool:

- In an explosive environment
- On hard or brittle material
- On un-backed, thin, soft material
- Within 3 inches of the edge of masonry
- On thin concrete
- On spalled areas
- On existing Holes

Operations:

- Eye or face protection is required for operators and assistants.
- The tool must be inspected prior to use.
- Defective tools must not be used.
- Tools must not be loaded until ready for use.
- Tools must be unloaded if work is interrupted.
- Never point a loaded tool or empty tool at anyone.
- On misfire, the tool must be held in place for 30 seconds.
- Different power loads must be kept in separate compartments.
- Warning signs bearing the words, POWDER-ACTUATED TOOLS IN USE, must be conspicuously displayed within 50 feet.

CODE OF SAFE PRACTICES

HAMMER

JOB SUMMARY:	Drives nails, etc.
SKILLS REQUIRED:	Ability to follow directions.
PHYSICAL STANDARDS:	Inadequate heights, work surfaces. Excessive reaches. Strong physical health.
JOB HAZARDS:	Repetitive motions. Bending over. Forceful motions. Direct pressure on palm. Crushing.
SAFETY EQUIPMENT REQUIRED:	Eye Protection.

SAFE CONDITIONS:

Employees shall be properly instructed on the hazards of their work and of safe practices by bulletins, printed rules, verbal instructions and periodic safety meetings.

SAFE PRACTICES

1. Check head of hammer for loose parts.
2. Follow all Company safety rules and policies.
3. Employees must report all unsafe conditions immediately to a Supervisor.
4. No horseplay is permitted.
5. Clean worksite conditions must be maintained at all times.
6. All Personal Protective Equipment (PPE) required by State or Federal Regulation must be worn.
7. All equipment guards required by State and Federal Regulations must be in place.
8. Report all accidents immediately to a Supervisor.
9. Use Lockout/Tagout/Blockout procedures when required by State or Federal Regulation.
11. Inspect equipment prior to each use.
12. Only operate equipment that you have been trained and authorized to use.
13. All electrical wiring shall be to code and maintained in safe condition.
14. Use proper lifting techniques.
15. Only qualified personnel can perform maintenance services.
16. Follow all Manufacturers safety guidelines.
17. Do not operate equipment under the influence of altering prescription drugs, illegal drugs and/or alcohol.
18. Ensure that all Warning, Caution and Danger signs are in place.

CODE OF SAFE PRACTICES

STATIC ELECTRICITY

A. Where not effectively grounded and/or bonded by contact or connection, provision shall be made to prevent the accumulation of static electrical charges that may create a source of ignition in the presence of flammable vapors or gases. This order applies specifically, but is not necessarily limited to, the following operations:

- 1) Blowing or agitating with air.
- 2) Loading and unloading tank cars and tank trucks.
- 3) Filling metal drums or containers.
- 4) Abrasive blasting.
- 5) Hydro blasting.

EXCEPTION: Bonding is not required where vehicles are loaded or unloaded exclusively with products not having a static-accumulating tendency.

- B. Stationary tanks containing flammable liquids and Class II combustible liquids, not inherently grounded by contact or by connection to a grounded pipeline, shall be grounded.
- C. The nozzle of air, inert gas and steam lines or hoses when used in the cleaning or ventilation of tanks and vessels that contain hazardous concentrations of flammable gases or vapors, shall be bonded to the tank or vessel shell. Bonding devices shall not be attached nor detached in hazardous concentrations of flammable gases or vapors.
- D. Conductors used for bonding and grounding shall be equivalent in strength to a #8 A.W.G. (American Wire Gage) copper wire and shall be suitably conductive to ensure a circuit resistance of not more than one megohm.
- E. Flexible conductors shall be used for bonds that are to be connected and disconnected frequently. Solid conductors are acceptable for fixed connections.
- F. When attaching bonding and grounding clamps or clips, a secure and positive metal to metal contact shall be made. Such attachments shall be made before closures are opened and shall not be broken until after static generating activities are completed, and/or closures closed.
- G. Static bonding installations shall be so designed, constructed, installed and maintained to prevent static charges of different potential from arcing from one conductive object to another.

CODE OF SAFE PRACTICES

MOBILE SCAFFOLDING (California Standards -1646)

- a. The minimum dimension of rolling scaffold shall not be less than 1/3 the height of the scaffold unless the scaffold is securely guyed or tied.
- b. Railings are required at 7 ½ feet or more above grade.
- c. Uprights shall not exceed 24 inches without being braced to manufacture's specifications.
- d. Wheels or casters shall be provided with an effective locking device, and kept locked when working or climbing on scaffold. At least two of the four must be swivel type.
- e. All wheels or casters must be able to support 4 times intended load.
- f. Joints of metal scaffolding shall be locked together with lock pins, bolts or equivalent fastening, including caster joints. Lock pins must be of locking type.
- g. Platform planks on rolling scaffolds shall not project farther than 18 inches past supports at the edges of scaffold. An effective method of preventing platform planks from slipping off must be provided. The nailing of cleats more than 1 inch material on the under side of each projecting end, or equivalent means.
- h. Platforms shall be tightly planked for the full width of scaffold except for necessary entrance openings.
- i. Employees may ride on rolling scaffold moved by others below if the following conditions exist:
 - AA. The floor or surface is within 3 degrees of level, and free of pits, holes, or obstructions.
 - BB. The minimum dimension of the scaffolding base, when ready for rolling, is at least ½ of the height, Outriggers, if used shall be installed on both sides.
 - CC. The wheels are equipped with rubber or similar resilient tires.

Rolling scaffolds require a horizontal diagonal brace.

CODE OF SAFE PRACTICES

ELECTRICAL MAINTENANCE

JOB SUMMARY:	Maintain and repair equipment.
SKILLS REQUIRED:	Creativity. Follow directions. Good attitude.
EMOTIONAL STANDARDS:	Detail oriented. Safety conscious. Complete assignments as directed. Ability to follow directions. Ability to handle repetitive work.
PHYSICAL STANDARDS:	Good eyesight with corrective lenses. Strong physical health. Excessive reaches. Inadequate heights, work surfaces. Inadequate mobility.
JOB HAZARDS:	Moving Equipment. Electricity. Hot asphalt. Overhead obstructions.
SAFETY EQUIPMENT REQUIRED:	Gloves. Respirators. Hot glove if applicable. Safety glasses.

SAFE CONDITIONS:

Employees shall be properly instructed on the hazards of their work and of safe practices by bulletins, printed rules, verbal instructions and periodic safety meetings.

SAFE PRACTICES

1. Never exceed your knowledge.
2. Must be a certified Electrician.
3. Never put hands or body in harms way.
4. Try never to work alone (if at all possible).
5. Know where main electrical switch is located.
6. Use barricades to warn other employees of hazardous operations.
7. Know safety procedures for electrical spacing.
8. Follow all Company safety rules and policies.
9. Employees must report all unsafe conditions/accidents immediately to a Supervisor.
10. No horseplay is permitted.
11. Clean worksite conditions must be maintained at all times.
12. All Personal Protective Equipment (PPE) required by State or Federal Regulation must be worn.
13. All equipment guards required by State and Federal Regulations must be in place.
14. Use Lockout/Tagout/Blockout procedures when required by State or Federal Regulation.
15. Inspect equipment prior to each use.
16. Only operate equipment that you have been trained and authorized to use.
17. All electrical wiring shall be to code and maintained in safe condition.
18. Use proper lifting techniques.
19. Only qualified personnel can perform maintenance services.
20. Follow all Manufacturers safety guidelines.
21. Do not operate equipment under the influence of altering prescription drugs, illegal drugs and/or alcohol.
22. Ensure that all Warning, Caution and Danger signs are in place.

CODE OF SAFE PRACTICES

WELDING SAFETY PROCEDURES

GENERAL PRECAUTIONS

Welding Area Precautions

1. The welding area shall be thoroughly screened off from the rest of the worksite and "DANGER WELDING" signs posted conspicuously on all sides.
2. The screened area shall be considered as an "EYE HAZARD AREA" and will be so posted. Anyone entering or working within it shall wear eye protection.
3. Welders working within this area will use extreme caution and screen their work whenever possible to prevent flash burns to fellow workers.

WELDING AND BURNING OPERATIONS

A. Scope of this section

This section applies to all personnel performing work involving the use or handling of oxygen, acetylene, hydrogen, or other compressed fuel gases or electric arc-welding equipment. This specifically includes all persons performing the following operations:

- a. Oxygen-acetylene welding, brazing, or soldering.
- b. Oxygen-acetylene cutting or other flame cutting.
- c. Electric arc-welding or arc-cutting.
- d. "Stud" welding.
- e. All heating operations using flame produced by a torch using oxygen-acetylene hydrogen, and other compressed fuel gases. This includes the use of "Flame", "Rock Gas", and similar casing head gas or high test gas when transported in tanks or cylinders and used for heating, cutting, or welding purposes.

B. Definitions

1. The words "operator", "welder", "cutter", etc., where used in this section, refer to the person actually operating, handling, connecting, disconnecting, or using the equipment under the scope of the section.
2. The word "supervisor" or "supervision", where used in this section, refers to the person or persons in charge of the welding operation and the welding operator.
3. The "work area" shall be defined to include the location where the work is being performed, and in addition, all spaces below, above, or adjacent to, where there is any possibility of causing a fire or an explosion.

C. Responsibility and Authority

1. The first responsibility for safety rests upon the operator.
2. The operator of any welding, cutting, or heating torch, or machine or equipment shall be held responsible for violations of the mandatory provisions of the OSHA regulations. Operators will be held responsible for willful and deliberate misuse of equipment or proven carelessness or inattention, either of which result in the creation of a hazard.

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(WELDING SAFETY PROCEDURES continued)

3. The operator or the operator's supervisor shall make the required inspection of the work area to see that all spaces where the work is to be performed, or spaces below, above, or adjacent to, are free from possible causes of fire or explosion. The welder or cutter shall have the right to refuse to proceed under what he believes to be unsafe conditions. However, he shall refer this to his supervisor's attention, who will take the necessary steps to investigate the conditions, calling in the safety director and/or the fire marshal for final decision if necessary. Other employees or their supervisors shall not do anything that will so change conditions as to create a hazard while the hot work is going on.
4. The safety director shall be responsible for the general enforcement of safety orders and the observance of safe practice. It is the responsibility of the supervisors that employees under their control not only know what constitutes safe practices, but also that safe practices are regularly followed and that the mandatory OSHA provisions are observed.
5. No person shall be allowed to operate any equipment until such person has been properly trained and qualified in the operation of such equipment and has a thorough working knowledge of safety rules.
6. The Gas Free Engineer or Industrial Hygienist shall be called upon to make tests in all closed compartments, voids, and other confined spaces, and they must issue an "all clear" or "gas free" certificate before anyone else is allowed to enter.

D. Explosion Hazards From Compressed Gasses

1. Explosions occur from the following conditions:
 - a. Excess pressure.
 - b. An unstable chemical compound.
 - c. Rapid combustion (burning) in a closed space.
2. Excess Pressure
 - a. Operators of welding, cutting, or heating equipment, in which compressed fuel gases are used, shall not exceed the specified safe operating pressures.
 - b. When a gas is heated in a confined space, its pressure is increased. Particular hazards of this sort to be watched for and avoided are:
 - 1) The increase of pressure in a tank; for example, an oxygen tank, when heated by the sun or by hot piping or machinery.
 - 2) The increase of pressure inside a closed section of piping of a hollow casting of which it is proposed to weld.
 - c. To avoid these dangers:
 - 1) Keep gas cylinders from becoming overheated.
 - 2) Any hollow article shall be vented before heat is applied.
 - d. When liquid in a confined space is turned into vapor as water into steam, increase in pressure is much greater than that from heating gas, and the danger is therefore increased.
 - e. Venting may be accomplished by drilling a hole of sufficient size to allow the escape of steam or heated air.

CAUTION: Do not close vent until the object has cooled to normal temperature. Condensing steam or cooling air may create a partial vacuum that will cause the thin-walled object to collapse from external atmospheric pressure.

3. Unstable Chemical Compounds
Many high explosives are of the type of unstable chemical compounds that can flash into an explosion from a jar or sudden jolt. Acetylene gas starts to become such an unstable compound at slightly above 15 pounds pressure per square inch.
4. Rapid Combustion
 - a. Combustion means burning. Anything that will burn will explode if conditions are right.

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(WELDING SAFETY PROCEDURES continued)

- b. **Oxygen, such as used for welding or cutting, will cause a much hotter and fiercer flame than air. Many things, such as oily rags, tend to burn in air, but explode in oxygen. Oxygen and oil make an especially dangerous combination.**
- c. **Most inflammable gases, and the vapors of inflammable liquids, become explosives when mixed with proper proportions of air or pure oxygen. Hydrogen gasoline, tectyl, and saran vapors are especially dangerous.**

APPARATUS AND EQUIPMENT FOR GAS CUTTING, WELDING, HEATING, ETC.

A. Apparatus and Equipment (General)

Only approved apparatus, such as torches, cylinders, regulators, hoses, etc. that have been tested and found to be safe shall be used. Equipment shall be used only for the gas for which it was intended. Defective or damaged apparatus shall be turned in immediately for replacement or repair.

B. Cylinders

A gas cylinder can be a source of great danger if not treated properly. All persons concerned with the use, storage, or handling of gas cylinders shall be thoroughly familiar with the provisions of "Safety Precautions" in this regard.

C. Hose

- 1. **For light work the 3/16" or 1/4" diameter hose may be used. For pressure above 15 P.S.I. the 1/4" or 5/16" diameter hose shall be used.**
- 2. **Single hose lines may be tied or taped together for convenience in handling but no more than four inches (4") in each eight inches (8") may be covered.**
- 3. **Hose connections shall be made through substantial fittings securely attached and leak proof under standard tests. "Dry splices" and "Hay wire" connections are not allowed.**

D. Regulators

- 1. **Approved regulators designed and designated for the gas being used shall always be used between hose lines and gas cylinders or piping supply systems.**
- 2. **Oil shall never be allowed to come into contact with an oxygen regulator, not even for testing, assembly, or preservation.**

E. Manifold Cylinders

- 1. **When acetylene cylinders are coupled, approved flash arrestors shall be installed between each cylinder and the manifold. For outdoor use only, and where the number of cylinders coupled does not exceed three, one flash arrestor installed between manifold and regulator is acceptable.**
- 2. **Each fuel gas cylinder lead should be provided with a check valve to prevent gas flowing back into the cylinder.**
- 3. **Acetylene shall be distributed in hose or pipelines at a pressure above 15 pounds per square inch.**
- 4. **Unalloyed copper, or copper alloys containing more than sixty-seven percent (67%) copper shall NOT be used in piping or fittings for handling acetylene (except blowpipe or torch tips). Acetylene reacts with pure or slightly alloyed copper to form acetylide, which is a violent explosive.**
- 5. **Iron or steel pipe, tubing or fittings shall not be used for high-pressure oxygen. Annealed brass, or copper should be used for high-pressure oxygen.**

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(WELDING SAFETY PROCEDURES continued)

6. Special care shall be taken at all times to see that no scale, dirt, oil, grease, or any combustible material of any kind is in an oxygen manifold when put into service.
7. Flash-arrestors of the water seal type shall be inspected for correct water level at least once a week when in service, and when being put into service after being out of use.
8. In manifold acetylene cylinders, care should be taken to connect cylinders containing approximately equal pressure.
9. Brass tubing subjected to repeated bending may become hard and brittle. Cylinder leads should be annealed or renewed when evidence of "work-hardening" of the tubing from repeated bending is noted.
10. No manifold or pipe or tubing distributing systems for oxygen or fuel gas shall be constructed or operated unless the design and method of operation has been approved by the Safety Director.
11. When the rate of consumption of acetylene is such that a full cylinder will be emptied in seven (7) hours or less of use, cylinders must be manifold.

OPERATING PROCEDURES (GAS WELDING AND CUTTING)

- A. All personnel using gas welding, cutting, silver brazing, and heating equipment shall carry out the following operating procedure.
 1. **Setting Cylinders**
See that cylinders are set in the safest available location and secured against falling or being knocked over.
 2. **Connecting Apparatus and Lighting Torch**
 - a. Remove valve protection caps.
 - b. Face oxygen valve away from acetylene valve.
 - c. Look oxygen cylinder valve and regulator over closely to see that no oil or grease is present.
 - d. Face cylinder valve away from personnel and "Blow Out" cylinder valves by quickly opening and closing part of a turn. This is to be done in a well-ventilated place, preferably out-of-doors.
 - e. Inspect cylinder valve openings to see that no dirt or foreign matter is present.
 - f. Inspect regulator connections to see that they are clean.
 - g. Attach regulators.
 - h. Attach hose.
 - i. "Purge" hose to open air only (not in confined spaces) by allowing acetylene to pass through acetylene hose, and oxygen through oxygen hose for a few seconds until the hose is filled with only the gas for which it was intended.
 - j. Torch may be attached and tested at this point or may be moved to work site and attached later.
 - k. See that regulator screws are backed out until loose and that no one is standing in front of the pressure gauges before opening cylinder valves.
 - l. Open acetylene cylinder valve slowly, ¼ to ½ turn. Leave valve wrench in place so that acetylene can be shut off quickly in an emergency.
 - m. Open oxygen valve slowly at first. Never attempt to tighten a leaking regulator nut to cylinders while cylinder valve is opened. Never force threaded connections on any gas welding or cutting equipment and use only approved wrenches in making connections.
 - n. Turn on acetylene and light it first. Use care not to allow unburned acetylene to escape into a room or compartment. Use a spark lighter to light the torch. Do not use a match held in the hand.
 - o. Turn on oxygen and adjust flame.

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(WELDING SAFETY PROCEDURES continued)

B. When welding or cutting will not be resumed for a considerable period of time, or when the operator leaves the scene for any period of time, the equipment should be turned off as follows:

1. Extinguish torch, closing acetylene valve first and then closing oxygen.
2. Close both oxygen and acetylene cylinder valves (leave regulators open).
3. Open acetylene valve on torch and allow gas in hose to escape to open air or in well-ventilated area only.
4. Open oxygen valve on torch and allow gas to escape. Close valve.
5. Close both regulators. Oxygen and acetylene regulators are closed when adjusting screws are backed out until loose.

C. To relight after being secured as above:

1. Check torch valves to be sure they are closed firmly.
2. Repeat steps k., l., and m. in paragraph A above.
3. Open cylinder valves slowly.
4. Open regulators slightly.
5. "Purge" the acetylene line to open air or into well ventilated area for 5 to 15 seconds. Close valve.
6. "Purge" oxygen line the same way and close.
7. Then light as directed in steps n. and o. in paragraph A above.

D. Storing Gear

1. Gas welding and cutting equipment will be stored as follows at the end of the shift or on completion of work in the vicinity:
 - a) Repeat steps 1., 2., 3., 4., and 5., in paragraph B above.
 - b) Shut off tanks, release regulator screws and coil hose.
 - c) Disconnect torch and regulators and lock them in toolbox.
 - d) Replace valve protection caps on cylinders.
 - e) Check cylinders to be sure that they are properly secured against being knocked over.

E. General Precautions

1. An explosive mixture of acetylene and oxygen can accumulate quickly in a closed space. **DO NOT** allow such a mixture to accumulate. Particularly, do not be slow to light the torch, especially a large one for heavy work.
2. Take care not to burn yourself or others with torch flame. **LOOK** and **THINK** before you move the torch to point away from the work.
3. If there is any chance of the hose becoming cut or broken or your torch being damaged while you are away, coil the hose back up to the cylinders. **DO NOT** hang hose or torch on regulators. Regulator connections are not made to carry weights.
4. If there is danger of your outfit being tampered with while you are gone, take the torch off and lock it in your toolbox.
5. Tests for leaks shall be made with soapy water. Use grease free soap. Never employ flames to detect leaks.
6. Always use care in lowering a torch through small openings, etc., so that the valves do not become opened and fill the space with an explosive mixture of gases.
7. Take care to route hose up off the ground and out of the way where people will not trip over it. Use special care to avoid danger of hose being cut or pinched by doors, traffic in area, etc., or pulled in two by the handling of construction materials at the jobsite.

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(WELDING SAFETY PROCEDURES continued)

8. The practice of kinking the hose to shut off the pressure when changing torches, etc., is strictly forbidden. The hose may be kinked to stop the flow of gas in an emergency.
9. The operator shall not make attempts to light the torch from hot metal.
10. Never attempt to light the torch with both acetylene and oxygen turned on.
11. No operator of any welding, cutting, or heating equipment using oxygen-acetylene gas shall make attempts to repair defective equipment. It shall be returned to the tool room for check and repairs.

OPERATING PROCEDURES (ARC WELDING)

A. Connecting Equipment

1. The power supply of welding machines shall be connected by a qualified electrician. The electrician shall also ground the frame (equipment ground) of all welding machines. He shall connect the ground (welding return lead) of multiple units.
2. Leads shall be kept off the ground or out of the way to prevent their becoming a tripping hazard. They shall be kept from coming in contact with any inflammable materials, oily rags, solvent, paints, etc.
3. Windows, doors, etc., should be blocked where leads might be cut or jammed. Leads with damaged or deficient insulation shall be turned in promptly for repair.

- B. Electrode holders shall be of an approved type. Handles and surfaces that the operator grips in his hand shall be insulated.**

C. Shutting Down Arc Welding Equipment

1. At lunch period, at the end of the day, and any other time when leaving work for an extended period of time (15 minutes or more in most cases), the lead must be de-energized. On single operator machines, the machine must be shut down when leaving for any period of time.
2. A multiple machine must be shut down when all operators on that machine cease work as above. An individual operator leaving the job during working hours may open his grid switch, when the machine is running. Leads not in use shall be disconnected at the grid.
3. In any case, a lead, whether energized or not, shall not be left unattended near combustibles where a fire could be caused if such a lead is accidentally grounded.

D. Precautions in The Use of Arc Welding Equipment

1. Do not assume that just because a welding lead carries low voltage, it is safe. It could get mixed up with a 440-volt power line. Stand on a dry wood board or have some kind of insulation between you and a steel surface or grounded structure whenever it is possible to do so.
2. Always wear gloves when handling energized holders, changing electrodes, etc. Gloves should be dry and in good condition. Never put an electrode under your arm.
3. No operator shall attempt to make repairs to any welding equipment.
4. No gasoline driven welding machine shall be operated in any building or other confined space, where there is danger of carbon monoxide accumulation.

FIRE PREVENTION

- A. Guarding against fires and explosions is the responsibility of every employee, supervisor, and all others concerned with the work to be accomplished.**

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(WELDING SAFETY PROCEDURES continued)

B. Inspection of Work Area

1. The "work area" shall be defined to include the location where the work is being performed and, in addition, all spaces below, above, or adjacent to, where there is any possibility of a fire or an explosion being started.
2. The entire work area shall be inspected carefully by the operator or the safety director and by assisting personnel before welding, cutting, etc., are allowed to begin. Additional inspections shall be made at the start of each shift and more often when unusual hazards are present.

C. Fire and Explosion Hazards

1. General

- a) The work area shall be inspected for inflammables, including gas.
- b) All inflammable materials shall be removed from the work area.
- c) The precautions, preventative measures, and conditions shall be continuously observed by the supervisor/safety director.

D. Oil, Gasoline, Paint, Etc.

1. Welding and cutting operations shall not be permitted in or on the outer surface rooms, compartments, or tanks; or on closed drums, tanks, or other container containing or which have contained inflammable or explosive materials, liquids, or vapors until all fire and explosive hazards have been eliminated and the Gas Free Engineer or Industrial Hygienist approves the conditions prior to commencing work.
2. Gasoline, paint thinner, kerosene, or any other similar inflammable liquid shall not be allowed in the same area where welding or flame cutting is being performed.
3. Diesel oil, fuel oil, and other inflammable liquids shall not be permitted to accumulate in the work area. If there is any oil present, the space shall be cleaned and rendered as gas free before work is started. Oil and debris are much worse than oil alone. It shall be the responsibility of the personnel using rags etc., in machinery spaces or other areas to keep their oily rags in containers and to have them removed from the space at the end of each shift. Oily rags, etc., found in spaces shall be picked up by personnel using them.
4. The fumes from fresh paint and hot or cold Bit mastic constitute a serious fire hazard. No painting shall be done in the work area at the same time that welding, cutting, or heating is being performed. Fresh paint shall be set beyond the "tacky" stage and paint fumes shall be removed by adequate ventilation before welding, cutting, brazing, or use of open flame is allowed.
5. Oil paint containing lead constitutes not only a fire hazard – but a health hazard as well, due to the presence of lead or other poisonous substances in the smoke from cutting or welding. Thick coats of oil or paint or paint containing lead and coats of red lead shall be removed by scaling, chipping, or other approved methods from both sides of the material being welded or cut to such extent that it will not constitute a fire hazard. When removing Bit mastic, coal tar paint, or preservatives such as "No-oxide", the removal shall be adequate to clear any area which will be heated enough to make the material run; otherwise, it may melt and run into a hotter area which could ignite. The area from which all Bit mastic, coal tar paint, or preservative such as "No-oxide" shall be removed, and shall be for twenty-four (24) inches in all directions from any welding or cutting to be done.

E. Fire Watches

1. During gas or arc welding and cutting operations fire watches shall be posted in the number and locations as necessary to protect against fire. Supervisors are expected to utilize judgement and discretion to the end that adequate protection shall be provided.

(continued on next page)

(WELDING SAFETY PROCEDURES continued)

2. At least one fire watch must be provided for every location where a fire hazard exists. It is possible for one fire watch to serve two or more welders where working in the same location. It is also possible for one cutter or one welder to require two or more fire watches for adequate protection.
3. Maintenance of discipline among fire watches is the responsibility of the supervisor in charge of the job. All cases of unauthorized absence from post or carelessness or inattention to fire watches shall be cause for disciplinary action or termination and immediate stoppage of work until alert fire watches are obtained.
4. Supervisors shall determine their needs for fire watches and the hours to be worked, and make the necessary arrangements for fire watch personnel.
5. For work, a fire watch shall be posted at any location where definite hazard exists which cannot be properly watched by the operator. Employees or a dependable helper may be detailed for this job by the supervisor in charge of the work being done, but detail must be definite, and responsibilities must be fixed.

F. Fire Extinguishers

1. Suitable fire extinguishers, equipment of approved types shall be maintained near all welding and cutting operation. The suitability of the equipment shall be judged by an analysis of the conditions at the scene of operations.
2. In case of doubt as to the suitability of the equipment, the Safety Director or the Fire Marshal shall be consulted.
3. Whenever a fire watch is assigned, each fire watch employee shall be provided with at least one fifteen (15) pound capacity (50 pounds gross weight) CO₂ fire extinguisher, fully charged and in good working order. Extinguishers with seals broken or which are in any way broken, damaged, or in an inoperative condition shall not be used for fire watches.
4. Supervisors requesting fire watches shall make a daily routine inspection of the condition of the fire extinguishers. Any extinguisher found noticeably underweight or with the seal broken, or in an inoperable condition for any reason whatsoever, shall promptly be reported to the Safety Director or Fire Marshal.
5. Special Protection, in the form of fire hoses, fog nozzles, etc., or other special types of fire fighting equipment to combat special risks, shall be arranged for by the supervisor wherever and whenever deemed necessary.

G. Safe Clothing and Equipment

1. Welders, gas cutters, and all other persons associated with the welding and cutting operations, shall not wear flimsy or highly flammable clothing or clothing so designed or constructed or in such condition as to cause a definite fire or accident hazard.
2. Unsafe clothing shall be changed for safe clothing, or covered by suitable protective clothing, such as leather sleeves or leather jackets. Oilskins shall **NOT** be worn by any operator while using welding or cutting equipment.
3. Protective equipment supplied by the employer is listed below:
 - a. Welding helmets for electric welders.
 - b. Burning goggles for gas cutters.
 - c. Safety hats (welder's type) for welders and gas cutters.
 - d. "Flash" goggles for welders.
 - e. Leather jackets, sleeves, and gloves for welders and gas cutters.
 - f. Metal screens for shielding arc-glare from nearby employees.

CODE OF SAFE PRACTICES

ERECTION/DISMANTLING PROCEDURES Frame Scaffolds, System Scaffolds, Tube And Clamp Scaffolds, And Rolling Towers

If these guidelines in any way conflict with any state, local, federal, or other government statute or regulation, said statute or regulation shall supercede these guidelines and it shall be the responsibility of each user to comply therewith.

1. General Guidelines

- a) Post these Scaffolding Guidelines in a conspicuous place and be sure that all persons who erect, dismantle or use scaffolding are aware of them.
- b) Follow all state, local and federal codes, ordinances and regulations pertaining to scaffolding.
- c) Survey the job site. A survey shall be made of the job site for hazards, such as earth fills, ditches, debris, high tension wires, unguarded openings and other hazardous conditions created by other trades. These conditions should be corrected or avoided as noted in the following sections.
- d) Inspect all equipment before using. Never use any equipment that is damaged or defective in any way. Remove it from the job site.
- e) Scaffolds must be erected in accordance with design and/or manufacturer's recommendations.
- f) Do not erect, dismantle or alter a scaffold unless under supervision of a Qualified Person.
- g) Do not abuse or misuse the scaffold equipment.
- h) Erected scaffolds should be continually inspected by users to be sure that they are maintained in a safe condition. Report any unsafe condition to your Supervisor.
- i) Never take chances! If in doubt regarding the safety or use of scaffold, consult your scaffold supplier.
- j) Never use equipment for purposes or in ways for which it was not intended.
- k) Do not work on scaffolds if your physical condition is such that you feel dizzy or unsteady in any way.

2. Guidelines for Erection and Use of Scaffolds

- a) A scaffold's base must be set on an adequate pad to prevent slipping or sinking and fixed thereto where required. Any part of a building or structure used to support must be capable of supporting the maximum intended load to be applied.
- b) Use adjusting screws or other approved methods instead of blocking to adjust in uneven conditions.
- c) Bracing, Leveling and Plumbing of Frames or Scaffolds:
 1. Plumb and level all scaffolds as the erection proceeds. Do not force frames or braces to fit. Level the scaffolds until proper fit can easily be made.
 2. Each frame or panel shall be braced by horizontal bracing, cross bracing, diagonal bracing, or any combination thereof, for securing vertical members together lateral. All brace connections shall be made secure in accordance with the manufacturer's recommendations.
- d) Bracing, Leveling and Plumbing of Tube & Clamp and System Scaffolds:
 1. Posts shall be erected plumb in all directions, with the first level of runners and bearers positioned as closed to the ground as feasible. The distance between bearers and runners shall not exceed manufacturer's procedures.
 2. Plumb, level and tie all scaffolds as erection proceeds.
 3. Fasten all couplers and/or connections securely before assembly of next level.

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(ERECTION/DISMANTLING continued)

4. Vertical and/or horizontal diagonal bracing must be installed according to manufacturer's recommendations.
- e) Tie continuous (running) scaffold to the wall or structure at each end and at least every 30' of length when scaffold height exceeds the maximum allowable free standing dimension. Begin ties or stabilizers when the scaffold height exceeds that dimension and repeat at vertical intervals not greater than 26'. The top anchor shall be placed no lower than four (4) times the base dimension from the top of the completed scaffold. Anchors must be used to prevent scaffold from tipping into or away from wall or structure. When scaffolds are partially or fully enclosed or subjected to overturning loads, specific precautions shall be taken to insure the frequency and adequacy of ties to the wall and structure. Due to increased load resulting from wind or overturning loads, the scaffolding component to which ties are secured to shall be checked for additional loads.
- f) When free standing scaffold towers exceed four (4) times their minimum base dimension vertically, they must be sustained from tipping. (CAL OSHA and some government agencies require stricter ratio of 3 to 1.)
- g) Do not erect scaffold near electrical power lines unless proper precautions are taken. Consult the power service company for advice.
- h) A means of access to all platforms shall be provided.
- i) Do not use ladders or makeshift devices on top of scaffolds to increase height.
- j) Provide guardrails and mid-rails at each working platform level where open sides and ends exist, and toeboards where required by code.
- k) Brackets and Cantilevered Platforms:
 1. Brackets for System Scaffolds shall be installed and used in accordance with manufacturer's recommendations.
 2. Brackets for Frame Scaffolds shall be seated correctly with side brackets parallel to the frames and end brackets at 90 degrees to the frames. Brackets shall not be bent or twisted from normal position. Brackets (except mobile brackets designed to carry materials) are to be used as work platforms only and shall not be used for storage of materials or equipment.
 3. Cantilevered Platforms shall be designed, installed and used in accordance with manufacturer's recommendations.
- l) All scaffolding components shall be installed and used in accordance with manufacturer's recommended procedure. Components shall not be altered in the field. Scaffold frames and their components manufactured by different companies shall not be intermixed unless the component parts readily fit together and the resulting scaffold's structural integrity is maintained by the user.
- m) Planking:
 1. Work platforms shall cover scaffold area as completely as possible. Only scaffold grade wood planking, or fabricated planking and docking meeting scaffold use requirements shall be used.
 2. Check each plank prior to use to be sure plank is not warped, damaged, or otherwise unsafe.
 3. Planking shall have at least 12" overlap and extend 6" beyond center of support, or be closed or restrained at both ends to prevent sliding off supports.
 4. Solid sawn lumber, LVL (laminated veneer lumber) or fabricated scaffold planks and platforms (unless cleated or restrained) shall extend over their end supports not less than 6" nor more than 18". This overhang should not be used as a work platform.
- n) For Putlogs and Trusses, the following additional guidelines apply:
 1. Do not cantilever or extend putlogs/trusses as side brackets without thorough consideration for loads to be applied.
 2. Putlogs/trusses should extend at least 6" beyond point of support.
 3. Place proper bracing between putlogs/trusses when the span of the putlog/truss is more than 12".
- o) For Rolling Scaffolds the following additional guidelines apply:
 1. Riding a rolling tower is very hazardous. The Scaffold Industry Association does not recommend nor encourage this practice. However, if you choose to do so, be sure to follow all state, Federal or other government guidelines.
 2. Casters with plain stems shall be attached to the panel or adjustment screw by pins or other suitable means.

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(ERECTION/DISMANTLING continued)

3. No more than 12' of the screw jack shall extend between the bottom of the adjusting nut and top of the caster.
 4. Wheels and casters shall be provided with locking means to prevent center rotation and scaffold movement and shall be kept locked.
 5. Joints shall be restrained from separation.
 6. Use horizontal diagonal bracing near the bottom and at 20' intervals measured from the rolling surface.
 7. Do not use brackets or other platform extensions without compensating for the overturning effect.
 8. The platform height of a rolling scaffold must not exceed four (4) times the smallest base dimension. (CAL OSHA and some government agencies require ratio of 3 to 1.)
 9. Cleat or secure all planks.
 10. Secure or remove all materials and equipment from platform before moving.
 11. Do not attempt to move a rolling scaffold without sufficient help. Watch out for holes in floor or overhead obstructions. Stabilize against tipping.
- p) Safe Use of Scaffold:
1. Prior to use, inspect scaffold to insure it has not been altered and is in safe working condition.
 2. Erected scaffolds and platforms should be inspected continuously by those using them.
 3. Exercise caution when entering or leaving a work platform.
 4. Do not overload scaffold. Follow manufacturer's safe working load recommendations.
 5. Do not jump onto planks or platforms.
 6. Do not use ladders or makeshift devices on top of working platforms to increase the height or provide access from above.
 7. Climb in access areas only and use both hands.

3. When Dismantling Scaffolding, the following additional guidelines apply:

- a) Check to assure scaffold has not been structurally altered in a way which would make it unsafe and, if it has, reconstruct where necessary before commencing with dismantling procedures. This includes all scaffold ties.
- b) Visually inspect planks prior to dismantling to be sure they are safe.
- c) Consideration must be given as to the effect removal of a component will have on the rest of the scaffold prior to that component's removal.
- d) Do not accumulate excess components or equipment on the level being dismantled.
- e) Do not remove ties until scaffold above has been removed (dismantled).
- f) Lower dismantled components in an orderly manner. Do not throw off scaffold.
- g) Follow erection procedures and use manuals.

CODE OF SAFE PRACTICES

STACKER BRACKETS

JOB SUMMARY:	Used as Fall Protection.
SKILLS REQUIRED:	Knowledge of Stacker Bracket erection, dismantling, use and daily evaluation.
EMOTIONAL STANDARDS:	Knowledge of fall protection exposures. Safety conscious. Ability to work at heights. Follow directions.
PHYSICAL STANDARDS:	Physically strong. Able to stand or crouch. Able to reach for extended periods of time to extended lengths.
JOB HAZARDS:	Fall hazard. Strain of muscle. Repetitive movement of shoulder, arm, wrist, neck, back, and knees.
SAFETY EQUIPMENT REQUIRED:	Fall protection equipment needed at required height.

SAFE CONDITIONS:

Employees shall be properly instructed on the hazards of their work and of safe practices by printed assembly instructions, verbal instructions and periodic safety meetings.

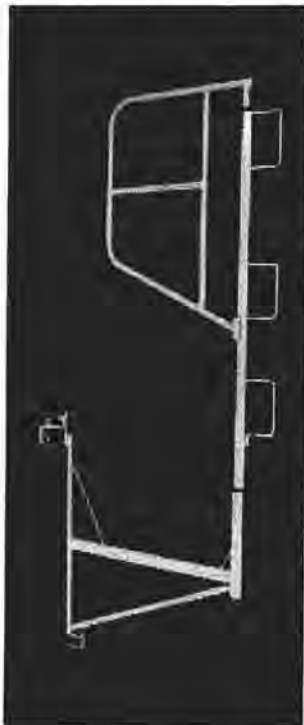
SAFE PRACTICES

1. Follow all Company safety rules and policies.
2. Employees must report all unsafe conditions immediately to a Supervisor.
3. No horseplay is permitted.
4. Clean worksite conditions must be maintained at all times.
5. All Personal Protective Equipment (PPE) required by State or Federal Regulation must be worn.
6. All equipment guards required by State and Federal Regulations must be in place.
7. Report all accidents immediately to a Supervisor.
8. Use Lockout/Tagout/Blockout procedures when required by State or Federal Regulation.
9. Inspect equipment prior to each use.
10. Only operate equipment that you have been trained and authorized to use.
11. All electrical wiring shall be to code and maintained in safe condition.
12. Use proper lifting techniques.
13. Only qualified personnel can perform maintenance services.
14. Follow all Manufacturers safety guidelines.
15. Do not operate equipment under the influence of altering prescription drugs, illegal drugs and/or alcohol.
16. Ensure that all Warning, Caution and Danger signs are in place.
17. Assess the site location and building where Stacker Brackets are to be installed.
18. The erection and dismantling of Stacker Brackets must be performed under the supervision and direction of a qualified person. A "qualified person" is a person possessing a certification of competence in Stacker Bracket erection and dismantling.

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(STACKER BRACKETS continued)

19. Daily inspections of the Stacker Brackets to assure they are secured, in good working order, and installed correctly and completely.
20. Inspections should be made daily on Stacker Brackets being overall secure and safe.
 - a. Stacker Brackets are to be built to exact manufacturers specifications.
 - b. Clamps secured and bolted.
 - c. Support Bracket secured to clamp.
 - d. Guardrail posts are secured to bracket and guardrails are in place.
 - e. End rail is installed and secured.
 - f. Planking on Support Bracket is overlapping and secured.
21. Materials should be hoisted or brought to area to be secured by lift.
22. Appropriate footwear should be worn.
23. Do stretching exercise for back muscles.



VIEW OF COMPLETE ASSEMBLY

PARTS OF STACKER BRACKETS:

Support Bracket - Main component, holds platform planks

Top Clamp - Accommodates walls from 4' to 12' thick

End Rails - Installed at the end of a run

Guardrail Posts - Inserts into Support Bracket, holds handrail boards

*** Other Material Required:**

2 x 4 - 36" (Support Brace)

2 x 10 - 10' Truss Joist (TM) Scaffold Planks

2 x 4 - 10' Rails Per Section

"WARNING: Per the manufacturer, the Stacker Bracket System is engineered for use with 2 x 4 DF #1 handrails and scaffold grade planks. Failure to use designated materials may result in bodily injury or death!"

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(STACKER BRACKETS continued)

STACKER BRACKETS ARE A FALL PROTECTION SYSTEM

1. Stacker Brackets can be used for Fall Protection if they are completed per manufacturer's specifications. If there is a single component missing, they do not act as fall protection and a fall hazard is present and/or an OSHA citation can be issued.
2. Stacker Brackets should be installed from the interior of the structure.
3. Stacker Brackets should stay installed until work is completed.
4. Stacker Brackets can only be installed by qualified personnel.
5. Stacker Brackets have a weight limit of 375 lbs. per bracket, do not exceed intended load.
6. Stacker Brackets are designed to be installed at a spacing of not more than 8 ft.
7. 10 - foot planks should overlap the brackets at least 6 inches and not more than 18 inches.

INSTALLATION OF BRACKETS

1. Inspection should be done on all bracket materials, planks, guardrails for any damage. Do not use if any materials are damaged.
2. Use caution tape in all areas where there is an overhead fall hazard.
3. Lubricate hex and eye bolt before fastening to bracket.
4. Layout bracket location on eight-foot centers.
5. Hang brackets (2 x 4 brace must cross three studs.) (Do not use with finger joint studs.)
6. Check for adequate wall bracing.
7. Install planks, guardrail post, and 2 x 4 guardrails.
8. Install end-caps at open ends.
9. All ends and edges must have guardrails.

REMOVAL OF BRACKETS

1. Always use proper Fall Protection equipment.
2. Secure your work zone area for overhead falls.
3. Inspect your equipment prior to storage. (All stacker bracket equipment should be stored in a dry, secure area to prevent rust or any other damage.)

CODE OF SAFE PRACTICES

HARD HATS

JOB SUMMARY: Head protection.

SKILLS REQUIRED: Safety conscious.

EMOTIONAL STANDARDS: Ability to follow directions.

SAFE CONDITIONS:

Employees shall be properly instructed on the hazards of their work and of safe practices by bulletins, printed rules, verbal instructions and periodic safety meetings.

SAFE PRACTICES

1. Follow all Company safety rules and policies.
2. All Personal Protective Equipment (PPE) required by State or Federal Regulation must be worn.
3. Hard Hat must be worn when it is a Company Policy, Jobsite Rule, Posting and/or there is an overhead risk.
4. Inspect Hard Hat for cracks.
5. Do not wear backwards or with a hat under the Hard Hat.

CODE OF SAFE PRACTICES

WHEEL BARROW

JOB SUMMARY: Moves material.

SKILLS REQUIRED: Safety conscious.

PHYSICAL STANDARDS: Excessive reaches. Strong physical health.

JOB HAZARDS: Lifting, twisting and turning. Direct pressure on palm. Forceful motions. Posture: bent wrist or extended elbow or both.

SAFETY EQUIPMENT REQUIRED: Safety glasses. Hard-toed boots. Gloves.

SAFE CONDITIONS:

Employees shall be properly instructed on the hazards of their work and of safe practices by bulletins, printed rules, verbal instructions and periodic safety meetings.

SAFE PRACTICES

1. Follow all Company safety rules and policies.
2. Employees must report all unsafe conditions immediately to a Supervisor.
3. No horseplay is permitted.
4. Clean worksite conditions must be maintained at all times.
5. All Personal Protective Equipment (PPE) required by State or Federal Regulation must be worn.
6. All equipment guards required by State and Federal Regulations must be in place.
7. Report all accidents immediately to a Supervisor.
8. Use Lockout/Tagout/Blockout procedures when required by State or Federal Regulation.
9. Inspect equipment prior to each use.
10. Only operate equipment that you have been trained and authorized to use.
11. All electrical wiring shall be to code and maintained in safe condition.
12. Use proper lifting techniques.
13. Only qualified personnel can perform maintenance services.
14. Follow all Manufacturers safety guidelines.
15. Do not operate equipment under the influence of altering prescription drugs, illegal drugs and/or alcohol.
16. Ensure that all Warning, Caution and Danger signs are in place.
17. Do not overload.
18. Keep tire inflated.

CODE OF SAFE PRACTICES

ROOF WALKING AND LOADING

Falls are one of the leading causes of death each year in the roofing industry. There are many procedures that can be followed to load a roof safely and help eliminate falls. The following is a list of procedures to help prevent these falls:

INSPECTIONS:

1. Review the area around the roof to protect any impalement hazards.
2. Review the height, condition and slope of the roof for fall protection requirements.
3. Add all fall protection requirements before starting any roofing or roof loading operations.

SAFE ACCESS:

1. Review the safest access way to the roof.
2. Be sure that the access that is used to the roof is clear of debris and slippery material.
3. Set-up a landing area that offers secure footing when moving from the ladder to the roof.

SURVEY THE ROOF FOR HAZARDS:

1. Look for and protect all openings in roof. Cover securely and mark appropriately as required. Protect skylights from falls or use a fall harness system.
2. Look for and protect all vent pipes, conduit, dormers, guyed wires, antennas and all other hazards that may cause a trip or impalement.
3. Review the roof for the condition of roofing materials present that may cause a slip hazard. An example would be wood shake roof with green moss. Also review the roof condition for bad plywood or wood that cannot support the weight of a person. Walk on high parts of the roof or where the nails are present because that is the truss and it will support the weight.
4. Check roof for electrical hazards such as exposed wires, conduit and power lines. Beware of metal flashings coming into contact with power lines. Only Qualified Persons should handle live wires.
5. When loading roof, stack material securely distributing the weight of the material so that no collapse is possible. Additional items may be required to prevent material from moving on sloped roofs. Never try to save a falling piece of material. Make sure that no one is under any loading operation. Set-up caution tape when required. Never ride a conveyor or send equipment up a conveyor. Hoist heavy material. Do not use a ladder.
6. Walk around and be familiar with the pitch of the roof.
7. Always be prepared for a slip by walking on the side where a valley may be or keeping in mind where obstructions may be present that you can use to prevent from going over the edge of the roof. In the event of a fall, spread as much of your body against the roof to create resistance to slow down.

WEATHER CONDITIONS:

1. Do not load in rain without a fall harness system.
2. Do not work on a roof if there is lightning.
3. Be aware of how certain materials are affected by rain such as wood shake.
4. Be aware that leaves and other debris may be a slip hazard.
5. Look for ice on the roof, especially in the mornings.
6. Be aware of how wind can effect carrying certain products like plywood.

PROPER SAFETY EQUIPMENT AND PERSONAL PROTECTIVE EQUIPMENT:

1. Wear gloves and proper clothing when loading or walking around hot asphalt.
2. Wear eye protection when using any chemical, or where there is flying debris or wind.
3. Have fire extinguisher near all hot operations.

RULES & REGULATIONS

The orderly and efficient operation of the Company requires that employees maintain discipline and proper personal standards of conduct at all times. Discipline and proper standards of conduct are necessary to protect the health and safety of all employees, to maintain uninterrupted service and jobs, and to protect the goodwill and property of the Company. The Company sets forth its established Rules and Regulations which, together with the observance of all other proper standards, shall be followed at all times. Any employee who violates any of the following Rules and Regulations shall be subject to disciplinary action up to and including termination of employment.

Derived from the Company Rules and Regulations

EQUIPMENT, PROPERTY, & SAFETY:

1. Destroying, abusing, or misusing Company property and equipment is prohibited.
2. Employees shall be responsible for all Company tools, equipment, and property in or assigned to their custody and care.
3. An employee must immediately notify the Supervisor of any accident or property damage to Company property.
4. Violating any safety rule or practice or engaging in any conduct that tends to create a safety hazard is strictly prohibited.
5. All employees must wear all required safety articles and use all required protective equipment at all specified times to comply with good safety practice, plant safety rules, and OSHA regulations.
6. Smoking is prohibited, except in areas expressly designated for that purpose. Careless handling of matches or smoking materials is prohibited.
7. All employees must immediately report any injuries occurring on the job to their Supervisor.
8. An employee shall not escort or permit unauthorized persons to be on Company premises.
9. An employee shall not post or remove notices, signs, or writings in any form on Company property without permission from management.
10. Walk in aisles. Never run.
11. Fighting, horseplay, and mischievous or careless conduct is prohibited.
12. Keep aisles clear of material. Pieces of material with protruding nails or staples are to be removed or bent over before material is reused or discarded.
13. Stack materials so they cannot fall.

14. **Keep all machinery guards in place. Machinery should not be repaired or adjusted while in operation, nor should moving parts be oiled except on equipment that is fitted with safety guards to protect the person performing the work. Use all attached safety equipment. Never disconnect or lock any safety devices.**
15. **Fire extinguishers shall be kept clear of obstructions and easily accessible. Fire extinguishers will be used for fires only. If an extinguisher is used, it should immediately be taken to the tool crib to be recharged.**
16. **No one other than the driver is allowed on any forklift trucks.**
17. **If hot plates are used, do not use extension cords. Plug directly into receptacle.**
18. **Workers should not handle or tamper with any electrical equipment, machinery, or tools in any manner not within the scope of their duties.**
19. **Correct lifting procedures shall be observed at all times. Lift with the legs, not with the back. Ask for assistance with heavy loads.**

ORIENTATION AND TRAINING

All Supervisors/Foremen/Superintendents, prior to the commencement of work, receive training on the following items as well as items listed in the sections below:

- 1. Responsibility of a Competent Person**
- 2. Emergency Procedures**
- 3. Evacuation Procedures**
- 4. Site Inspection and Abatement**
- 5. Accident Investigation**
- 6. OSHA Safety Programs and Training Requirements**

All employees, prior to the commencement of work, receive training on the following:

- 1. Code of Safe Practices**
- 2. Accident Reporting**
- 3. Fall Protection**
- 4. MSDS**
- 5. Tool Safety**

During their employment, formal monthly training is conducted which consists of, but is not limited to:

- 1. Fall Protection**
- 2. Ladder Safety**
- 3. Lifting Safety**

(Orientation & Training, continued)

- 4. Electrical Safety**
- 5. Bloodborne Pathogens**
- 6. Friendly First Aid**
- 7. Lockout/Tagout Procedures**
- 8. Sexual Harassment**
- 9. Hazard Communications (MSDS, Right-to-Know)**
- 10. Accident Investigation**
- 11. Fire Safety**
- 12. Heat Stroke**

R C Foster Corporation Contractors Job Site Documentation Checklist

1. Proper Postings

- a. Job Health and Safety.
- b. Forklift.
- c. Crane Signals (if applicable use of crane or hand signals are needed).
- d. All other state postings requirements.
- e. Post general construction code of safe practice.
- f. Emergency Evacuation Plan specific to the job site-listing staging area, emergency equipment, First Aid station and Fire Extinguishers (post in trailer and each floor of construction).

2. Sub-Permit Requirements from OSHA

- a. Erection or demolition of building above 36 feet or 3 stories.
- b. Removal of carcinogens, lead, or asbestos.
- c. Trench work below 5 feet.
- d. Notification of activity to District Office of Occupational Safety and Health (DOSH).

3. R C Foster Corporation Safety Manual On Site

- a. Keep front section of manual filled out per job site issues.
- b. Codes of Safe Practice that are not applicable to R C Foster Corporation work, are for reference material only.

4. R C Foster Corporation Hazardous Communications Program

- a. List of current MSDS sheets from each Sub-Contractor and for each required product on site.
- b. Fill out Hazardous Communications Program per each job site.
- c. These should be kept in archives after job.

5. R C Foster Corporation Weekly Foreman Safety Meeting

- a. Hold weekly safety talks about future job site concerns, current issues, and safety concerns from job walks.
- b. Keep minutes and signatures of those who attended in a binder per site.

6. Daily Safety Evaluation by R C Foster Corporation Superintendent

- a. Keep a log of inspections in a binder per job site.
- b. Also issue violation notices for unsafe conditions created by Sub-Contractors.
- c. Log when they abated safety violation on initial violation form.

7. Sub-Contractors Safety Program

- a. Collect each Sub-Contractor's safety manual.
- b. Keep the log sheet current for collection of manuals.

8. Sub-Contractor Weekly Safety Tailgate Meetings

- a. Collect a copy of the minutes and attendance sheets from each Sub-Contractor.
- b. Keep track of which contractors did not turn in meeting and issue violation.

9. Weekly Inspection by Sub-Contractors

- a. Each Sub-Contractor should perform weekly inspections and be able to provide weekly copies to General Contractor.

10. Qualification for Sub-Contractors

- a. Check for Competent Person before starting operation (fall protection areas, trenching, etc.) Issue violation notices for compliance.
- b. Certification of equipment operators. Issue violation notice for compliance.

11. Registered Engineers Approval

- a. Trench work deeper than 20 feet, glue lams longer than 25 feet, erection plan for panels, etc.

12. Sub-Contractor Responsibilities

- a. Sub-Contractors should supply their own First Aid kit, Fire Extinguisher, First Aid responder and drinking water.

13. R C Foster Corporation Fire Equipment

- a. Fire Extinguisher every 3,000 square feet and near each stairway of every floor.
- b. Fire Extinguisher within 75 feet of any construction operation.
- c. High rises may call for fire hose hook-ups.

14. Access Light

- a. Proper illumination must be provided in access areas.
- b. Lighting must be in good working order and covered.

15. First Aid Responder

- a. First Aid certified person required from R C Foster Corporation.
- b. First Aid certified person from each trade.

16. Restrooms

- a. One restroom for every 20 persons on site.
- b. Must be kept in sanitary condition and stocked with adequate toilet paper.

17. Trailer Requirements

- a. Close to entry of job for authorized check-in and emergency service.
- b. Post general job-site rules near trailer or entry.
- c. Trailer must be on firm level foundation. Chock tires (if applicable).
- d. Guardrails are required on stairs entering the trailer.
- e. Clean and clear access throughout especially to emergency equipment.
- f. Cover lighting above trailer.

R C Foster Corporation
DAILY JOB SAFETY INSPECTION

 JOB NAME AND NUMBER

 WEEK

Check (X) if no correction needed; (O) for not applicable; and (C) for correction

	Mon	Tues	Wed	Thur	Fri	Sat
1. State and OSHA Postings/Regulations, Safety Manual, MSDS						
2. Permits						
3. Tailgate Meetings with Sub-Contractors Foreman - Weekly						
4. Collecting Weekly Tailgate Topics, Minutes, and Signatures from Sub-Contractors						
5. Trenches and Excavation						
6. Personal Protective Equipment						
7. Walkways, Runways and Aisles						
8. Exits						
9. Ladders						
10. Housekeeping						
11. Guard Rails						
12. Illumination/Lighting						
13. Sanitation Facilities						
14. Tools						
15. Electrical						
16. Drinking Water, Cups and Refuse Containers						
17. First Aid Kit						
18. Scaffolding						
19. Fall Protection						
20. Overhead Hazards						
21. Material Handling						
22. Fire Extinguishers						

Those marked for correction have been corrected with the following exceptions: _____

Notes: _____

Date of abatement for items not corrected (List # and date): _____

 Superintendent/Foreman

HEAT ILLNESS PREVENTION PROGRAM

This program is intended to comply with the California Code of Regulations Title 8, Section 3395, Heat Illness Prevention. The Heat Illness Prevention Standard is applicable to any outdoor workplace, whenever environmental risk factors for heat illness are present.

When employees work in hot conditions, special precautions must be taken in order to prevent heat illness. Heat illness can progress to heat stroke and be fatal, especially when emergency treatment is delayed. An effective approach to heat illness is vital to protecting the lives of workers.

Heat illness results from a combination of factors including environmental temperature and humidity, direct radiant heat from the sun or other sources, air speed, and workload. Personal factors, such as age, weight, level of fitness, medical condition, use of medication and alcohol, and acclimatization affect how well the body deals with excess heat.

HEAT ILLNESS RISK REDUCTION:

Recognizing Heat Illness Risk Factors

There is no absolute cut-off below which work in heat is not a risk. With heavy work at high relative humidity or if workers are wearing protective clothing, even work at 70°F can present a risk. In the relative humidity levels (20 to 40 percent) often found in hot areas, employers need to take some actions to effectively reduce heat illness risk when temperatures approach 80°F. At temperatures above 90°F, especially with heavy work, heat risk reduction needs to be a major concern.

Supervisors must evaluate work conditions before sending employees to perform outdoor work in hot conditions. Typically, temperatures above 90°F, especially with heavy physical work activities, would represent conditions where there is a risk of heat illness. Other factors, such as high humidity or work activities that restrict the body's ability to cool itself, such as protective clothing, could result in a risk of heat illness at lower temperatures.

The National Weather Service Heat Index guideline (attached) may be used to assess the environmental risk of heat illness based on temperature and relative humidity.

Water

There must be an adequate supply of clean, cool, potable water. Employees who are working in the heat need to drink 3-4 glasses of water per hour, including at the start of the shift, in order to replace the water lost through sweat. For an eight-hour day this means employers must provide two or more gallons per person. Thirst is an unreliable indicator of dehydration. Employees often need ongoing encouragement to consume adequate fluids, especially when the workload or process does not encourage breaks.

Shade

The direct heat of the sun can add as much as 15 degrees to the heat index. If possible, work should be performed in the shade. If not, where possible, employers should provide a shaded area for breaks and when employees need relief from the sun. Wide brimmed hats can also decrease the impact of direct heat.

Acclimatization

People need time for their bodies to adjust to working in heat. This "acclimatization" is particularly important for employees returning to work after (1) a prolonged absence, (2) recent illness, or (3) recently moving from a cool to a hot climate. For heavy work under very hot conditions, a period of 4 to 10 days of progressively increasing work time starting with about 2 hours work per day under the working conditions is recommended. For less severe conditions at least the first 2 or 3 days of work in the heat should be limited to 2 to 4 hours. Monitor employees closely for signs and symptoms of heat illness, particularly when they have not been working in heat for the last few days, and when a heat wave occurs.

Rest Breaks

Rest breaks are important to reduce internal heat load and provide time for cooling. Heat illness occurs due to a combination of environmental and internal heat that cannot be adequately dissipated. Breaks should be taken in cooler, shaded areas. Rest breaks also provide an opportunity to drink water.

Prompt Medical Attention

Recognizing the symptoms of heat illness and providing an effective response requires promptly acting on early warning signs. *No employee with any of the symptoms of possible serious heat illness should be sent home or left unattended without medical assessment and authorization.* If required, emergency services (911) should be called from a land line or cell phone. Address and directions to the work site must be available to be effectively reported to emergency services.

IDENTIFYING HEAT ILLNESS

WHAT ARE SOME OF THE SYMPTOMS OF HEAT STRESS?

HEAT STROKE, the most serious health problem for workers in a hot environment, is caused by the body's failure to regulate its core temperature. Sweating stops and the body can no longer release excess heat.

Victims of heat stroke usually die unless treated promptly. Signs include:

- Mental confusion, delirium, loss of consciousness, convulsions, or coma
- Body temperature of 106° F or higher
- Hot, dry skin that may be red, mottled, or bluish

HOW CAN HEAT STROKE BE TREATED?

Prompt First Aid can prevent permanent injury to the brain and other vital organs. While awaiting medical help, the victim should be moved to a cool area. The victim's clothing should be soaked with cool water and he or she should be fanned vigorously to increase cooling.

HEAT EXHAUSTION results from loss of fluid through sweating and from not drinking enough replacement fluids. The worker still sweats but experiences extreme weakness or fatigue, giddiness, nausea, or headache. The skin is clammy and moist, while body temperatures are normal or slightly elevated.

HOW CAN HEAT EXHAUSTION BE TREATED?

The victim should rest in a cool place and drink water or an electrolyte solution, such as Gatorade or similar beverages used by athletes to restore potassium and salt. Severe cases, in which the victim vomits or loses consciousness, may require longer treatment under medical supervision.

HEAT CRAMPS, painful spasms of the muscles, are caused by the body's loss of salt.

HOW CAN HEAT CRAMPS BE TREATED?

As in the case of heat exhaustion, a victim of heat cramps should drink an electrolyte solution such as Gatorade. Seek medical attention for the victim in the case of severe cramping.

FAINING can occur when a worker is not acclimatized to a hot environment.

HOW CAN FAINTING BE TREATED?

At first, allow the victim to lie down on his or her back. When consciousness has been regained, the victim should usually recover after a brief period of walking around slowly.

HEAT RASH, also known as prickly heat, can be extensive and can be complicated by infection. Heat rash can be so uncomfortable that sleep is disrupted. It can impede a worker's performance and can even result in a temporary total disability.

HOW CAN HEAT RASH BE TREATED?

Place the victim in a cool place and allow the skin to dry.

Any of these symptoms require immediate attention. Even the initial symptoms may indicate serious heat exposure. If medical personnel are not immediately available on-site, and you suspect severe heat illness, you must call 911.

Regardless of the worker's protests, no employee with any of the symptoms of possible serious heat illness noted above should be sent home or left unattended without medical assessment and authorization.

Any employee who recognizes symptoms or signs of heat illness in themselves or in co-workers should immediately report this condition to their supervisor.

Responding to Heat Illness

When you recognize signs of heat illness in yourself or in co-worker:

- Move to a shaded area for a recovery period
- If condition appears to be severe and the employee does not recover, then emergency medical care is needed
- Emergency medical care shall be provided by the following method:
 - Call 911
 - Be prepared to provide emergency response personnel with directions to the work-site
 - Transport employee to the nearest hospital or urgent care (via emergency services when available)

Training

Supervisors and employees must be trained in the risks of heat illness and the proper measures to protect themselves and their co-workers. Training will include, but is not limited to:

1. Why it is important to prevent heat illness
2. Procedures for acclimatization
3. The need to drink water frequently
4. The need to take breaks out of the heat
5. How to recognize the symptoms of heat illness
6. How to contact emergency services and provide work-site location
7. Importance of choosing water instead of soda or other caffeinated beverages and avoiding alcoholic beverages altogether during high heat.

HEAT ILLNESS PREVENTION

GUIDANCE FOR WORKERS

Awareness of heat illness symptoms can save your life or the life of a co-worker.

- **If you are coming back to work from an illness or an extended break or you are just starting a job working in the heat, it is important to be aware that you are more vulnerable to heat stress until your body has time to adjust. Let your employer know you are not used to the heat. It takes about 5 – 7 days for your body to adjust.**
- **Drinking plenty of water frequently is vital to workers exposed to the heat. An individual may produce as much as 2 to 3 gallons of sweat per day. In order to replenish that fluid, the worker should drink 3 to 4 cups of water every hour starting at the beginning of your shift. Avoid soda or other caffeinated beverages and alcohol because they can lead to dehydration.**
- **Taking your breaks in a cool, shaded area and allowing time for recovery from the heat during the day are effective ways to avoid heat illness.**
- **Avoid or limit the use of alcohol and caffeine during periods of extreme heat. Both dehydrate the body.**
- **If you or a co-worker start to feel symptoms such as nausea, dizziness, weakness or unusual fatigue, let your Supervisor know, and then rest in a cool, shaded area. If symptoms persist or worsen, seek immediate medical attention.**
- **Whenever possible, wear clothing that provides protection from the sun but allows airflow to the body. Protect your head and shade your eyes if working outdoors.**
- **When working in the heat, be sure to pay extra attention to your co-workers and be sure you know how to call for medical attention.**

Heat Index

The **Heat Index (HI)** is the temperature the body feels when heat and humidity are combined. The chart below shows the HI that corresponds to the actual air temperature and relative humidity. (This chart is based upon shady, light wind conditions. **Exposure to direct sunlight can increase the HI by up to 15°F.**) (Due to the nature of the heat index calculation, the values in the tables below have an error +/- 1.3F.)

Temperature (F) versus Relative Humidity (%)

°F	90%	80%	70%	60%	50%	40%
80	85	84	82	81	80	79
85	101	96	92	90	86	84
90				99	94	90
95						98
100						
105						
110						

HI	Possible Heat Disorder:
80°F - 90°F	Fatigue possible with prolonged exposure and physical activity.
90°F - 105°F	Sunstroke, heat cramps and heat exhaustion possible.

1 see NPS Energy Service Inc., California Occupational Safety and Health Appeals Board, Decision After Reconsideration 83-R2D1-600

2 The Wet Bulb Globe Temperature (WBGT) is used by the military, occupational health professionals, and employers as a more comprehensive approach to assessing the risk of heat illness. The WBGT calculates a combined equivalent temperature that incorporates radiant heat, air movement, air temperature and relative humidity. The WBGT temperature is then used in combination with other factors such as workload, clothing, and worker acclimatization to determine a work/rest schedule and other control measures. The OSHA Technical Manual explains the application of the WBGT at: http://www.osha.gov/dts/osta/otm/otm_iii/otm_iii_4.html. This manual recommends lowering the permissible WBGT temperatures by 4-10 degrees Fahrenheit (2-6 degrees Centigrade) for various types of work clothing, except "impermeable" hazmat-type suits, which can pose a risk of heat illness at much lower temperatures. As mentioned above, people who work in impermeable clothing should be included in a comprehensive heat stress-monitoring program.

CALIFORNIA FALL PROTECTION PROGRAM

Falls are a leading cause of fatal injuries in the construction industry. On average throughout the nation, over 50 people die every day from a fall. Additionally, falls at work is one of the top cited serious violations from Cal OSHA.

All violations of the Fall Protection Program may be grounds for a written violation and for termination.

Fall Protection Requirements:

When working where there is a hazard of falling more than 7½ feet from a perimeter of a structure, unprotected sides and edges, loading edges, through openings, and roof surfaces.

Some Examples of Fall Protection Requirements at Less Than 7½ Feet:

Rod buster working a vertical rebar - 6 feet.

Pitches on a roof steeper than 7:12 - any height.

Use of a pneumatic nailer or stapler on 1/3 pitch roof - any height.

Some Exemptions to the 7½ Feet Requirements:

15 feet for ironworkers, decking operations, panelized roof construction and framers working on 4 inch nominal or wider structural members while doing truss or joist work.

20 feet for roofing operations on pitches less than a 7:12.

30 feet for ironworkers for connecting steel only.

Fall Protection Types:

1. Standard guardrails, cables or secured and labeled floor hole covers
2. Personal Fall Arrest System
3. Positioning Device Systems
4. Fall Restraint Systems
5. Safety net
6. Roof jacks (roofers only)
7. Catch platforms
8. Scaffold platforms
9. Eave barriers (roofers only)

Standard Guardrails, Safety Cables, or Covers

These are the easiest and most cost effective methods of providing fall protection and have a very high success rate. Standard guardrails, safety cables, floor hole and sky light covers are our preferred means of fall protection on job sites. The following rules will be followed when using them:

1. Railings shall be constructed of select lumber or in an equally substantial manner from other materials, and shall consist of a top rail not less than 42 inches, or more than 45 inches in height measured from the upper surface of the top rail to the floor, platform, runway or ramp level and a mid rail. The mid rail should be halfway between the top rail and the floor, platform, runway or ramp. All railings shall be able to withstand 200 pounds of pressure at any point.
2. Wooden posts shall be not less than 2 inches by 4 inches nominal in cross section, spaced at 8 feet or closer intervals.
3. Wooden top railings shall be smooth and made of 2x4 or larger material. Double, 1 inch by 4 inch members may be used for this purpose, provided that one member is fastened in a flat position on top of the posts and the other fastened in an edge-up position to the inside of the posts and the side of the top member. Mid rails shall be 2x4 or greater.
4. The rails shall be placed on the inside of the post.
5. All railings will be set up and able to handle expected tasks.
6. Floor openings of or greater than 12 square inches at any depth that may cause a trip hazard or greater, shall be protected. Floor, roof and skylight openings shall be guarded by standard railing and toeboards or cover. Covering shall be capable of safely supporting the greater of the weight of a 200-pound person or the weight of worker(s) and material(s) placed thereon. Coverings shall be secured in place to prevent accidental removal or displacement, and shall bear a pressure sensitized, painted, or stenciled sign with legible letters set no less than one inch high, stating: "Opening—Do not remove." Markings of chalk or keel shall not be used.
7. Ladder ways, floor openings, or platforms shall be guarded by standard railings with standard top boards on all open sides, except at the entrance to the opening. The passage through the opening shall be guarded by either a warning protection so that a person cannot walk directly into the opening or by a removable chain at railing height.
8. Wall openings, from which there is a drop of more than 4 feet, and the bottom of the opening is less than 3 feet above the working surface, shall be guarded with standard rails with ability to support 200 pounds in any direction.
9. An extension platform outside a wall opening onto which materials can be hoisted for handling shall leave side rails, or equivalent guards of standard specification, or a Personal Fall Arrest System. One side of an extension platform may have removable railings in order to load material.
10. All elevator shafts in which cages are not installed and which are not enclosed with solid partitions and doors, shall be guarded on all open sides by standard railings and toeboards.
11. A fall harness and lanyard are required when using an aerial device. Personal Fall Arrest Systems are not required at elevated platforms unless standard guardrails are not in place.

Fall Protection

Personal Fall Arrest Systems:

Personal Fall Arrest Systems consist of a full body harness and a lanyard attached to suitable anchorage. The following rules, in addition to the manufacturer's requirements and OSHA regulations, will be observed:

- 1. Prior to the use of a Personal Fall Arrest System, all employees should be trained on how to inspect the Fall Arrest System, how and when to wear a Fall Arrest System and how to perform a rescue after a fall in a Fall Arrest System.**
- 2. Ropes and straps (webbing) used in lanyards, lifelines, and strength components of body harnesses shall be made from synthetic fibers except when they are used in conjunction with hot work where the lanyard may be exposed to damage from heat or flame. All systems shall be ANSI approved.**
- 3. Anchorages used for attachment of Personal Fall Arrest System equipment shall be independent of any anchorage being used to support or suspend platforms and capable of supporting at least 5,000 pounds per employee attached, or shall be designed, installed, and used as part of a complete Personal Fall Arrest System which maintains a safety factor of at least two; and under the supervision of a Qualified Person.**
- 4. Where practical, the anchor end of the lanyard shall be secured at a level not lower than the employee's waist, limiting the fall distance to a maximum of 4 feet.**
- 5. Harnesses, lanyards, and other components shall be used only for employee protection as part of a Personal Fall Arrest System and not to hoist materials.**
- 6. Personal Fall Arrest Systems and components subjected to impact loading shall be immediately removed from service and shall not be used again for employee protection until inspected and determined by a Competent Person to be undamaged and suitable for reuse.**
- 7. Personal Fall Arrest Systems shall be inspected prior to each use for wear, damage and other deterioration, and defective components shall be removed from service.**
- 8. Any lanyard, safety harness, or drop line subjected to in-service loading, as distinguished from static load testing, shall be immediately removed from service and shall not be used again for employee safeguarding.**
- 9. Personal Fall Arrest Systems shall not be attached to guardrails, unless the guardrail is capable of safely supporting the load or 5000 pounds per person, whichever is greater.**
- 10. Each Personal Fall Arrest System shall be inspected not less than twice annually by a Competent Person in accordance with the manufacturer's recommendations. The date of each inspection shall be documented.**
- 11. Personal Fall Arrest Systems will be rigged such that an employee can neither free fall more than 4 feet, nor contact any lower level.**
- 12. Personal Fall Arrest Systems will bring an employee to a complete stop. They will also limit maximum deceleration distance an employee travels to 3.5 feet and have sufficient strength to withstand twice the potential impact energy of an employee free falling a distance of 6 feet, or the free fall distance permitted by the system, which ever is less.**

Positioning Device Systems:

Positioning Device Systems are designed to allow employees to work with both hands free at elevated locations. Their use shall conform to the following provisions:

1. Prior to the use of a Positioning Device System, all employees should be trained on how to inspect the Positioning Device System, how and when to wear a Positioning Device System and how to perform a rescue after a fall in a Positioning Device System.
2. Positioning Device Systems shall be rigged such that an employee cannot free fall more than 2 feet.
3. Positioning Device Systems shall be inspected prior to each use for wear, damage, and other deterioration, and defective components shall be removed from service.
4. Body belts, harnesses, and components shall be used only for employee protection (as part of a Personal Fall Arrest System or Positioning Device System) and not to hoist materials.
5. The use of non-locking snap hooks is prohibited.
6. Anchorage points for Positioning Device Systems shall be capable of supporting two times the intended load under a Qualified Person's supervision or 3,000 pounds, whichever is greater.

Personal Fall Restraint Systems:

Personal Fall Restraint Systems are designed to prevent the wearer from reaching the edge or danger area and thus prevent them from falling.

1. Prior to the use of a Personal Fall Restraint System, all employees should be trained on how to inspect the Personal Fall Restraint System, how and when to wear a Personal Fall Restraint System and how to perform a rescue after a fall in a Personal Fall Restraint System.
2. Anchorage points used for fall restraint shall be capable of supporting 4 times the intended load under qualified supervision or 3000 pounds, whichever is greater.
3. Restraint protection shall be rigged to allow the movement of employees only as far as the sides of the working level or working area.

Note: All safety belts, harnesses and lanyards placed in service or purchased on or before February 1, 1997, shall be labeled as meeting the requirements contained in ANSI A10.14-1975, Requirements for Safety Belts, Harnesses, Lanyards, Lifelines and Drop Lines for Construction and Industrial Use.

All Personal Fall Arrest Systems, Personal Fall Restraint Systems and Positioning Device Systems purchased or placed in service in service after February 1, 1997, shall be labeled as meeting the requirements contained in ANSI A10.14-1991 American National Standard for Construction and Demolition Use, or ANSI Z359.1-1992 American Standard Safety Requirements for Personal Fall Arrest Systems, Subsystems and Components.

Safety Nets

Where the elevation is 25 feet or more above the ground, water surface, or continuous floor level below, and when the use of Personal Fall Arrest Systems, Personal Fall Restraint Systems, Positioning Device Systems or more conventional types of protection are clearly impractical, the exterior and/or interior perimeter of the structure shall be provided with an approved safety net. It shall extend at least 8 feet horizontally from such perimeter and be positioned at a distance not to exceed 10 feet vertically below where such hazards exist, or equivalent protection provided. Safety nets shall extend outward from the outermost projection of the work surface as follows:

<i>Vertical distance from working level to horizontal plane of net:</i>	<i>Minimum required horizontal distance of outer edge of net from the edge of working surface:</i>
Up to 5 feet	8 feet
More than 5 feet up to 10 feet	10 feet
More than 10 feet but not to exceed 30 feet	13 feet

Nets shall be hung with sufficient clearance to prevent user's contact with the surfaces or structures below. Such clearances shall be determined by impact load testing.

EXCEPTION: See Section 1710 (d), (e) and (f) for flooring requirements and nets for steel erection in tiered buildings and structures.

Only one level of nets shall be required for bridge construction.

Safety nets purchased on or after January 1, 1998 shall be labeled as meeting the requirements of American National Standards Institute (ANSI) A 10.11-1989, American National Standard for Construction and Demolition Operations – Personnel and Debris Nets, Repair and Demolition Operations. Safety nets purchased before January 1, 1998 shall be labeled as meeting the requirements of ANSI A10.11-1979, Safety Nets used during construction, repair and demolition operations, or ANSI A10.11-1989.

Roof Jack Systems (includes jacks, planks and appurtenances.)

Roof jacks shall be constructed to fit the slope of the roof and be designed, fabricated and installed in such a manner that they will sustain all expected loads. The supported plank shall be positioned at some angle from perpendicular to the roof to horizontal. For suggested installation, see Appendix Plate C-19.

Intervals (spans) between roof jacks shall not exceed 10 feet.

When rope supports are used, they shall consist of first-grade Manila rope of at least ¾-inch diameter or other material of equivalent strength.

Wooden supporting members that span between jacks, shall be select lumber or equivalent and be of at least 2 inch by 6 inch material. Where supporting members other than wood are used they shall be of at least the equivalent strength.

Catch Platforms

When catch platforms are used, they shall be installed in close proximity below the eaves below roof work areas, extend at least 2 feet horizontally beyond the projection of the eaves, and be provided with standard railings and toeboards (See Article 16).

The platforms shall be fully planked.

Scaffold Platforms

When built-up scaffold platforms are used to protect workers from falls from the edges of roofs, they shall be installed and maintained in accordance with the provisions of Article 22, Scaffolds.

A fully planked platform shall be provided near the eave level.

Eave Barriers

When a system of eave barriers is provided to prevent falls from roofs, the barrier, unless of solid construction, shall be in accordance with standard railings.

The barrier system shall be securely anchored at eave level or supported by ropes securely tied to substantial anchorages on the roof.

If the barrier system is to be moved from one work area to another, employees performing the moving operation shall be protected by the use of safety belts and lines.

FALL PROTECTION CHECK LIST

SITE LOCATION _____

Check type of Fall Protection being used.

___ Stay and Lay Policy (Leading Edge)

___ Mobile Scaffolds

___ Stationary Scaffold

___ Wood Pole Scaffold

___ Frame Scaffold Access

___ Tube and Coupler Scaffold

___ System Scaffold

___ Metal Carpenter Bracket

___ Pump Jack Scaffold

___ House Scaffold

___ Bricklayers Square Scaffold

___ Vehicle-Mounted Elevating Platform

___ Boom Supported Platform

___ Manual-Propelled Elevating Platforms

___ Self-Propelled Elevating Platforms

___ Motion Stopping Systems

___ Guardrails

___ Fall Protection Harness, Lanyards etc.

___ Safety Net

___ Warning Systems

___ Safety Monitoring System

Special Fall Protection _____

Supervisor Signature _____ Date _____

WHAT IS FALL PROTECTION

Fall Protection is the system designed to protect workers exposed to:

- Slips, trips and falls which occur at the same level;
- Slips, trips and falls which occur on stairs or ramps; and
- Slips, trips and falls which occur from elevations such as ladders, scaffolds, floor openings, roofs, etc.

A *Fall Protection Program* recognizes the potential hazard and responds by:

- Taking **action** steps to reduce or eliminate the hazard,
- Providing employee training and enforcing safety rules, and
- Providing personal protective equipment where and when required.

RESPONSIBILITY

Project management and front line supervision are responsible for implementation, enforcement and supporting this policy to assure compliance by all employees.

PROJECT MANAGERS/SUPERINTENDENTS/SUPERVISORS

1. Responsible to plan in advance the methods, material and equipment needed for compliance.
2. Authorize necessary action to correct unsafe acts and/or substandard safety conditions reported or observed.
3. Establish training programs to acquaint the worker with fall preventative measures and fall protection procedures.

SUPERINTENDENTS/SUPERVISORS

1. Determine the fall prevention/protection equipment and/or materials needed by employees working in locations above 6 feet (Federal), (10 feet for Washington State and 7 ½ feet for California) and assure that said equipment and/or material is available prior to work.
2. Advise Project Manager regarding safety on the job as requested.
3. Ensure that the Fall Protection policy is explained to each employee and subcontractor before they start work and a means is provided for their active participation in our program.
4. Make daily safety inspections of project and direct employees or subcontractors to take necessary corrective action to eliminate non-compliance with this program.

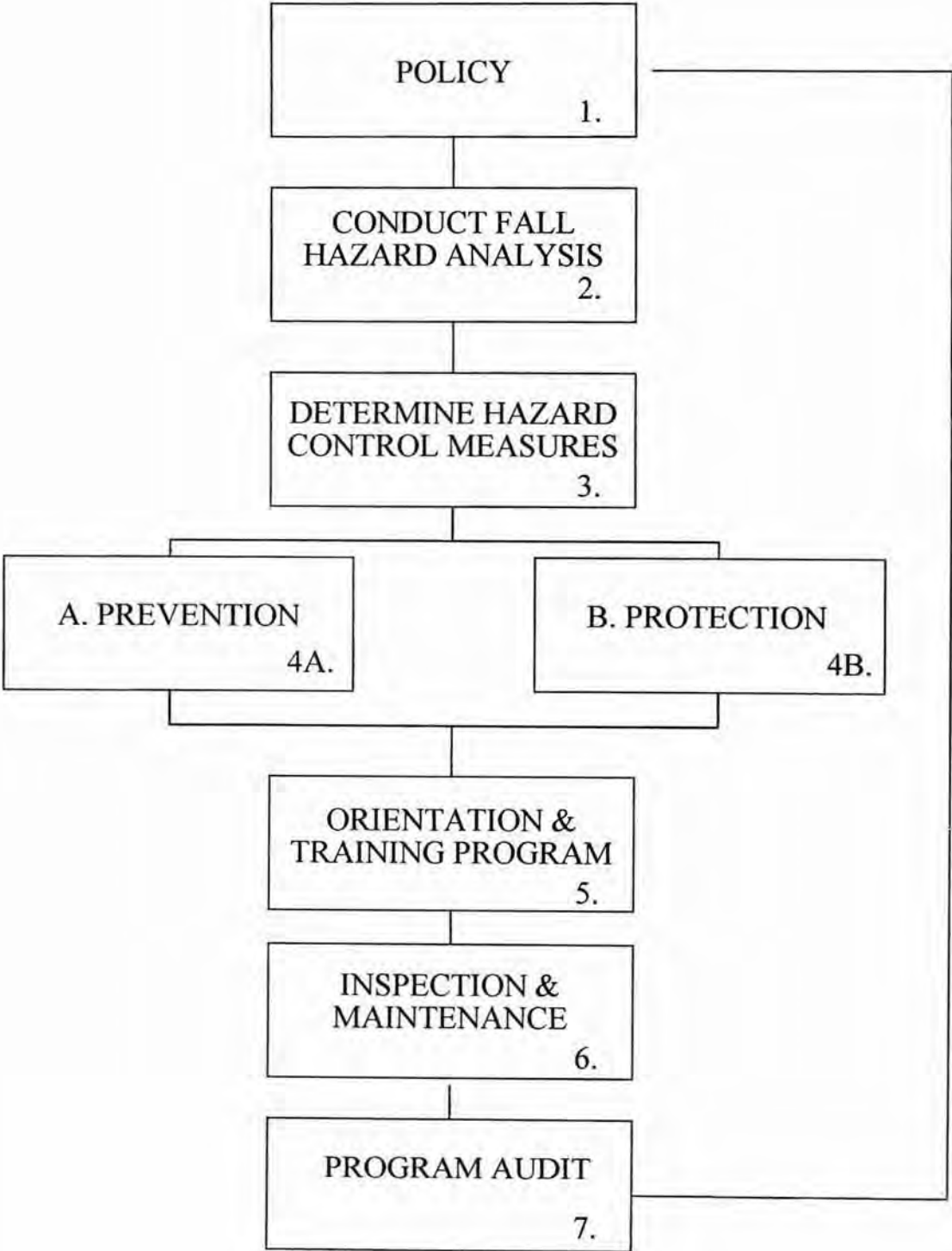
SUBCONTRACTOR

1. Each contractor is responsible for the safety of their personnel and shall provide and execute all work in compliance with this policy.

PROJECT FOREMEN/SUPERVISORS

1. Instruct employees in safe work practices and methods at the time the employee is given work assignments and providing verification of understanding by each employee.
2. Seeing that employees have and use the proper fall protective equipment and tools for the job.
3. Continuously checking to see that no unsafe practices or conditions are allowed to exist on any job.
4. Setting a good example.

PLANNING A FALL PROTECTION PROGRAM



PLANNING

GENERAL

The flow chart at the beginning of this section is designed to help understand the sequence that needs to be followed to accomplish Fall Protection. Planning for 100% "Tie Off" must be done on an individual project basis. However, the sequence of planning should remain the same for all projects.

BLOCK 1 - 100% TIE OFF POLICY

100% Tie Off Policy is to be used in determining the needed planning.

BLOCK 2 - CONDUCT FALL HAZARD ANALYSIS

An analysis of elevated work begins by individually identifying the fall hazards that can occur during work tasks. A careful look at the required work task mobility is important. What may be an industry work practice or a job that lacks a set pattern or sequence of movement may necessitate a change to meet the capabilities and limitations of available equipment. Scaffold erection for example, varies considerably depending on the facilities of structure around which the scaffold is built. However, certain patterns of movement could be used to assemble the poles of frames without entangling lifelines suspended from above. An appraisal of each exposure may serve to provide a rationale for reducing the level of risk. Overall, the primary objective would be to minimize the probability of a loss by controlling the most frequent elevated work task with the highest potential severity.

BLOCK 3 - DETERMINE HAZARD CONTROL MEASURES

Once an elevated fall hazard has been analyzed, an appropriate control measure must be selected.

Exposure to a fall hazard can either be prevented (Block 4A) or when prevention is not practical, personal fall protection equipment can be used to control the fall (Block 4B).

BLOCK 4A - PREVENTION

Preventative measures typically involve the installation of floors, walls, nets, handrails, ladders and fixed platforms. These measures usually consist of permanent, passive systems and all require substantial planning effort. Finally, the availability of bucket trucks, scissor lifts, aerial lifts and other personnel lifts are increasing. These devices can offer a means of access to a work station or can be effectively used for the installation of a preventative or personal fall protection system. When aerial lifts are used for access only, that is getting to a work station, the use of personal fall protection (body harness and lanyard) is still required.

BLOCK 4B - PROTECTION

When fall prevention is not economical or feasible due to location or not practical for the work to be done, then plans for personal fall protection must be put into place. The overall objective is to minimize the potential for the employee to sustain injury due to a fall. Also as important is to determine how rescue will be accomplished in the event of a fall. Personal fall protection is not designed to be used as a tool for positioning or restraint. Rather, it should serve as a back up to comfortably arrest a free fall. Items required for personal fall protection include but are not limited to: body harness with lanyards, rope grabs, vertical and horizontal lifelines and retractable lifelines.

BLOCK 5 - ORIENTATION AND TRAINING PROGRAM

A personal fall protection system must include not only the device and all the accessories, but also proper orientation and training. The need for training cannot be overemphasized! Training is the first step to increase awareness and to develop an understanding of the capabilities and limitations of available equipment. Training is the key to making employees aware of the danger and how to hook up the proper equipment, once anchor points have been established. Fall protection equipment is designed for people and therefore, people should have the opportunity to train with their personal protective equipment to learn capabilities and limitations. The objective of training is to determine what additional skills, knowledge or understanding an individual needs to perform his responsibilities with maximum efficiency and effectiveness - without incidents. An understanding of the equipment and its limitations enables employees to work out simple sequences of moving with protection.

BLOCK 6 - INSPECTION & MAINTENANCE PROGRAM

Proper training must also include service, repair and comprehensive instruction required for proper use. Upon completion of training, each employee must demonstrate understanding either by hands-on use of equipment, by written test, or both.

BLOCK 7 - PROGRAM AUDIT

An audit can be used to assess the effectiveness of the fall protection program. A means to gather feedback is important to continually improve any program. Evaluations are necessary to check that the elevated fall hazard control employed is working properly and is the most suitable for the job.

TRAINING REQUIREMENTS

OSHA mandates that each employer shall provide a training program for each employee who might be exposed to fall hazards. The program shall enable each employee to recognize the hazards of falling and shall train each employee in the procedures to be followed in order to minimize these hazards.

The employer shall assure that each employee has been trained, as necessary, by a competent person qualified in the following areas:

1. The nature of the fall hazard in the work area.
2. The correct procedures for erecting, maintaining, disassembling and inspecting the fall protection systems to be used.
3. The use and operation of guardrail systems, personal fall arrest systems, safety net systems, warning line systems, safety monitoring systems, controlled access zones and other protection to be used.
4. The role of each employee in the safety monitoring system when this system is used.
5. The limitations on the use of mechanical equipment during the performance of roofing work on low-sided roofs.
6. The correct procedures for the handling and storage of equipment and materials, and the erection of overhead protection.
7. The role of employees in fall protection plans.

The employer is required to verify compliance with the *training requirement* by preparing a written certification record. The written certification record shall contain the name of the trainee, the date(s) of the training and the signature of the trainer or employer.

Retraining is required when changes in the workplace renders previous training obsolete, changes in the types of fall protection systems or equipment becomes obsolete, or if an employee indicates by a lack of knowledge or act that they have not retained the requisite understanding or skill.

PERSONAL FALL PROTECTION

GENERAL

In a fall, before the arresting equipment starts to work, the worker is *free-falling*. After a certain distance, the system activates. It then takes more distance, known as the *deceleration distance*, to bring the worker to a full stop. *Arresting force* is required to stop a fall. The fall-arresting force strikes the body through the straps of the body harness. The resulting jolt can cause severe internal injuries if the equipment is not rigged properly. Deceleration systems help absorb the fall-arrest force.

TYPES OF SYSTEMS

A personal fall protection system is a *secondary system*, and should be used as a back up to *primary systems* (guardrails, hole covers, etc.), or in the absence of *primary systems*.

There are three basic types of personal fall-protection systems:

1. **Personal Fall-Arrest Systems** catch workers after they have fallen. This system may include an anchorage point(s), body harness, lifelines, lanyards, connectors, deceleration device, or a suitable combination of these components.
2. **Positioning Devices** are designed to support the employee in a working position. Examples are a lineman's belt, a rebar belt and a window cleaner's belt.
3. **Ladder-Climbing Devices** connect to the front D-ring on the climber's body harness that slides up and down a rigid rail or cable. Should a fall occur, the device is designed to lock by inertia or cam action to arrest the fall.

ANCHORAGE

The anchorage point(s) should be strong enough to withstand the maximum fall-arrest force.

Inspect the anchorage point(s) carefully before hooking up.

LANYARDS

Use a shorter lanyard (less than 6 feet) to limit the free-fall distance.

Limit the amount of slack by tying-off above you, or no lower than your shoulder, if possible.

Never tie-off to a point that would allow more than 6 feet of free-fall.

Shock-absorbing and self retracting lanyards have built in absorbing protection and work automatically.

Do not tie off around rough or sharp surfaces that could damage the lanyard.

LIFELINES

Lifeline systems are points of attachment for lanyards. Lifelines and anchors should be designed, installed and used under the supervision of a *qualified person*.

No more than one person may be attached to a vertical lifeline.

Horizontal lifelines should be positioned so as to provide points of attachment at shoulder level or higher.

Lifelines and anchor points should not be used for any purpose other than fall protection.

SNAPHOOKS

Only locking type snaphooks are permitted.

Locking snaphooks are designed to help prevent *roll-out*. Only locking type snaphooks are to be used for personal fall-arresting systems.

HARNESS

Full body harnesses are designed to distribute both arresting and suspension forces over the buttocks, pelvis, thighs, chest and shoulders.

INSPECTION

Always follow the manufacturer's instructions for equipment maintenance, cleaning and storage.

Inspect personal fall protection equipment prior to each use.

Check for wear, mold, mildew, distortion, cuts, scratches, tears, broken fibers, pulled stitches and that snaphooks, D-rings, and buckles function properly.

If any item is damaged or defective, remove it from service immediately.

If any equipment has been subjected to impact loading, it must be turned into the Safety Department.

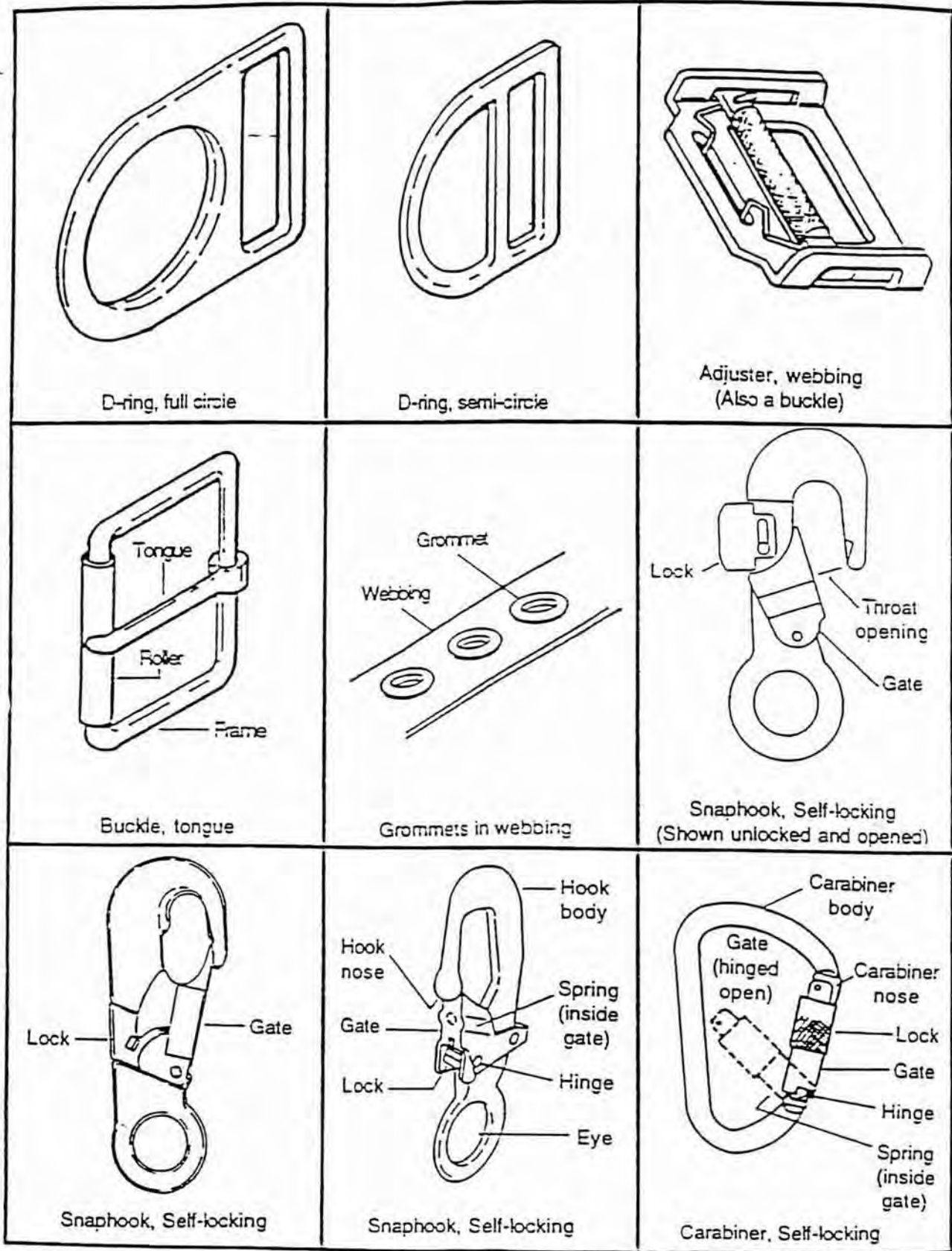


Figure 1
Example of Some Typical
Connector (hardware) Components and Elements

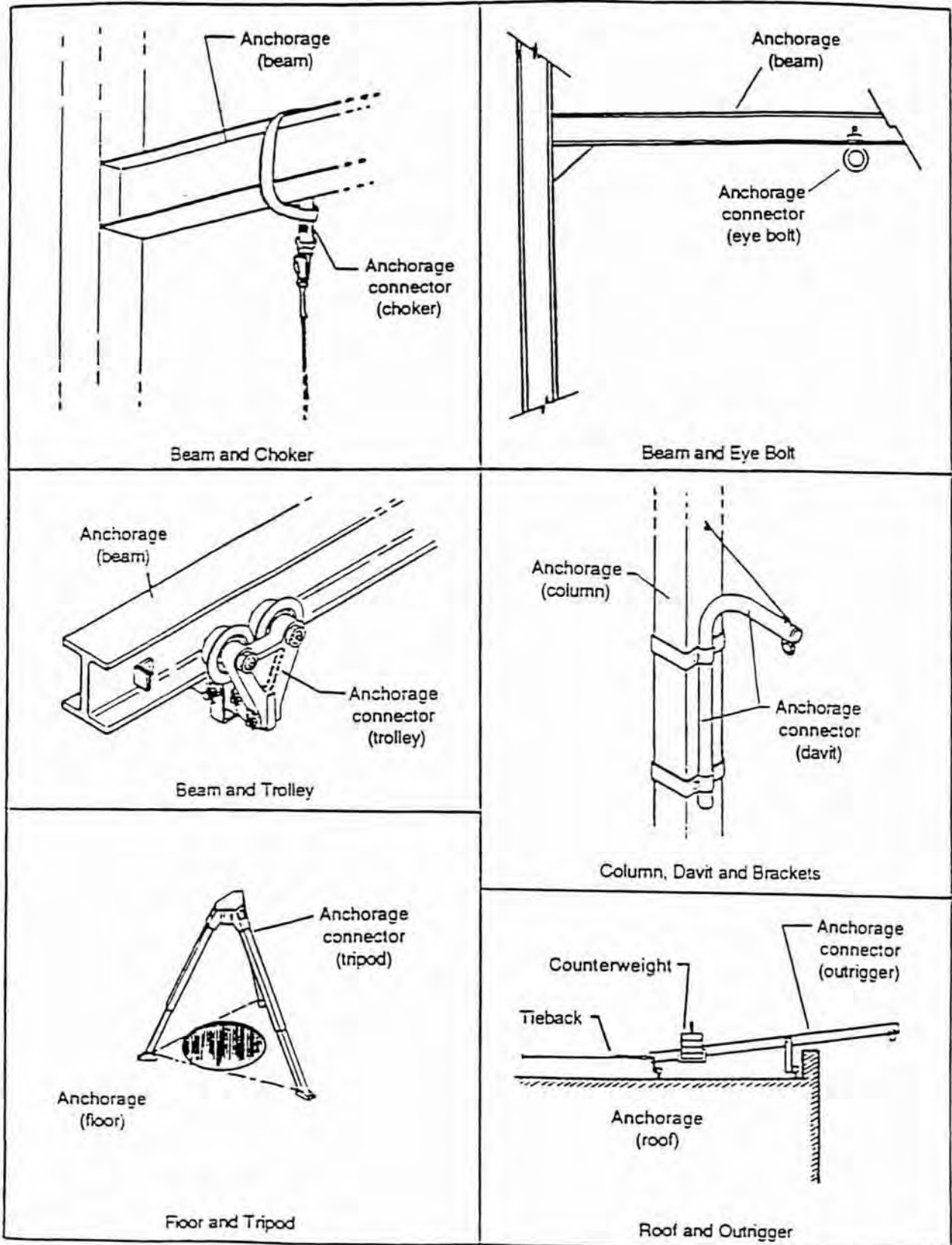


Figure 2
Examples of Some Typical
Anchorage and Anchorage Connectors

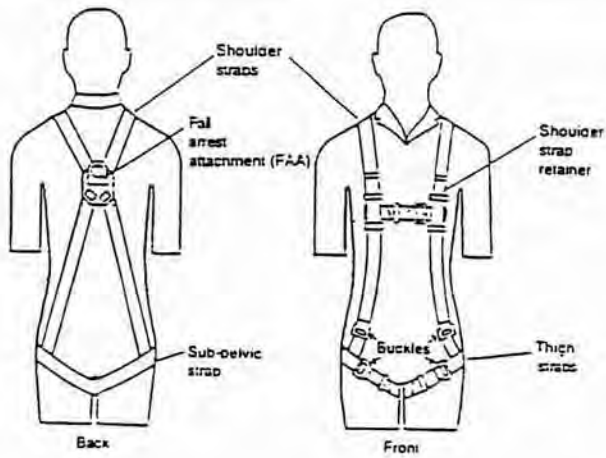
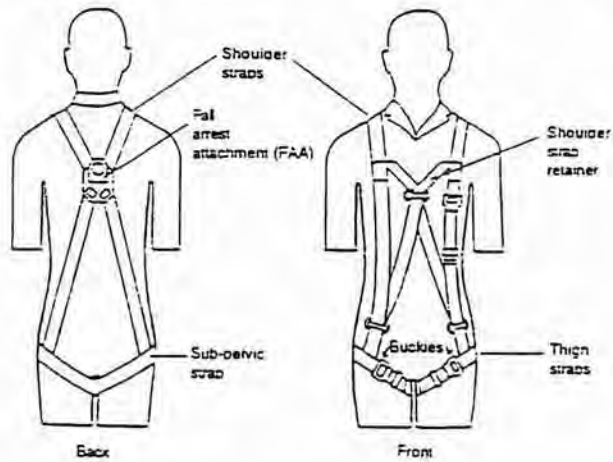
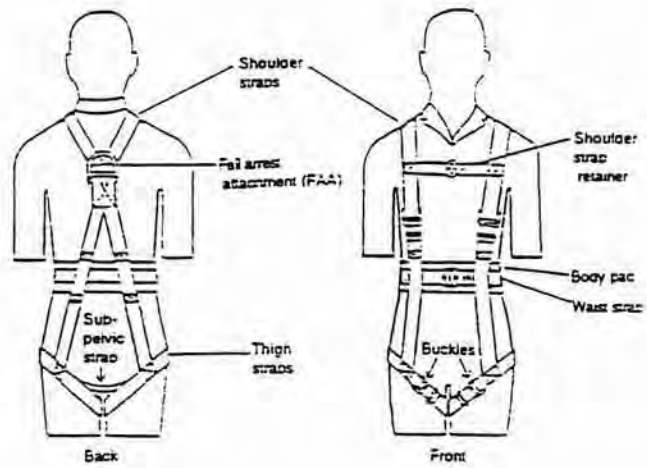
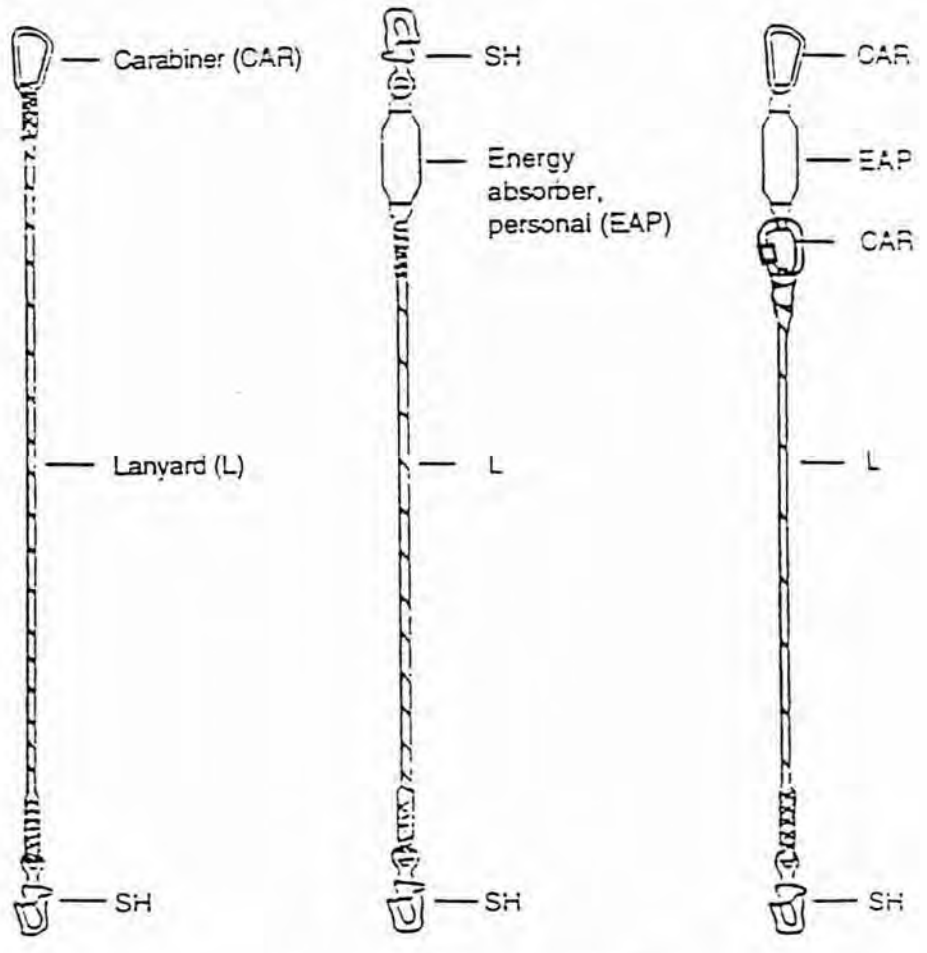
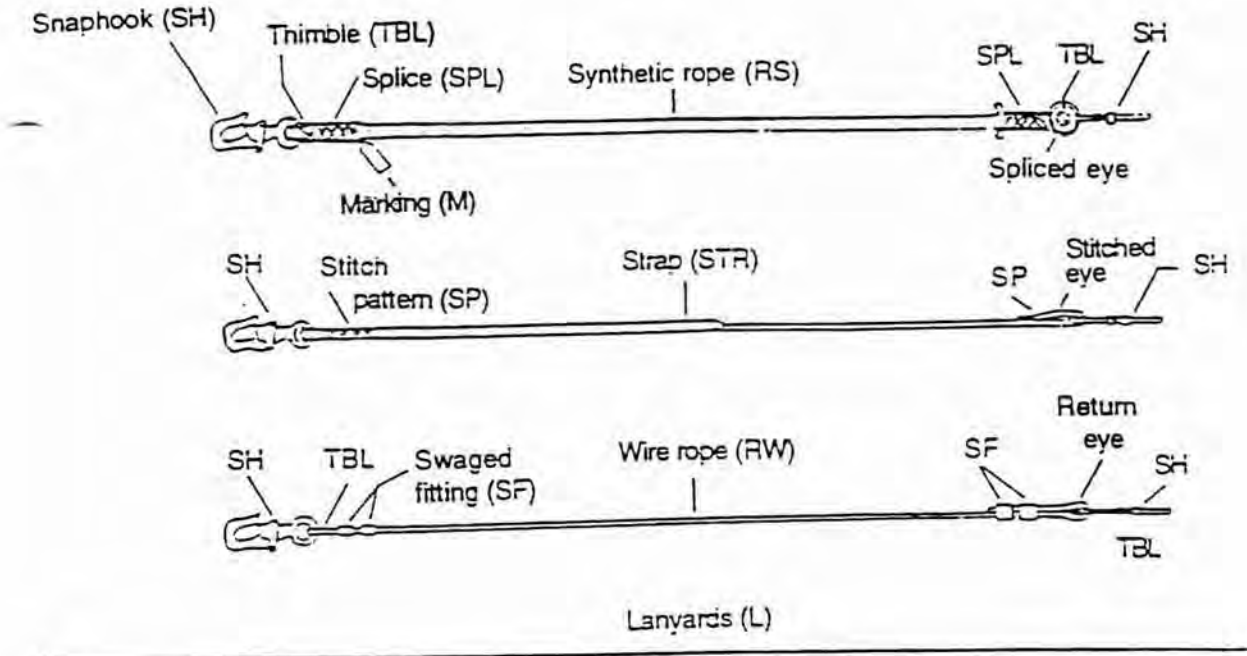


Figure 3
Examples of Typical
Full Body Harnesses



Lanyard Connecting Subsystems (LCSS)

Figure 4
 Examples of Typical Lanyards
 and Lanyard Connecting Subsystems (LCSS)

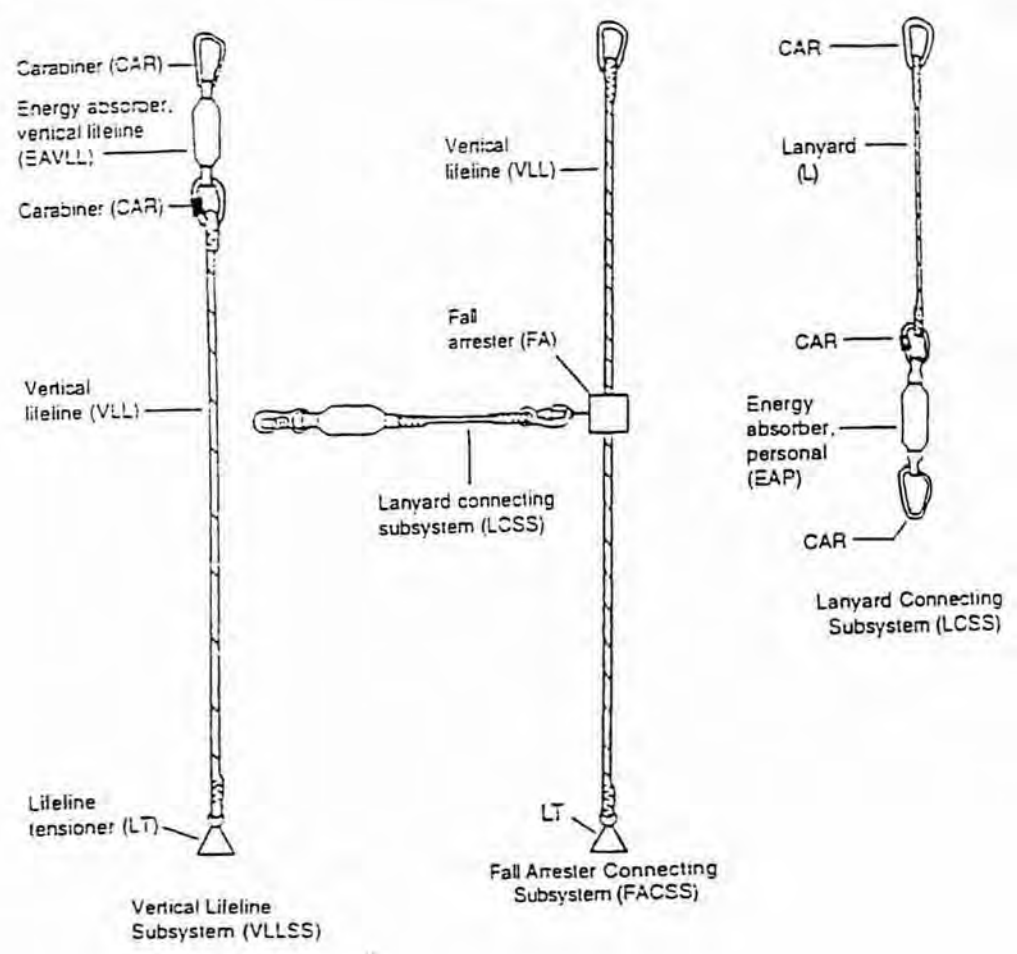
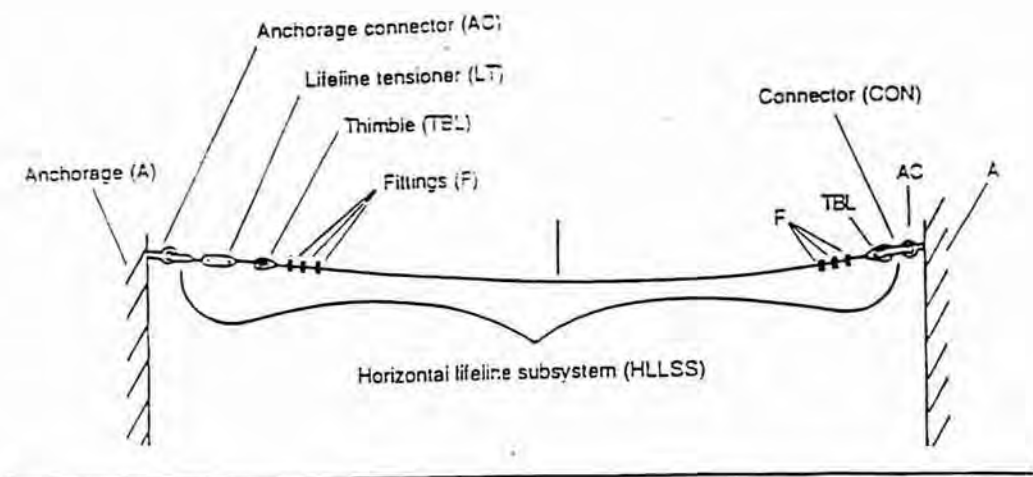


Figure 5
Examples of Some Typical
Subsystems (SS)

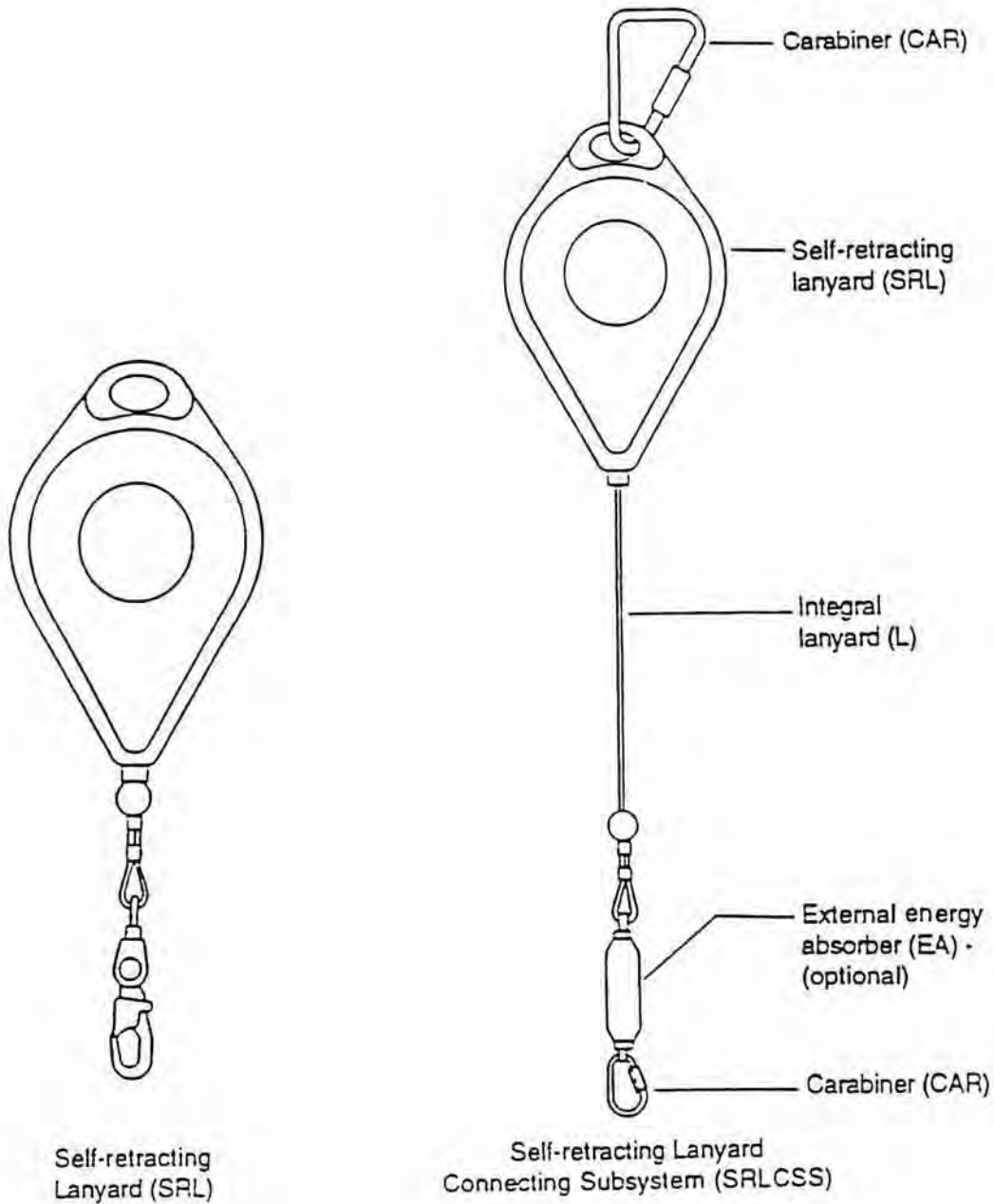


Figure 6
Examples of Self-retracting Lanyard
and SRL Connecting System

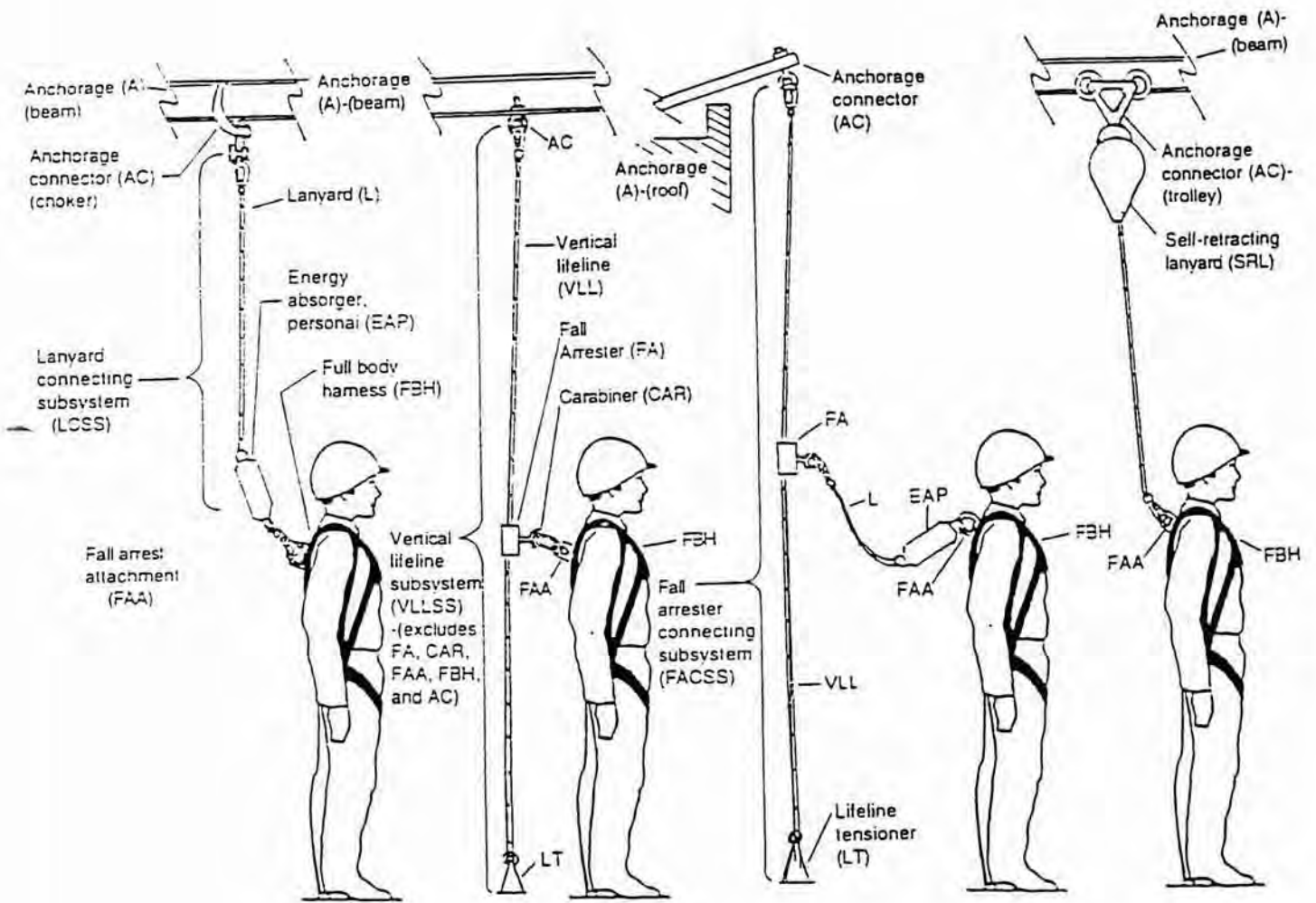


Figure 7
Examples of Some Typical
Personal Fall Arrest Systems (PFAS)

SLIPS AND TRIPS

Slips, trips and falls rank second only to motor vehicle accidents as a source of injury in the United States.

SLIPS

A slip occurs when there is insufficient traction or friction between a worker's feet and the walking surface. Three common causes of slips are constantly wet surfaces, occasional spills and various weather conditions.

There is a relationship between traction and footgear (shoes and boots). Slip-resistant footgear which is appropriate for the job should be worn. Proper fit, the composition and condition of the sole, as well as the shape and style of footgear has an effect on traction as well as comfort. New leather soles and heels can be very slippery when dry, and especially so when wet.

Footgear, with a heel, is critical for employees whose duties require them to climb ladders. The heel is designed to catch the rung which will prevent the entire leg from going through the opening which can flip the climber over backwards and to the ground.

Footgear should be maintained in good condition and free from build-up of mud and grit, to increase traction.

The risk of slipping on wet areas or on ice can be reduced by slowing down in order to increase reaction time if there is a loss of traction, shortening the stride to keep the center of balance over the feet, walking with the feet pointed slightly outward which creates a more stable base, and making wide turns at corners.

Other methods to reduce slipping include using abrasive strips to increase traction, posting signs to warn of wet areas, using matting, and prompt cleaning up of any spills.

TRIPS

Trips occur when balance is lost due to a foot or leg contacting an object or obstruction. On occasion, too much friction between the foot and the walking surface can also cause a trip.

Poor or inadequate housekeeping, such as blocked aisles, extension cords, tool boxes and materials stored in walkways, are a few of the conditions that often produce trips. Another source is an obstructed view as when a worker is carrying a bulky object such as sheetrock.

Good housekeeping and proper material storage reduces the potential for trips. Extension cords should be taped down, covered or run overhead if possible. Do not use stairs for storage, even temporarily. Be aware of the threshold when you step out of personnel hoist/elevator which may not always level properly with the landing.

Rolling objects such as pipe, pipe cut-offs, and conduit can be contributor to slips and trips when left in walkways.

Improper lighting can also contribute to trips.

STAIRWAYS

A stairway is a series of steps with four or more risers. Standard risers are from between 4.6 and 7.3 inches in height. Variations in riser height should not exceed $\frac{1}{4}$ inch in any flight or stairway system. 12.3 inches may be the ideal tread depth for the fewest mis-steps.

A stairway or ladder should be provided at all worker access points where there is a break in elevation of 19 inches or more, and no ramp, runway, embankment or personnel hoist is provided.

Except during construction of the actual stairway, skeleton metal frame structures and steps should not be used unless the stairs are fitted with secured temporary treads and landings. The actual stairway, stairways with metal pan landings and treads should not be used where the treads and/or landings have not been filled in with concrete or other material, unless the pans of the stairs and/or landings are temporarily filled in with wood or other material.

All stairway, ladder and personal fall protection systems required by OSHA or MSHA (mining) should be in place before starting work.

Stairways that will not be a permanent part of the structure should have landings at least 30 inches deep and 22 inches wide at every 12 feet or less of vertical rise.

Stairways should be installed at least 30 degrees, and no more than 50 degrees, from the horizontal. 33 degrees seems to be the ideal pitch for savings in human effort when climbing stairs.

Where doors or gates open directly onto a stairway, a platform should be provided that extends at least 20 inches beyond the swing of the door or gate.

Stairway or ladderway floor openings should be guarded by standard guardrails and toeboards on all exposed sides, except at the entrance to the opening, with the passage through the railing either provided with a swinging gate or so offset that a person cannot walk directly into the opening.

Stairways having four or more risers, or rising more than 30 inches in height, whichever is less, should have at least one handrail. A stair rail should be installed along each unprotected side or edge. When the top edge of a stair rail system also serves as a handrail, the height of the top edge should not be more than 37 inches nor less than 36 inches from the upper surface of the rail to the surface of the tread.

Illumination should be adequate for safety. OSHA specifies a minimum of 5 foot candles of intensity for interior stairways and landings.

STAIR CLIMBING TIPS

1. Take each step one at a time.
2. Never skip stairs or jump from one level to another.
3. Make sure that your front foot is firmly planted before shifting your weight on it.
4. Always use the handrail.
5. Never carry objects using both hands, so that the handrail can be used.
6. Keep stairways free of clutter, grease, ice, etc.
7. Reduce fatigue on long climbs by minimizing the load if you can, and by taking rest breaks when needed.

LADDER SAFETY

GENERAL

Ladders are among the most frequently used and abused pieces of equipment used in construction.

The selection and safe use of any ladder involves an understanding of what they are designed for and how to use them.

Selecting the right ladder for the job is the first step to ladder safety. The ladder type tells you how much weight it can support.

- Type 1A - extra heavy industrial ladder: 300 lbs
- Type 1 - heavy-duty industrial ladder: 250 lbs
- Type 2 - medium-duty commercial ladder: 225 lbs
- Type 3 - light-duty household ladder: 200 lbs

Remember when choosing a ladder, that it must be capable of holding the users weight plus any tools which may be carried on a tool belt or similar device. Also force exerted by the worker while performing the job, such as when pulling, pushing, lifting or tightening, can put added strain on the ladder, so be sure to select a fully adequate duty rating.

NOTE: Personnel should avoid carrying tools or materials while climbing a ladder. Put the tools or material in a bucket or bag fastened to a line which goes up the ladder with the worker. When the worker gets to the working level, he or she can safely hoist the gear up.

Some common ladders are step ladders, extension ladders, fixed ladders and job built ladders.

STEP LADDERS

Step ladders come in various heights, are designed to stand by themselves are not adjustable in height, have hinged back, flat steps that are from 6 to 12 inches apart, are at least 11 ½ inches wide at the top, and open at least from 1 inch for every foot of height.

When using step ladders:

- make sure the ladder is on solid base,
- that it is fully open and the spreaders are locked, and
- never climb, stand or sit on the top two steps.

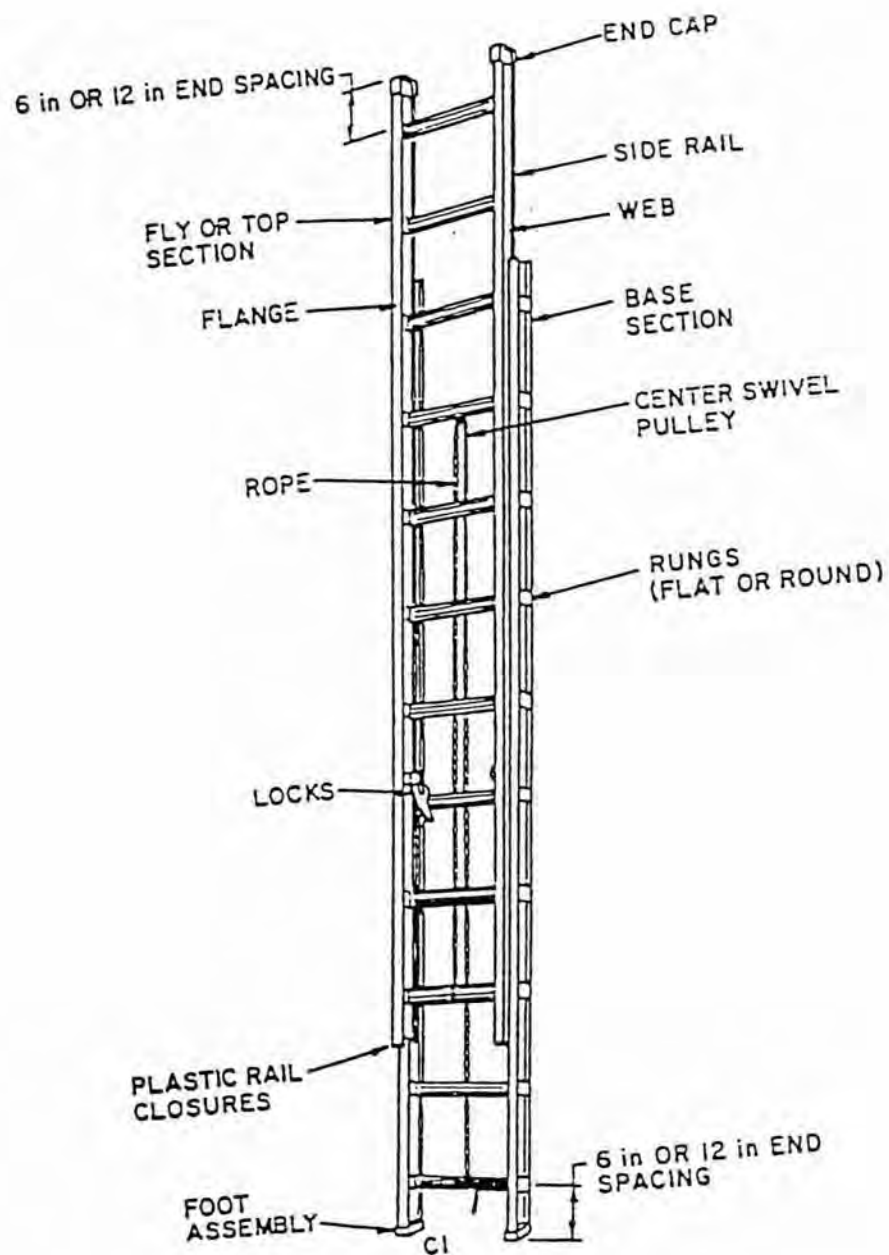


Figure 9
Extension Ladder Components

EXTENSION LADDERS

Extension ladders are lightweight, durable, adjustable in length, made up of two or more sections that travel in guides or brackets, are at least 12 inches wide, and are not longer than 24 feet per section.

When using extension ladders:

Handle the ladder with caution. A large ladder is heavy and tricky to handle. Don't hesitate to get help from a co-worker.

- Place the ladder on a substantial base with clear access at the top and bottom.
- Use a ladder with *safety feet* if there is any danger of skidding or slipping.
- Place the ladder's feet on a substantial and level base, not on movable objects.
- Never lean a ladder against unsafe backing, such as loose boxes or barrels.

Use the four-to-one ratio: that is, place the ladder so its feet are one foot away from what it leans against for every four feet in height to the point where the ladder rests. Example: If the top of a 16 foot ladder leans against a wall, its feet should be placed four feet from the wall.

Never place a ladder in front of a door or passageway unless the door is locked, blocked or guarded by someone.

Never use any ladder in a horizontal position such as a runway or scaffold.

Extension ladders **should be tied, blocked or otherwise secured** to prevent movement.

All extension ladders **should extend a minimum of 36 inches** above the landing.

When ascending or descending a ladder:

- always face the ladder,
- hold on with both hands,
- never slide down a ladder,
- do not climb higher than the third rung from the top, and
- be sure that your shoes are not greasy, muddy or slippery before your climb.

Since metal ladders are electrical conductors, they should never be used around electrical circuits or in places where they may come in contact with such circuits. Metal ladders should be marked with signs or decals reading "Caution - do not use near electrical equipment".

Other safety precautions:

1. Never use makeshift ladders such as cleats fastened across a single rail.
2. Before using a ladder, inspect it for defects.
3. Never use a defective ladder. Tag it or mark it so that it will be repaired or destroyed.
4. Keep ladders clean and free from dirt and grease, which might conceal defects.
5. Don't use ladders during strong wind except in an emergency, and then only when they are securely tied.
6. Do not leave placed ladders unattended, especially outdoors, unless they are anchored at top and bottom.
7. It is dangerous to reach out too far from a ladder in any direction; move the ladder as the work requires.

FIXED LADDERS

Fixed ladders provide access to roofs, pits, silos, tanks, towers, chimneys and other areas of limited access. Such ladders may consist of side rails and rungs or individual rungs fixed to the structure.

Important features are:

1. The maximum height is 30 feet
2. A cage should be provided for ladders 24 feet and higher. The cage should start at least 8 feet above ground or floor level and extend from 3 to 6 feet above the point of landing.
3. Fixed ladders should be installed at a pitch no greater than 90 degrees from the horizontal measured from the back side of the ladder.

JOB BUILT LADDERS

Job built ladders are those which have been constructed on site for a specific purpose. These would normally be constructed of wood, but may be made from other materials. Every ladder, whether manufactured or job made, must conform to applicable OSHA, MSHA and ANSI standards.

Job built ladders shall be constructed for their intended use. Cleats shall be uniformly spaced not less than 10 inches apart, nor more than 14 inches apart, along the handrails.

NOTE: Portable and fixed ladders with structural defects such as broken or missing rungs, cleats or steps, broken or split rails, or corroded components should be withdrawn from service immediately and tagged "DO NOT USE" or marked in a manner that identifies them as defective; or blocked (such as with a plywood attachment that spans several rungs). Repairs should restore the ladder to its original design criteria.

Since metal ladders are electrical conductors, they should never be used around electrical circuits or in places where they may come in contact with such circuits. Metal ladders should be marked with signs or decals reading "Caution - do not use near electrical equipment".

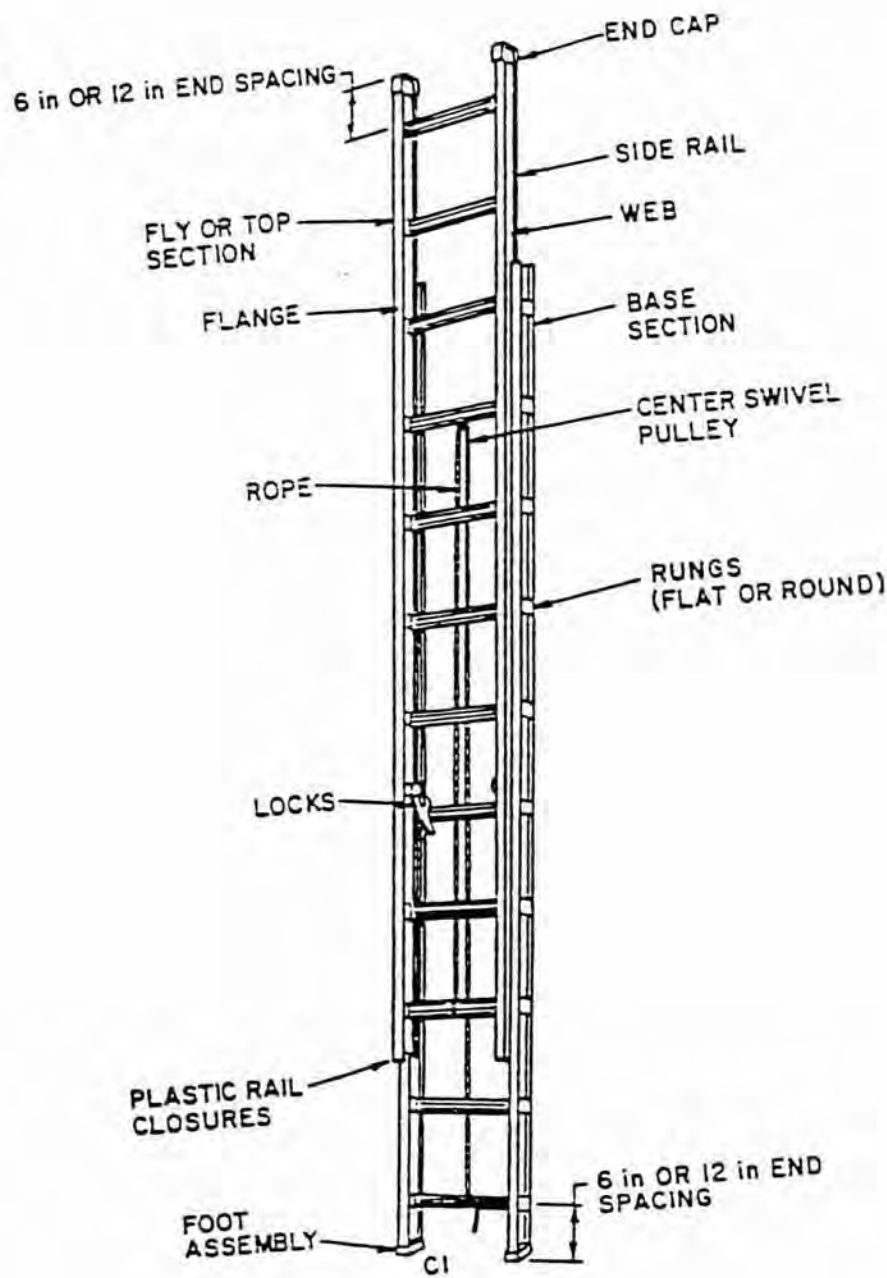


Figure 9
Extension Ladder Components

SCAFFOLD SAFETY

GENERAL

Scaffolds are elevated platforms that can be moved or installed in order to reach a desired work level or position. Falls from scaffolds are responsible for more deaths than falls from any other working surface. There are several kinds of scaffolds, but the three most common are suspension scaffolds, mobile scaffolds and stationary scaffolds.

SUSPENSION SCAFFOLDS

Suspension scaffolds hang by ropes or wires from an overhead support. Included are single-point suspension scaffolds for one person, such as a boatswains chair and double-point suspension scaffolds.

Inspection of Suspension Scaffolds:

1. Check the platform for holes, work areas or weak spots.
2. Check the lines for fraying, kinking, broken strands and loose connections.
3. Do not try to repair defective lines and do not use lines that have been repaired.
4. If a scaffold has been dropped or exposed to anything that could weaken it, inspect it carefully for damage.

Make sure the scaffold is built for the weight which will be placed on it. This includes the weight of the workers, tools and materials. The platform, suspension ropes or wires, and overhead supports must all be able to carry the load.

Do not attempt to use a suspension scaffold if winds are over 40 mph, unless it's designed to take wind loads and can protect the worker from the wind.

Moving a Suspension Scaffold:

1. Before moving a scaffold, remove or secure all tools on the platform.
2. Make sure the scaffold is level before raising or lowering.
3. Raise or lower each side a little at a time, keeping it as level as possible.
4. If you have help, you and your co-worker should stand on opposite sides of the platform, working at the same time to raise each end evenly.
5. Position the scaffold as close as possible to the working surface. If it is more than 14 inches away, an interior guardrail is required.

NOTE: OSHA standards require that on suspension scaffolds designed for a working load of 500 pounds, no more than two people should be permitted to work at one time. On suspension scaffolds with a working load of 750 pounds, no more than three people shall be permitted to work at one time. Each employee shall be protected by a harness and lanyard attached to a lifeline. The lifeline shall be securely attached to substantial members of the structure (not scaffold), or to securely rigged lines which will safely suspend the employee in case of a fall. In order to keep the lifeline continuously attached with a minimum of slack to a fixed structure, the attachment point of the lifeline shall be appropriately changed as the work progresses.

Working on a Suspension Scaffold:

1. When working on a suspension scaffold, keep a safe distance from power lines. The scaffold must be kept at least 10 feet from energized lines. If an insulated line is carrying less than 300 volts, the minimum distance is two feet.

2. Learn the purpose and use of guardrails, safety nets and other *fall protection* systems.
3. Toeboards shall be installed on all open sides and ends of platforms more than 10 feet above the ground floor.
4. There should be a screen with a maximum of ½ inch openings between the toeboard and the guardrail, where persons are required to work or pass under the scaffold.
5. Do not use a ladder as a scaffold platform.
6. Do not add or remove extensions or make other changes to the scaffold while it is in use.
7. Keep the platform free of loose tools, materials and spilled liquids.
8. If you must move from one scaffold to another, be very careful. Do not attempt to cross over:
 - A. Unless the scaffolds have been designed for that purpose.
 - B. If you have to climb over ropes or outside railings to get from one scaffold to the other.
 - C. Unless the two platforms are at the same level and are properly connected.

TWO POINT SUSPENDED SCAFFOLD

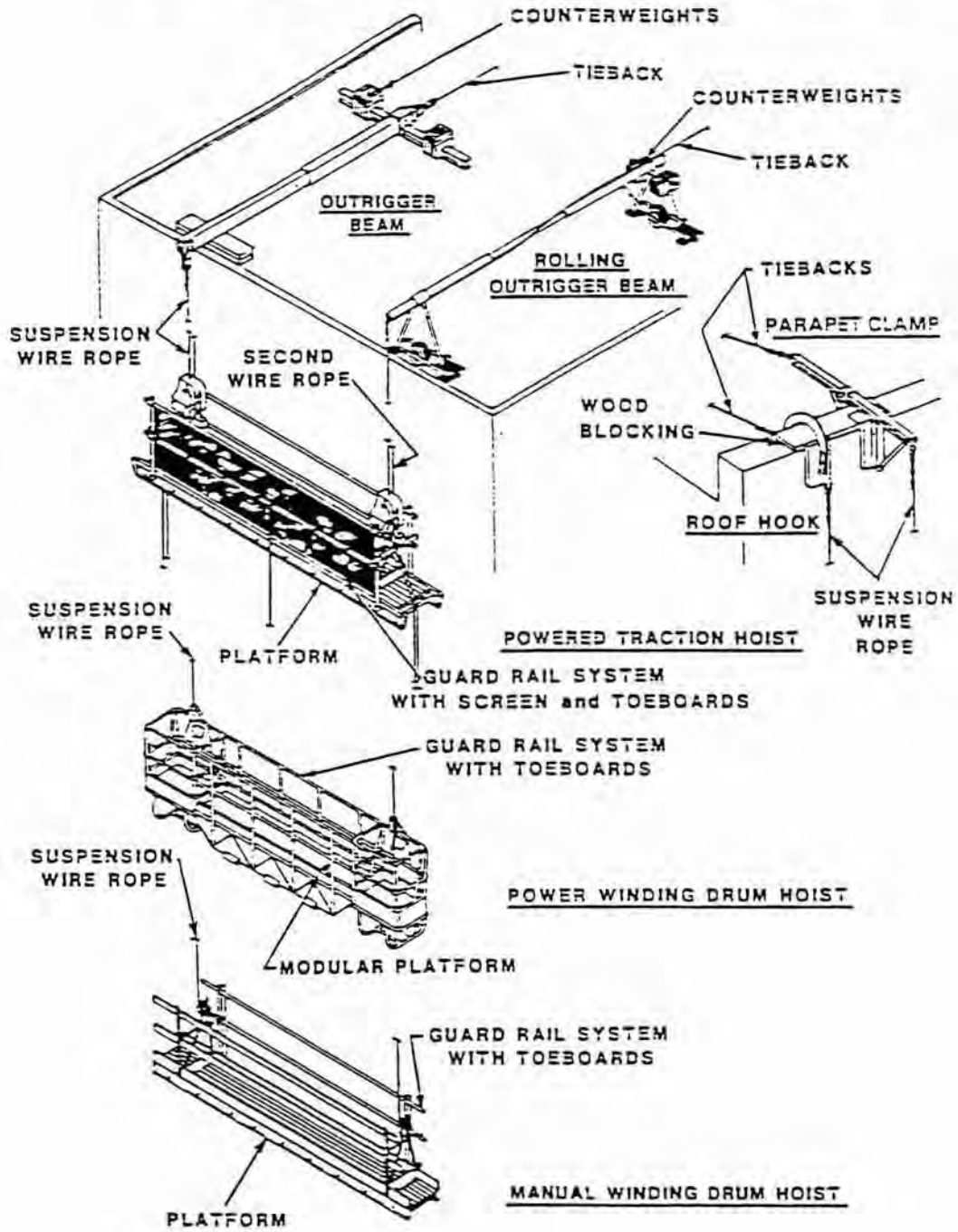
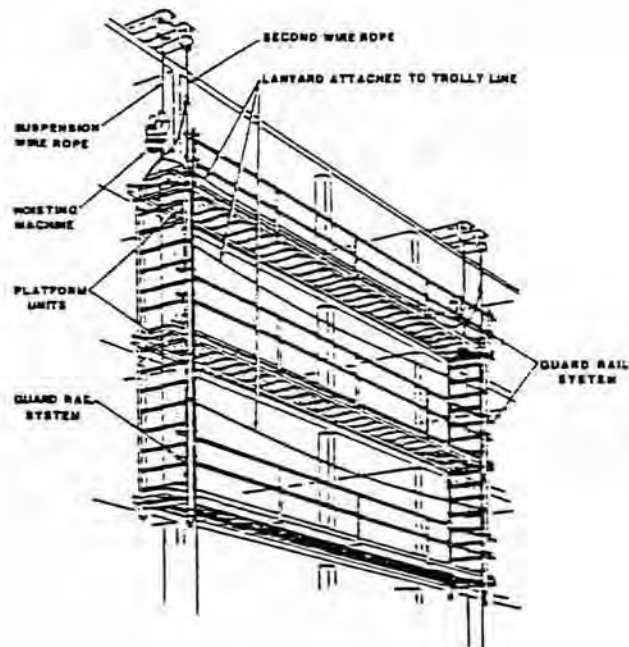


Figure 10
Typical Examples of
Two Point Suspended Scaffold

MULTI-LEVEL SUSPENDED SCAFFOLD WITH POWERED HOISTS



MULTI-POINT SUSPENDED SCAFFOLD

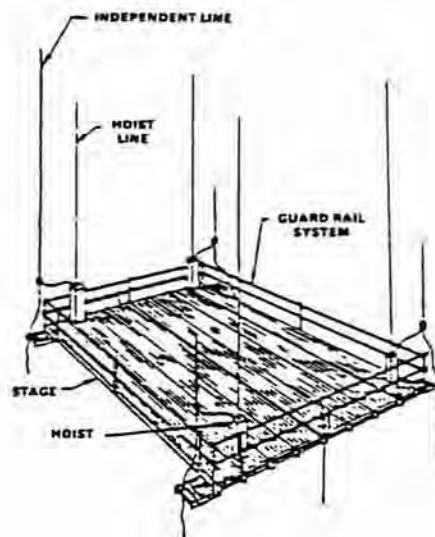
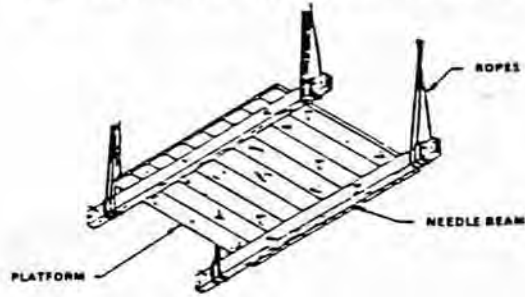


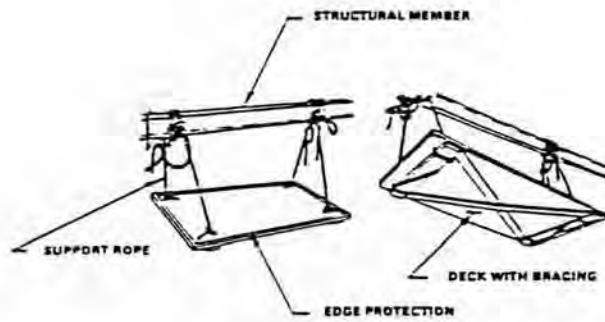
Figure 11
Typical Examples of
Multi-Point Suspended Scaffolds

NEEDLE BEAM SCAFFOLD

STRUCTURAL MEMBER ABOVE



FLOAT SCAFFOLD



WINDOW JACK SCAFFOLD

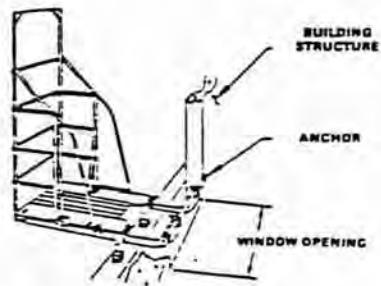
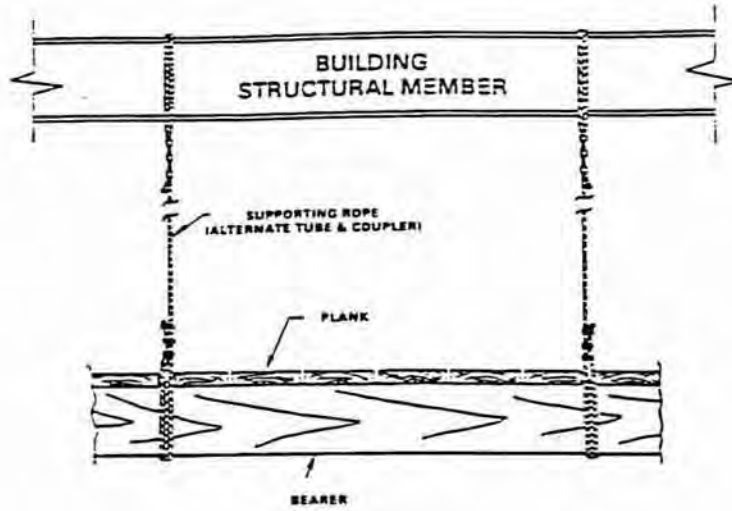


Figure 12
Examples of Other Types
of Suspended Scaffolds

INTERIOR HUNG SCAFFOLD



CATENARY SCAFFOLD

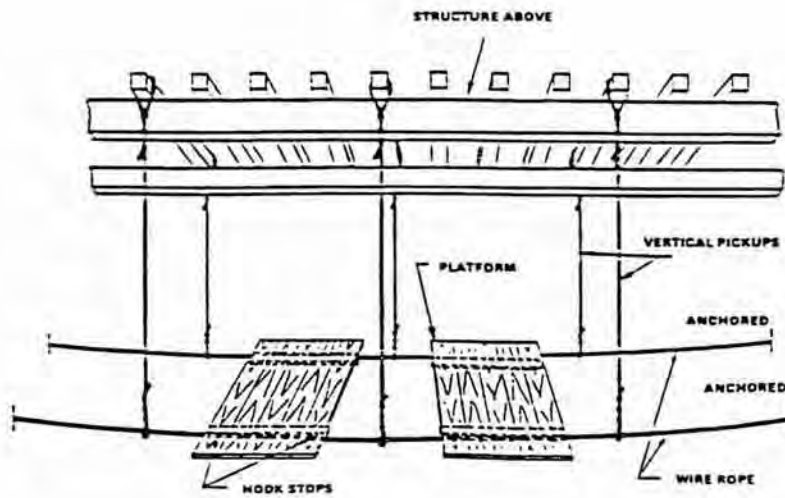
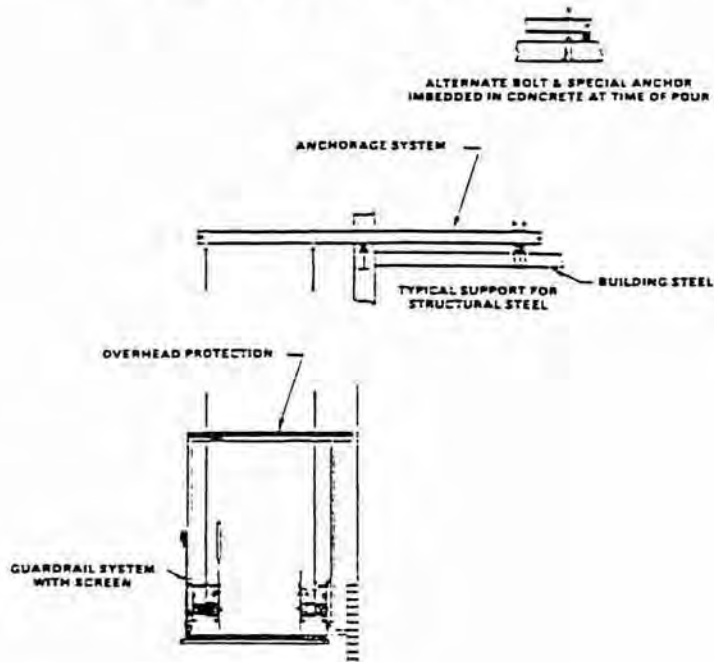


Figure 13
Examples of Other Types
of Suspended Scaffolds

MASONS' ADJUSTABLE MULTI-POINT SUSPENSION SCAFFOLD WITH WINDING DRUM HOISTS



BOATSWAIN'S CHAIR

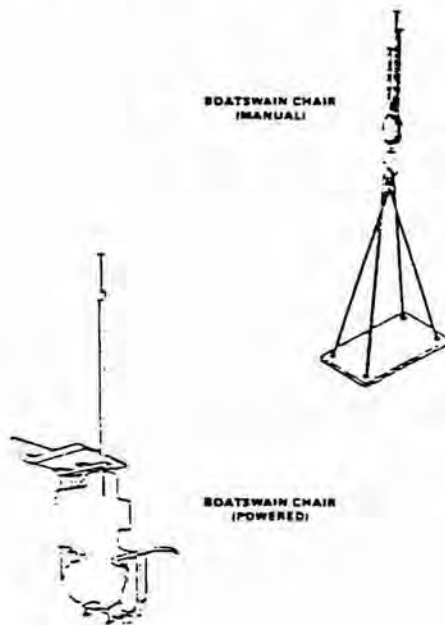


Figure 14
Examples of Other Types
of Suspended Scaffolds

MOBILE SCAFFOLDS

Mobile scaffolds (Tubular Welded Rolling Scaffolds) rest on the ground or floor and are supported by wheels or casters.

General Requirements:

1. Survey the area: The working area should be clear of all obstacles which would cause a mobile scaffold to tip over.
2. Inspect all equipment before using: Never use any equipment which has an obvious defect.
3. **Never use equipment for purposes or in ways for which it was not intended.**

General Rules for Assembly:

1. The uprights (frames) should be properly braced.
2. Wheels or casters should be provided with a locking device. Casters should be secured to the pin frame by a positive locking device (lock pin, bolt or equivalent fastener).
3. Adjusting screws (if used) should not be extended more than 12 inches.
4. Toggle pins, bolts or equivalent fasteners shall be installed at all connections between frames, guardrail supports and casters.
5. The working platform height of a rolling scaffold should not exceed four times the smallest base dimension unless guyed or otherwise stabilized (CAL OSHA and some Government agencies call for stricter a ratio of 3 to 1).
6. Guardrails should be installed on all open sides and ends of platforms more than 6 feet in height.
7. Use only scaffold grade planking. Planks should cover the full width of the scaffold, except for necessary access openings. (An effective method of preventing planks from slipping off must be provided, i.e., cleats or end support hooks).
8. Do not use outriggers or other platform extensions without thorough consideration for overturning effect.
9. Remember that the scaffold will be less stable with people on it, since its center of gravity is higher.
10. Toeboards should be installed on all open sides and ends of platforms more than 10 feet in height (CAL OSHA is 7 feet 6 inches).

Precaution During Use:

1. Always climb the scaffold with both hands.
2. Never climb on braces.
3. Always set the brake locking device on casters or chock the wheels when erecting, dismantling, climbing, descending, working or when it is in a stationary position.
4. Never attempt to move a mobile scaffold from the top. The force necessary to move the scaffold should be applied as closely as practical to the base.
5. Never place platform planks on guardrails to obtain greater height.
6. Never place ladders or other objects on top of a platform to increase height.
7. Do not ride on mobile scaffolds unless the following conditions exist:
 - A. The floor or surface is within 3 degrees of level and free of debris, cracks and holes.
 - B. The minimum base dimension of the scaffold is at least half of its height. Outriggers, if used, must be installed on both sides.
 - C. Ensure that all tools and materials are secured or removed from the platform.

- D. Ensure that all workers on the platform and in the area are alerted that the scaffold will be moving.
- E. If the scaffold is low enough to ride safely, workers should be sure to crouch low to the platform while holding on to the guardrails.
- F. *The best policy is to never allow anyone to ride a mobile scaffold.*

STATIONARY SCAFFOLDS

Stationary scaffolds may be either manufactured or job-built. In either case, the scaffolding must meet OSHA and industry standards.

Procedures for Erecting and Dismantling Stationary Scaffolds:

1. Inspection

- A. Survey the job site for hazards such as earth fills (soft ground), ditches, debris, high tension wires, unguarded openings and any other hazardous condition.
- B. If any job site is not safe, do not proceed with erection of scaffolds until the unsafe condition is corrected.

2. Layout

- A. Establish how scaffolding will be laid out as to how corner returns are to be made, tie-offs to be secured, and openings located.
- B. Whenever practical, start at the highest grade level and set the base run from here.

3. Erection Procedures

- A. Base plates (rigid or adjustable): All scaffold legs should rest upon base plates. Base plates should have support adequate to sustain the load and prevent horizontal movement. When scaffolding is resting on earth or other such material, the base plate should rest on a pad the equivalent of a 2 x 10 x 10 inch base. Base pads are not required on firm surfaces such as concrete, steel, asphalt, etc. except under extreme loading conditions.
- B. Use adjusting screws or other approved methods, instead of blocking, to adjust too uneven grade conditions.
- C. The base run should be level and plumb by using rigid or adjustable base plates.
- D. Each base frame should be properly braced. All frames or panels should be braced by horizontal bracing, cross bracing or combination thereof for securing vertical members together laterally.
- E. Free standing scaffold towers should be restrained from tipping by guying or other means.
- F. Never climb on cross braces (anytime).
- G. All scaffolding accessories should be used and installed in accordance with the manufacturers recommended procedure.
- H. Scaffolds and their components should be capable of supporting, without failure, at least 4 times the maximum intended load.
- I. Do not erect scaffolds near any electrical power lines unless proper precautions are taken.
- J. Scaffold levels above the base run should be installed in the following manner:
 - 1. Plum level and tie-off all scaffolds as erection proceeds.
 - 2. Do not force braces to fit.
 - 3. Position work planks.
 - 4. Raise frames and set in place.
 - 5. Install braces and guards (handrails, toeboards, screens, etc.) as required.
 - 6. Install ties to building or structure where required.
 - 7. Make final inspection of installation.

4. **Planking**

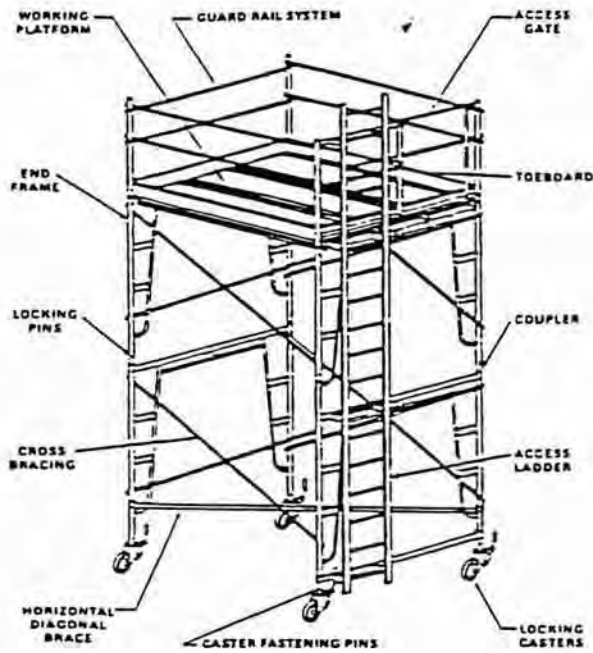
- A. Use only "scaffold grade" planking.
- B. Visually inspect plank prior to use to be sure plank is not warped, damaged or otherwise unsafe.
- C. Planking should have at least 12 inches of overlap and extend at least 6 inches nor more than 12 inches beyond the center of support or be cleated at both ends to prevent it from sliding off it's supports.

5. **Dismantling Procedure**

- A. Check to see if the scaffold has been structurally altered in any way which would make it unsafe and if so, reconstruct it where necessary before commencing with dismantling procedures.
- B. Visually inspect planking prior to dismantling to ensure that it is safe to work on.
- C. Do not accumulate excess components or equipment on the level being dismantled.
- D. Lower components in a safe manner so as to protect personnel below.
- E. Stockpile dismantled equipment in an orderly manner.

NOTE: OSHA standards require that guardrails made of lumber, be not less than 2 x 4 inches (or other material providing equivalent protection), approximately 42 inches high, with a midrail of 1 x 6 inch lumber (or other material providing equivalent protection) and toeboards, shall be installed at all open sides and ends on all scaffolds more than 6 feet in height above the ground or floor. A standard toeboard should be at least 4 inches in height and be made of any substantial material either solid or open, with openings not to exceed 1 inch in greatest dimension. Where persons are required to work or pass under the scaffold, wire mesh should be installed between the toeboard and the guardrail, extending along the entire opening, consisting of No. 19 gauge U.S. standard wire ½ inch mesh or the equivalent.

**MANUALLY PROPELLED
MOBILE SCAFFOLD**



PREFABRICATED MOBILE TOWER UNIT

THIS SCAFFOLD IS NORMALLY MANUFACTURED AS COMPLETE UNITS/TOWERS FOR USE AS MANUALLY PROPELLED MOBILE SCAFFOLD WITH SUPPLIERS IDENTIFICATION SYMBOL

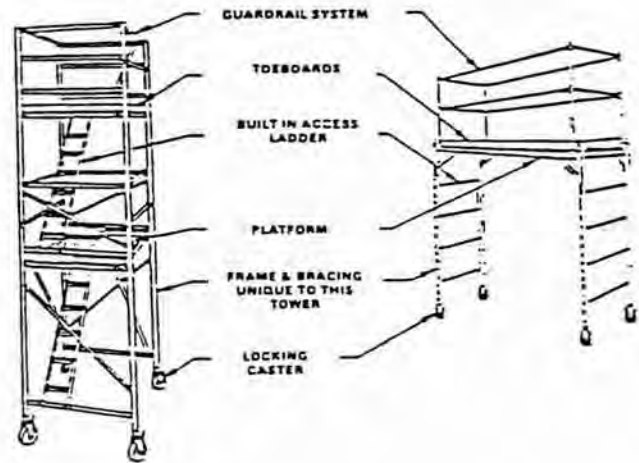
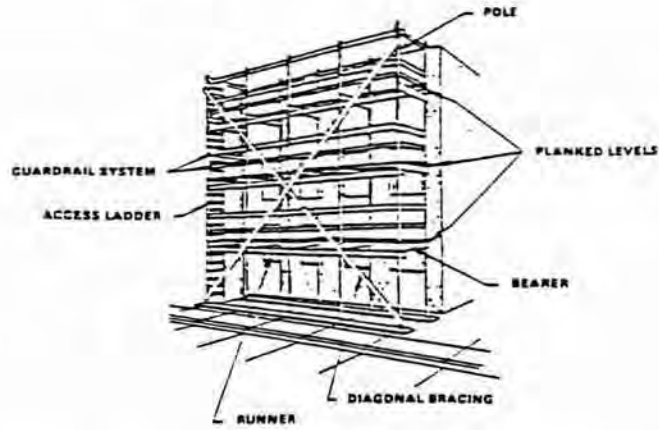


Figure 15
Typical Examples of
Mobile Scaffolds

WOOD POLE SCAFFOLD



SEE TABLES IN OSHA STANDARDS FOR SIZE & SPACING OF MEMBERS

FRAME SCAFFOLD ACCESS

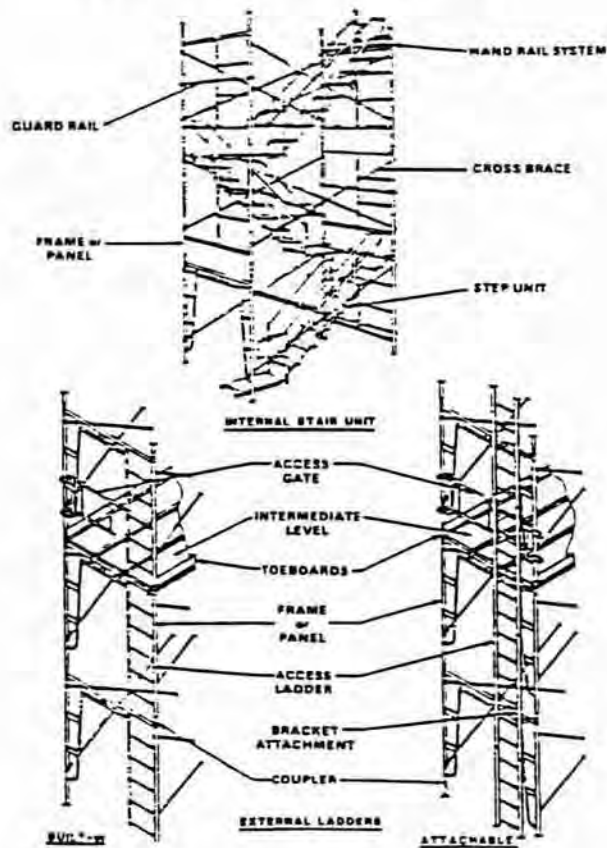


Figure 16
Typical Examples of
Stationary Scaffolds

TUBE and COUPLER SCAFFOLD

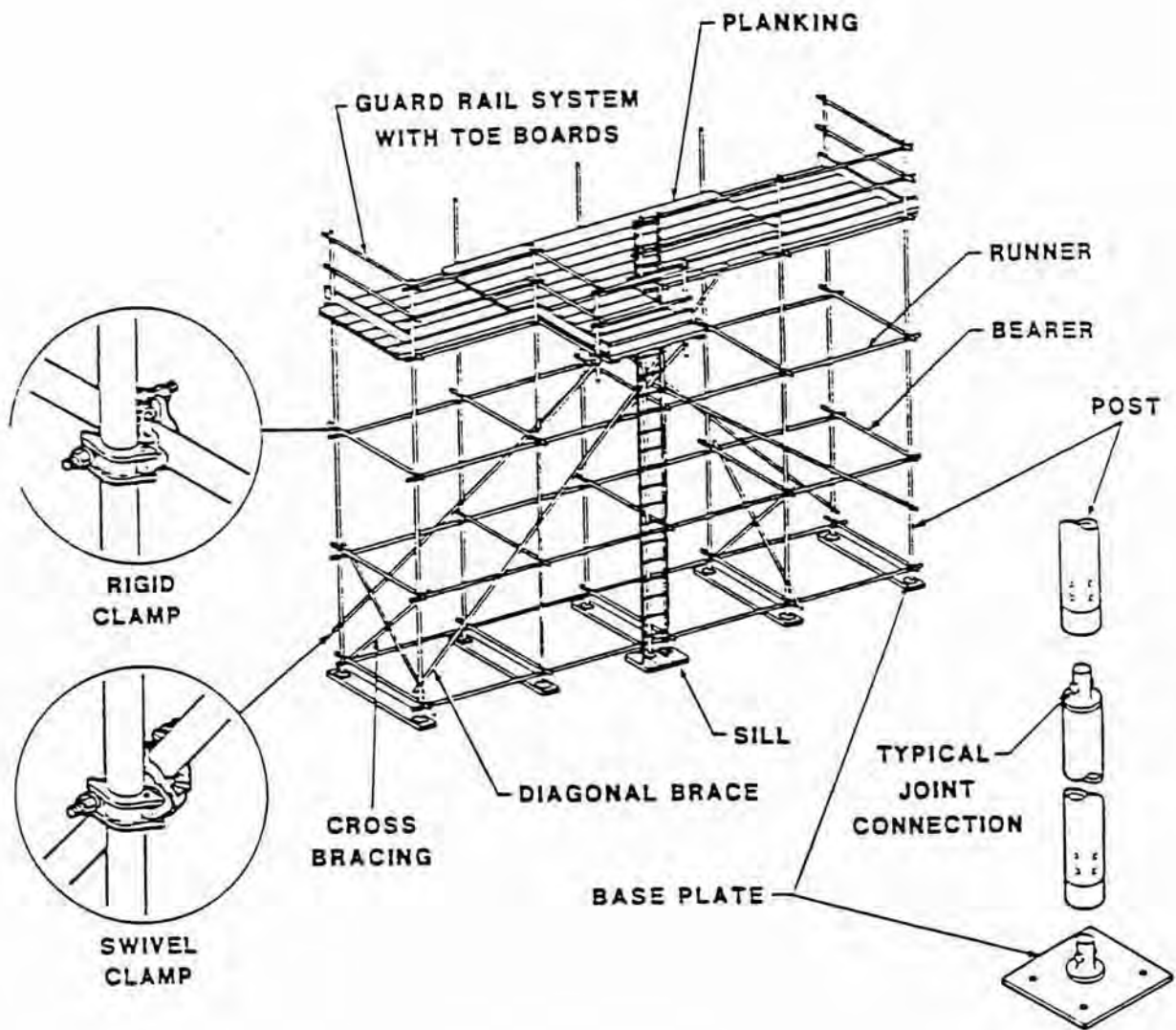


Figure 17
Typical Examples of
Stationary Scaffold (tube & coupler)

SYSTEM SCAFFOLD

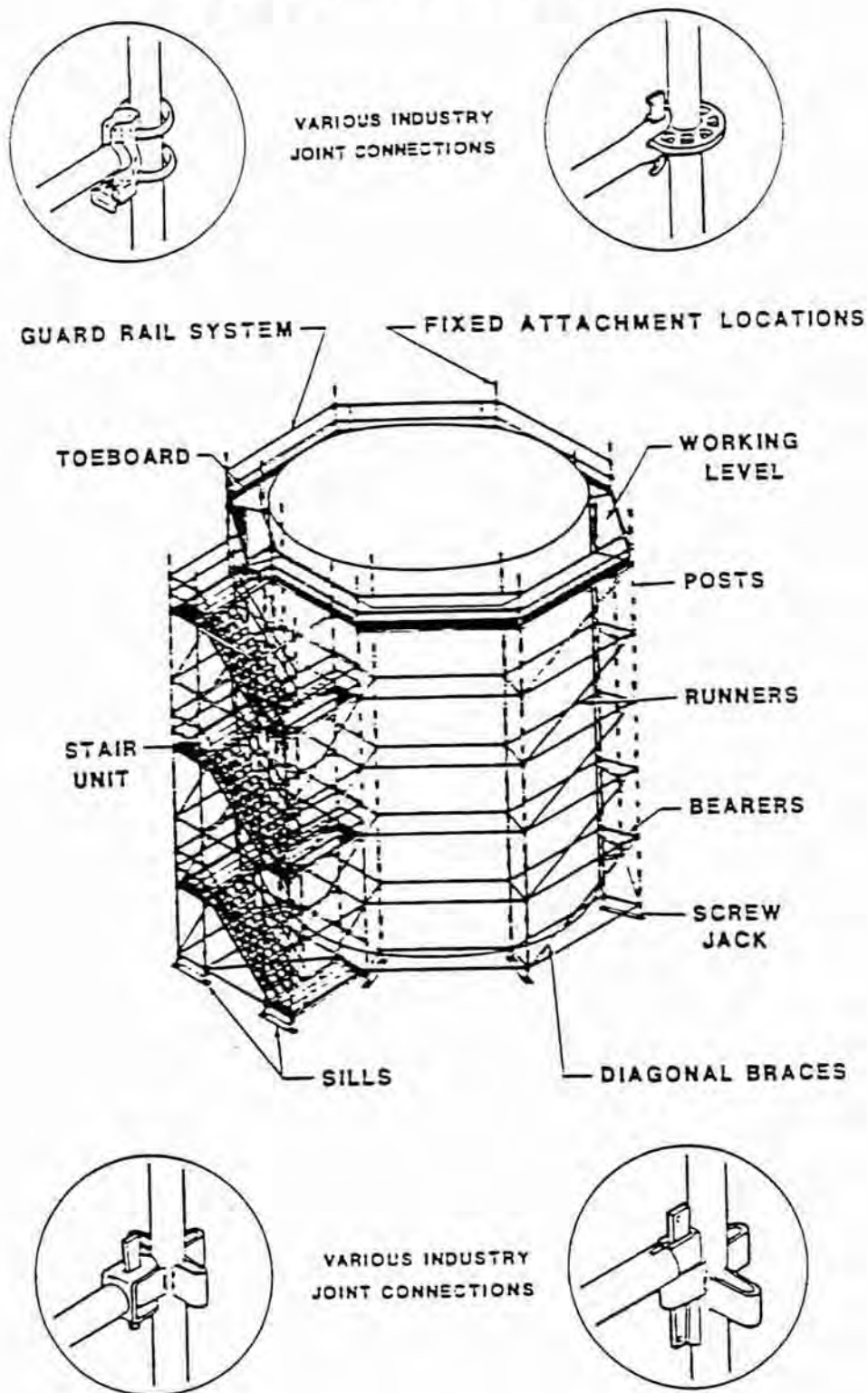
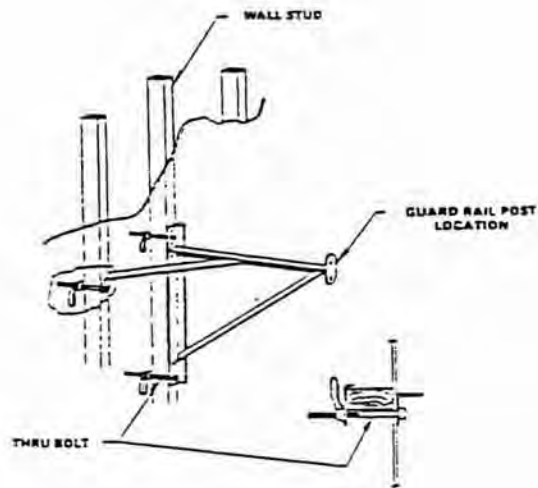


Figure 18
Typical Example of
Stationary Scaffold (system scaffold)

METAL CARPENTER BRACKET



PUMP JACK SCAFFOLD

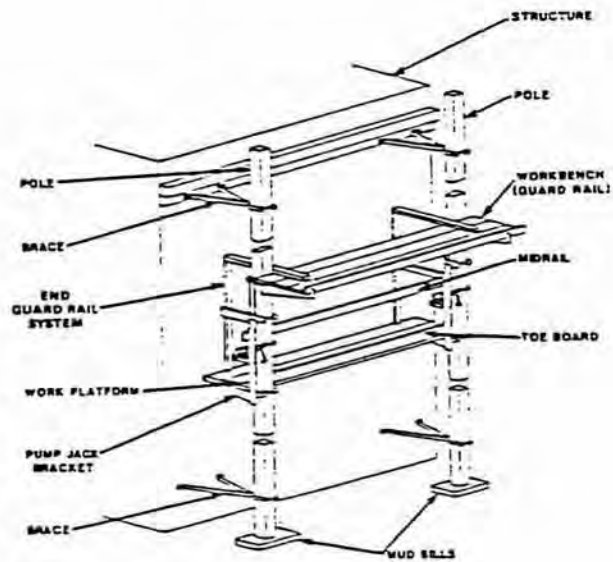
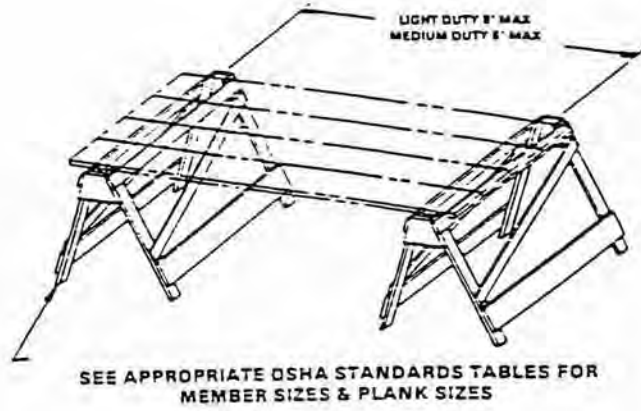


Figure 19
Typical Examples of
Other Stationary Scaffolds

HORSE SCAFFOLD



BRICKLAYERS' SQUARE SCAFFOLD

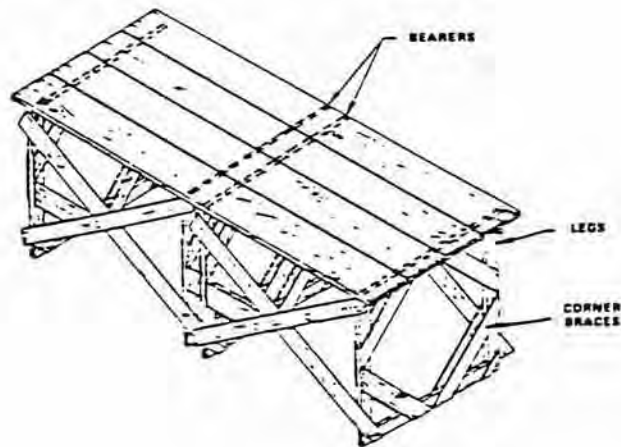


Figure 20
Typical Examples of
Other Stationary Scaffolds

ELEVATING PLATFORMS

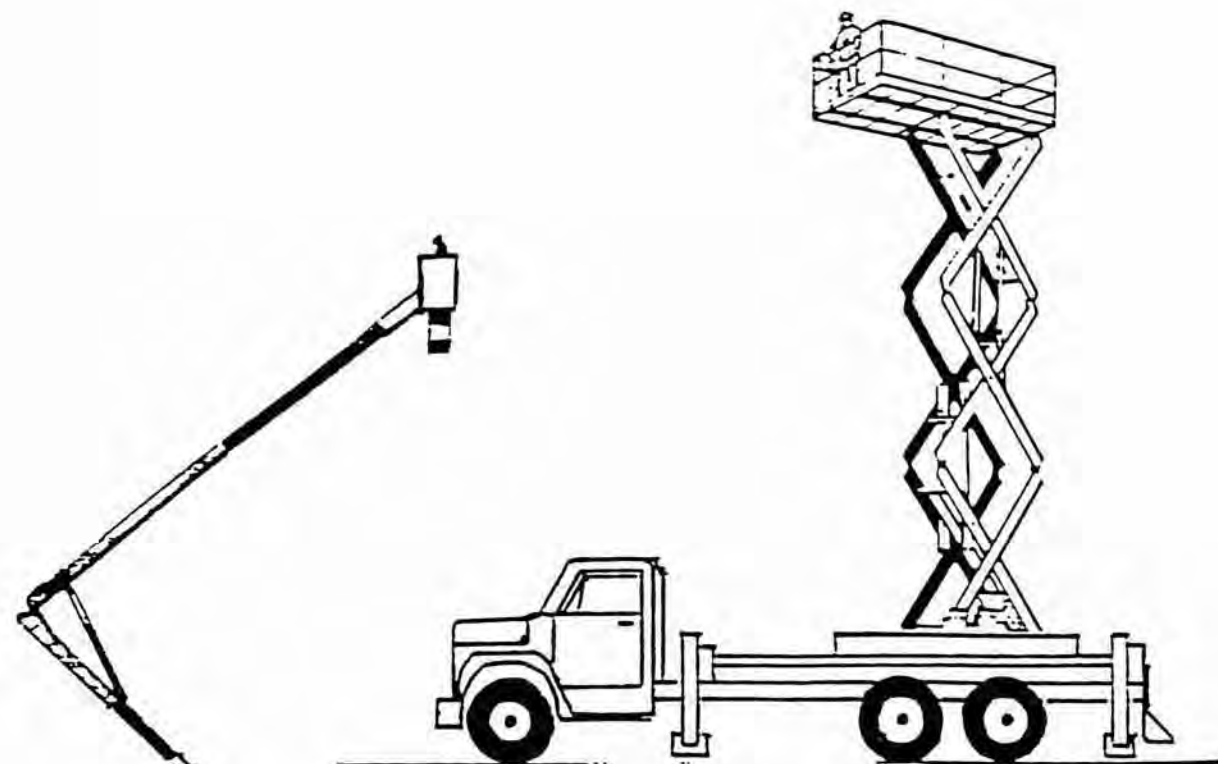
SAFE PRACTICES FOR THE OPERATION OF POWER ELEVATED MOBILE WORK PLATFORMS

GENERAL RULES

1. **Survey the jobsite:** A survey should be made of the jobsite for hazards such as untamped earth fills, ditches, debris, high tension wires, unguarded openings and hazardous conditions created by other trades. The machine should only be operated when on a firm and level base.
2. **Inspect all equipment before using:** Never use any equipment which has an obvious defect. Defective equipment must be repaired before using.
3. **NEVER USE EQUIPMENT FOR PURPOSES OR IN WAYS FOR WHICH IT WAS NOT INTENDED.**

OPERATING RULES

1. Read the manufacturer's operating instructions. Never exceed the manufacturer's recommended load. All accessories should be installed and used in accordance with the manufacturer's recommended procedures.
2. Perform the manufacturer's daily maintenance checks and make a visual inspection of the vehicle and surrounding area to be sure both are clear of other personnel and obstructions including overhead wires. Make sure that the platform or basket is securely attached to forks, booms, etc.
3. **Guardrails:** Do not use the equipment without guardrails. Do not stand on guardrails to gain extra reach. Do not use guardrails to carry materials unless they are designed for this purpose, and do not allow excessive overhang of materials when elevating the platform.
4. A safety harness with lanyard must be securely attached to an anchorage point on the boom, frame, basket or platform, **NOT TO GUARDRAILS.**
5. Do not lean out over the platform guardrail to perform work.
6. Do not use ladders or makeshift devices on the platforms to obtain greater heights.
7. All personnel should remain clear of pinch point and shear points while the equipment is in use. Do not climb up or down extendable or scissor arms.
8. Do not use the work platform as a "dead man" in performing work.
9. Do not operate equipment near electrical power lines.
10. Care should be taken to prevent ropes, electric cords, hoses, etc. from becoming entangled in the equipment when the platform is being elevated or when the equipment is being moved.
11. Do not alter equipment or override safety devices in any way.
12. If the equipment is to be stored or parked for an extended period of time, the wheels should be chocked.
13. Wheel chocks should be installed before using an aerial lift on an incline.



Vehicle-Mounted Aerial Platform
(Scissor Type)

Vehicle-Mounted Aerial Platform
with Telescoping and Rotating Boom

Figure 21
Typical Examples of
Vehicle-Mounted Elevating Platforms

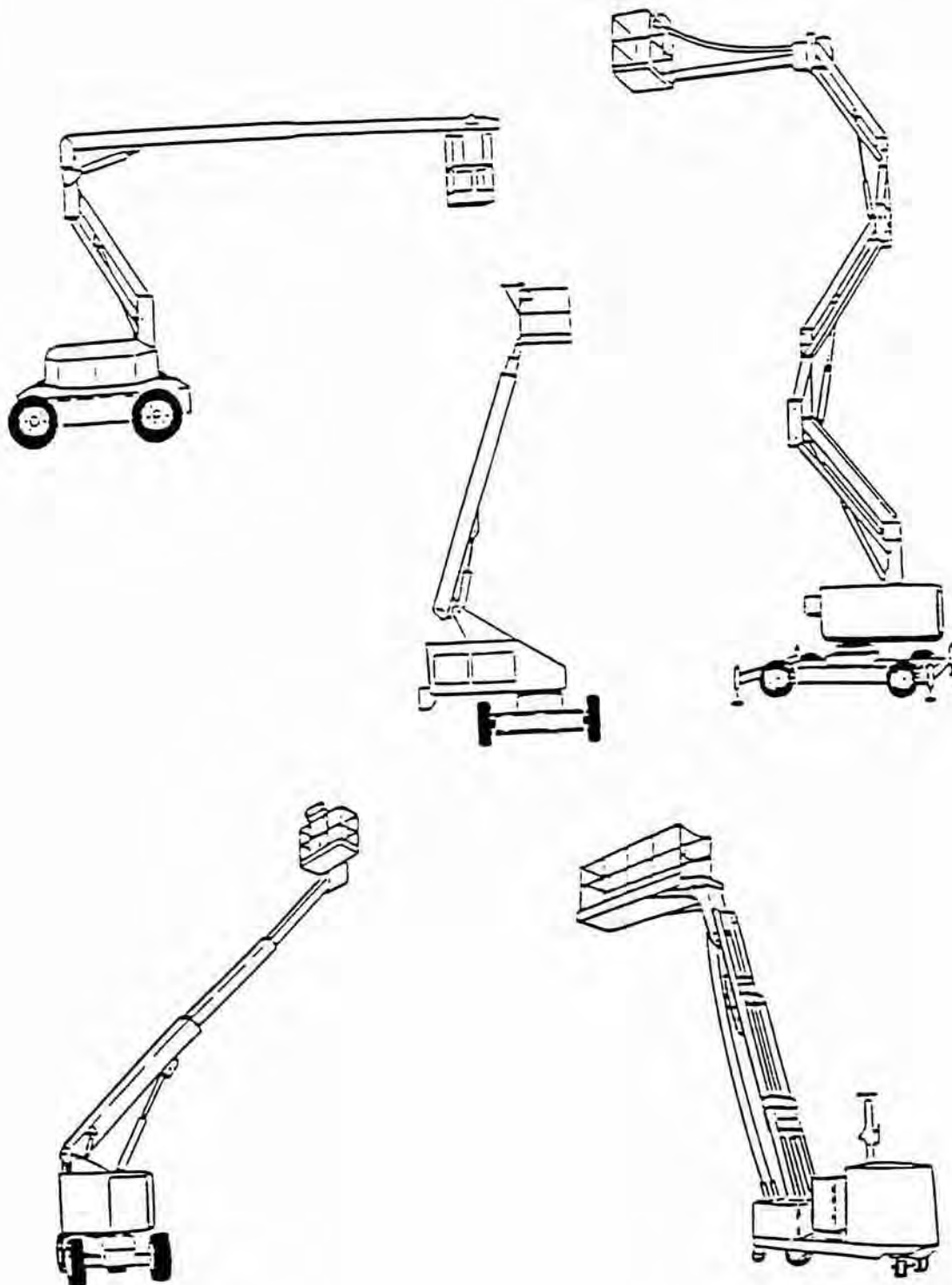


Figure 22
Typical Examples of
Boom-Supported Elevating Platforms

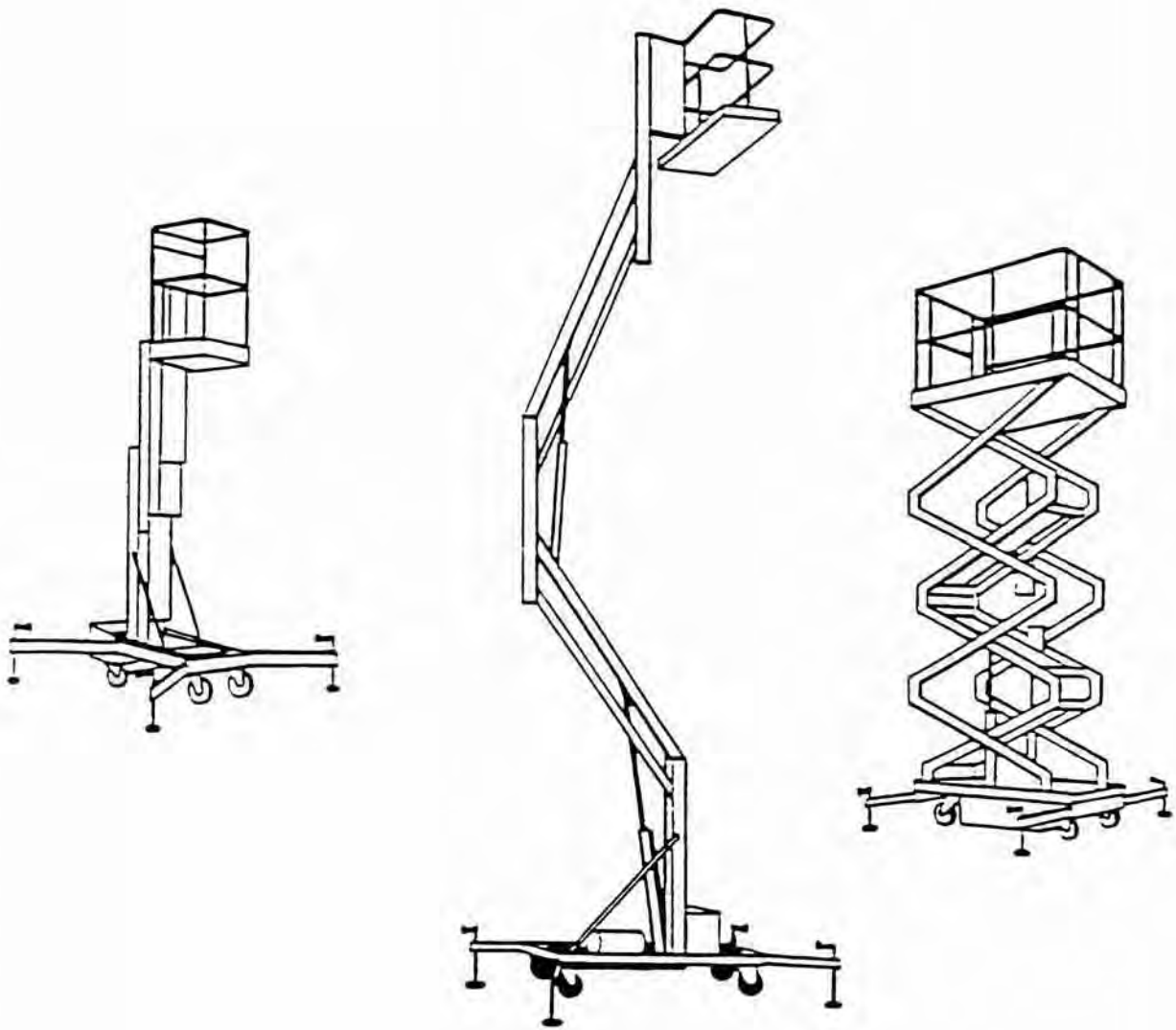


Figure 23
Typical Examples of
Manually-Propelled Elevating Platforms

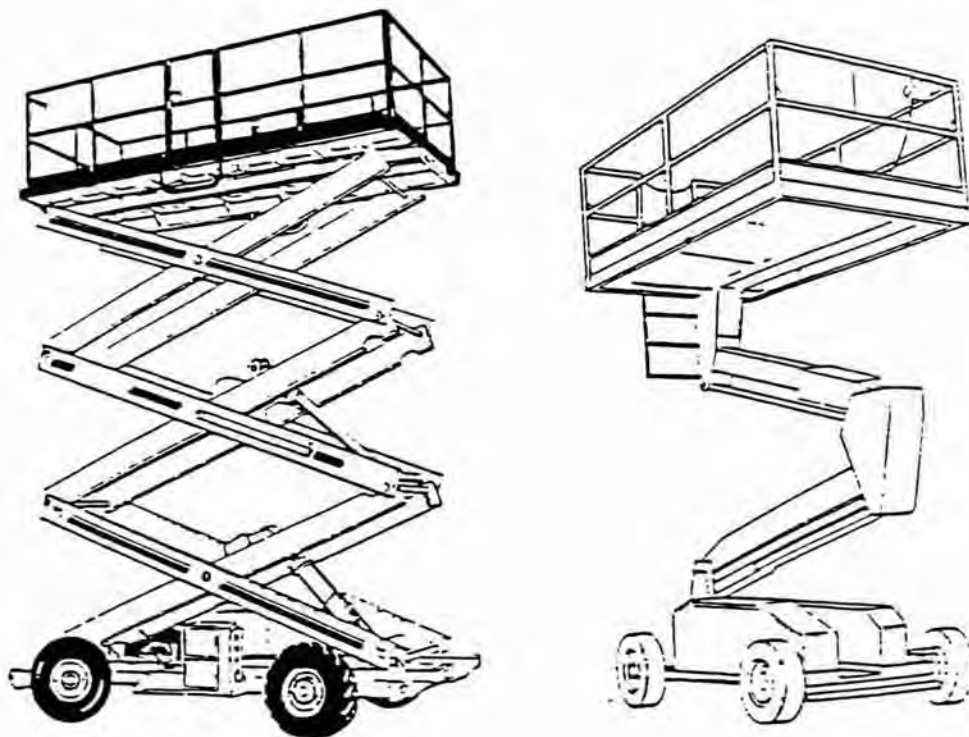
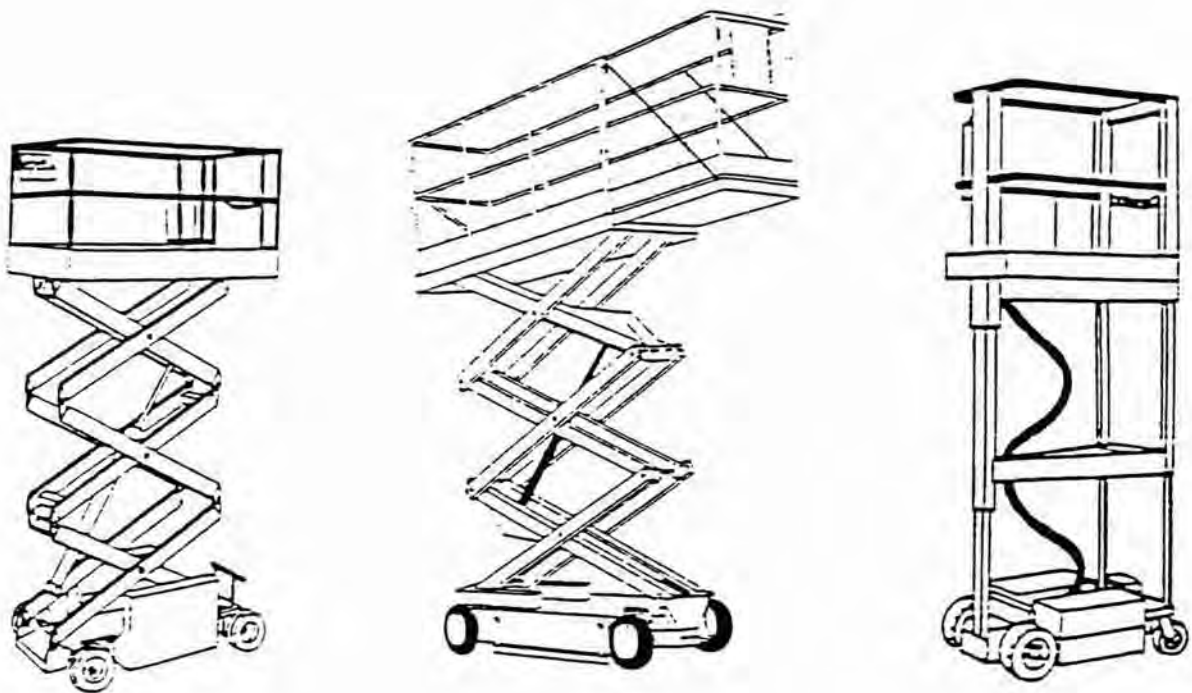


Figure 24
Typical Examples of
Self-Propelled Elevating Platforms

RAMPS

A ramp is an inclined surface between two different levels. It allows people or vehicles to move from one level to another.

1. When walking on a ramp, your center of balance may shift.
2. Ramps may have a different texture from the floors around them.
3. A ramp can be in one piece or it can be made up of two or more planks.
4. If a ramp has more than one plank, they should be firmly joined to keep them from coming apart.

TYPE-1 RAMPS

Type-1 ramps, or fixed ramps, are permanently secured to fixed landing surfaces at both ends.

1. Fixed ramps should not be steeper than 30 degrees from the horizontal.
2. If the ramp is steeper than 20 degrees or if there is a fall hazard or more than 4 feet, the ramp should be equipped with handrails.

TYPE-2 RAMPS

Type-2 ramps are portable or have at least one end that can change position. A good example is a bridging device used to reach the beds of trucks for easier loading or unloading from the truck bed to a raised platform. The Type-2 ramp should never be steeper than 30 degrees.

1. Caution must be used when positioning a Type-2 ramp and the vehicle supporting it.
2. Secure the ramp so that it cannot move.
3. Chock the wheels of the vehicle or vehicles supporting the ramp.
4. If the ramp cannot be secured, make sure it overlaps the supporting surfaces by at least 4 inches.

RAMP SAFETY

These safety rules should be followed with either type of ramp:

1. Use handrails on any ramp equipped with them.
2. Do not attempt to operate a vehicle (forklift) on a ramp which is not designed to support the weight of the vehicle, operator and the load.
3. Stay within your lane.
4. If there are no lane markings, vehicles and people should keep a safe distance apart.

THE LEADING EDGE

The leading edge is that portion of a roof, floor, formwork or other walking/working surface that poses a *fall hazard* where the worker is exposed to a position where an accidental fall may reasonably result in an injury.

If employees are required to work within this *danger zone*, one or more fall-arrest or fall-protection systems must be used. These systems include motion-stopping systems, warning lines or safety monitoring systems.

MOTION-STOPPING SYSTEMS

1. Guardrails

A standard guardrail should be constructed of a top rail, intermediate rail, toeboard and posts, and should have a vertical height of approximately 42 inches.

The top rail should be smooth-surfaced with a strength able to withstand 200 pounds of force applied in any direction at any point on the top rail with a minimum of deflection, i.e. 2 inches.

Guardrails are not intended or designed to support the employee while working. Do not lean or stand on guardrails.

Some guardrails have gates or removable sections to facilitate material handling. Make sure that gates are closed and removable sections are replaced when not in use.

2. Personal Fall Protection

This is a system which is designed to arrest an employee in a fall from working level. It consists of an anchorage point, connectors, a body harness and may include a lanyard, deceleration device, lifeline or a suitable combination of these components.

3. Safety Nets

Personnel nets can be used effectively in bridge construction or long-term structural projects. Nets can also be used where large open areas exist (floor openings), or where long leading edges expose workers to fall hazards.

Nets should be installed as close to the leading edge as possible, but no lower than 25 feet.

If the drop is 0 to 5 feet, the net should extend a minimum of 8 feet from the leading edge on a horizontal plane to the outer edge of the net. A drop of 5 to 10 feet requires an extension of 10 feet and from 10 to 25 feet an extension of 13 feet.

NOTE: Personal fall protection systems should be used when installing nets.

4. Scaffolds or Platforms

Scaffolds and platforms with guardrails can also be installed next to the leading edge to catch a worker who has lost their footing and gone over the leading edge. This system has the advantage of being sufficiently offset from the actual working area so as not to interfere with operations while providing protection.

WARNING LINE SYSTEM

A warning line is flagged cable, rope or chain between 34 and 39 inches high, stanchion mounted, and is set back 6 feet or more from the leading edge. Stanchions should be able to support 16 pound tipping force applied at 30 inches, and the line should be rated at a tensile strength of a minimum of 500 pounds.

When mechanical equipment is being used, the warning line should be erected not less than 6 feet from the leading edge which is parallel to the direction of equipment operation, and not less than 10 feet perpendicular to the direction of travel.

Each warning line should be flagged at no more than 6-foot intervals with high-visibility materials.

SAFETY MONITORING SYSTEM

This system requires that a *Competent Person* monitor the safety of all employees working near a leading edge, and warns them when it appears that they are unaware of a hazard if they are acting in an unsafe manner.

The safety monitor should be on the same working surface as and within visual sighting distance of the workers and should be close enough to verbally communicate with the workers.

A safety monitoring system is usable on working surfaces 50 feet or less in width where mechanical equipment is not being used or stored.

The safety monitor should not have any other responsibilities that could distract the monitor's attention.

The safety monitoring system has a number of problems of which everyone must be aware. Among these are that the monitor may become inattentive over an extended period of time, the monitor may become distracted, the monitor must be able to warn a worker while they still retain control over their balance and before they inadvertently step over the edge, and the warning must be heard by the worker over any background noise.

This system should only be used when absolutely necessary and for the shortest time possible.

This system must be used in conjunction with a fall protection plan.

FLOOR AND WALL OPENINGS

An opening means a gap or void 30 inches or more by 18 inches or more through which an employee can fall to a lower level.

An opening in a floor (walking/working) surface 6 feet or more above lower levels must be protected from an employee falling by use of a guardrail system, safety net system, or a cover.

When a cover is placed over a floor opening, the cover must be capable of supporting, without failure, at least twice the weight of employees, equipment, and other materials that may be imposed on the cover at any one time. All covers must be secured when installed so as to prevent accidental displacement by the wind, equipment, or employees. All covers must be color-coded or marked with the "opening", "DO NOT REMOVE" to provide warning of the hazard.

An opening in a wall where the outside bottom edge of the opening is 6 feet or more above lower levels and the inside bottom edge is less than 39 inches above the floor (walking/working) surface the opening must be protected from an employee falling by the use of a guardrail system, a safety net system, or a personal fall-arrest system.

PERSONNEL AND MATERIAL ELEVATORS

TOWERS

1. Use only experienced workers in the erection and taking down of towers. Construct tower of sound materials only and of ample strength to carry the intended loads.
2. Towers and all parts thereof should be regularly and frequently inspected, and a substantial ladder securely fastened should extend the entire height of the tower.
3. Platforms of ample size and strength with railings and toeboards should be built at each level where men work and the bottom of the tower should be screened or planked on all sides.
4. All platform hoists should be guarded at all floors with suitable gates two feet away from the opening.
5. Interior shafts or towers in which buckets or cages are operated should be barricaded so that no traffic is possible through them. At the basement level where the cage runs only occasionally, railings or gates and danger signs should be provided.

CAGES OR PLATFORMS

1. Platforms of elevators should be sufficient size so that wheelbarrow handles or other material will not project over the edge. Stop cleats should be nailed to the platform for wheelbarrows.
2. Platforms of elevators should be strongly built and have toeboards on the unused sides.
3. A roof of 2 inch planking should be constructed on the top of the cage to protect workers from falling objects.
4. Hoistway entrances of material hoists should be protected by substantial full width gates or bars.
5. Hoistway doors or gates of personnel hoists should not be less than 6 feet 6 inches high and be protected with the mechanical locks which cannot be operated from the landing side and are accessible only to persons in the car.

GENERAL

1. The employer should comply with the manufacturer's specifications and limitations.
2. Rated load capacities, recommended operating speeds and special hazard warnings or instructions should be posted on cars and platforms.
3. Inspect all cables frequently and report any that are worn, frayed or partially broken.

FALLING OBJECTS

One of the following measures must be implemented to reduce the potential of injury from falling objects:

1. A standard guardrail system with toeboards and screens should be erected to prevent objects from falling from higher levels; or
2. Erect a canopy structure and keep tools, equipment and materials far enough from the leading edge of the higher level so that these objects would not go over the edge if displaced; or
3. Barricade the area to which objects could fall, prohibit employees from entering the barricaded area, and keep objects that may fall far enough away from the leading edge of a higher level so that those objects would not go over the edge if they were accidentally displaced.

NOTE: Employees are required to wear a hard hat at all times in the work area. Form the habit of not walking below, next to and parallel to leading edges including scaffolds or platforms.

SPECIAL CONSIDERATIONS

Some trades such as roofing, overhand bricklaying and related work have special considerations.

ROOFING

Low slope roofs (4 to 12 or less in pitch): Each employee engaged in roofing activities on low slope roofs with unprotected sides and edges 6 feet (Federal), (10 feet for Washington State, 20 feet unless steeper than a 7/12 for California) or more above lower levels should be protected from falling by any motion-stopping system, warning line system, safety monitoring system or a combination thereof.

Steep roofs (any pitch greater than 4 to 12): Each employee on a steep roof with unprotected sides and edges 6 feet (Federal), (10 feet for Washington State 20 feet unless steeper than a 7/12 for California) or more above lower levels should be protected from falling by guardrail systems with toeboards, safety net systems, scaffolds or platforms, or personal fall-arrest systems.

OVERHAND BRICKLAYING

This refers to the process of laying bricks and masonry units such that the surface of the wall to be jointed is on the opposite side of the wall from the mason, requiring the mason to lean over the wall to complete the work. Related work includes mason-tending and electrical installation incorporated into the brick wall during the overhand bricklaying process.

Each employee performing overhand bricklaying and related work 6 feet or more above lower levels must be protected from falling by guardrail systems, safety net systems, personal fall-arrest systems or should work in a controlled access zone.

Employees reaching more than 10 inches below the level of the walking/working surface on which they are working should be protected from falling by a guardrail system, safety net or personal fall-arrest system.

Controlled Access Zone (CAZ) is an area in which certain work such as overhand bricklaying or precast concrete erection may take place without the use of guardrail systems, personal fall-arrest systems or safety net systems, and access to the zone is controlled.

GLOSSARY OF TERMS

Access:	Means of reaching a workstation, physically or mechanically.
Anchorage:	A secure point of attachment for lifelines, lanyards or deceleration devices.
Body Belt: (safety belt)	A strap with means both for securing it about the waist and for attaching it to a lanyard. To be used for positioning only.
Body Harness:	A design of straps that may be secured about the employee in a manner to distribute the fall arrest forces over at least the thighs, pelvis, waist, chest and shoulders, with means for attaching it to other components of a personal fall-arrest system.
Competent Person:	A person who is capable of identifying hazardous or dangerous conditions in the personal fall-arrest system or any competent thereof, as well as in their application and use with related equipment. The OSHA definition also requires that a competent person have the authority to take prompt corrective measures to eliminate hazards.
Connector:	A device that is used to couple (connect) parts of the system together. It may be an independent component of the system (such as a buckle or D-ring) sewn into a body belt or body harness or a snaphook spliced or sewn to lanyard of self-retracting lanyard.
Continuous Fall Protection:	The design and use of a fall protection system so that no exposure to an elevated fall hazard occurs. This may require more than one fall protection system or a combination of prevention or protection measures.
Danger:	Combination of hazard and risk that yields a qualitative measure of exposure of a person or system to harm, injury, damage or loss.
Dangerous Equipment:	Equipment (such as pickling or galvanizing tanks, degreasing units, machinery, electrical equipment and other units) which, as a result of form or function, may be hazardous to employees who fall onto or into such equipment.
Deceleration Device:	A mechanism such as a rope grab, retracing lifeline or shock absorbing lanyard that absorbs or dissipates energy during a fall arrest.
Elevated Fall:	An uncontrolled drop from one level to another.
Failure:	Load refusal, breakage or separation of component parts. Load refusal is the point where the ultimate strength is exceeded.
Fall Distance:	The distance from the location of a worker's support prior to a fall and the place where the worker comes to a complete stop.
Fall-Arrest System:	A tested device and components that function together as a system to arrest a free fall and minimize the potential for compounding injury.
Fall Hazard:	Any position from which an accidental fall may reasonably produce injury.

Fall Prevention:	Any same-level means used to reasonable prevent exposure to an elevated fall hazard. Floors, walls and guardrails are means of fall prevention.
Fall Protection:	What is done to effectively address fall hazards.
Guardrail:	A vertical barrier erected along exposed edges of a floor opening, wall opening, ramp, platform or runway to prevent the fall of persons.
Handrail:	A narrow rail for grasping with the hand for support. Also a bar or pipe supported on brackets from a wall or partition, as on a stairway or ramp, to furnish persons with a handhold in case of tripping.
Hole:	A gap or void 2 inches or more in its least dimension, in a floor, roof or other walking/working surface.
Ladder Climbing (Safety) Device:	A device or climbing sleeve connected to the front D-ring on the climber's full body harness that slides up and down a rigid rail or cable. Should a fall occur, the device is designed to lock by inertia or cam action to arrest the fall.
Ladder, Fixed:	A ladder that cannot be readily moved or carried because it is an integral part of the building or structure.
Ladder, Job-Built:	A ladder that is fabricated by employees, typically at a construction site. Job-built ladders can be of either a single or double cleat design with the latter offering a center rail to allow simultaneous two-way traffic ascending and descending to a specific access point.
Lanyard:	A flexible line of rope, wire rope or strap used to secure the harness to a deceleration device, lifeline or anchorage.
Lifeline:	A component consisting of a flexible line for connection to an anchorage at one end to hang vertically (vertical lifeline), or for connection to anchorages at both ends to stretch horizontally (horizontal lifeline), and which serves as a means for connecting other components of a personal fall-arrest system to the anchorage.
Opening:	A gap or void 30 inches or more high and 18 inches or more wide, in a wall or partition through which employees can fall to a lower level.
Personal Fall Protection System:	A system used to arrest an employee in a fall from a working level. It consists of an anchorage, connectors, body harness, and may include a lanyard, deceleration device, lifeline or a suitable combination of these components.
Shock Absorber:	A component of a fall protection system that dissipates energy by creating or extending the deceleration distance.

Snaphooks:

A connector comprised of a hook-shaped member with a normally closed keeper or similar arrangement which may be opened to permit the hook to receive an object and when released, automatically closes to retain the object. Snaphooks are generally one of two types: (1) the locking type with a self-closing, self locking keeper which remains closed until unlocked and pressed open for connection or disconnection, or (2) the non-locking type with a self-closing keeper which remains closed until pressed open for connection or disconnection. **NOTE:** The non-locking type is prohibited as part of a personal fall-arrest system.

Swing Fall:

A pendulum-like motion that can result from moving horizontally away from a fixed anchorage and falling. Swing falls generate the same amount of energy as a fall through the same distance vertically, but with the additional hazard of colliding with an obstruction or the ground.

Tie-Off:

To secure the end of lanyard to an anchorage point. **NOTE:** An anchorage point is sometimes referred to as a *tie-off point*.

EXCAVATION, TRENCHING AND SHORING POLICY AND PROCEDURE

1. **GENERAL:** An excavation, as defined by OSHA 29 CFR 1926.650, means any man-made cut, cavity, trench, or depression in an earth surface, formed by earth removal. All excavation work performed by R C Foster Corporation as the Contractor or Sub-Contractor, shall conform to the guidelines of this policy, the above referenced OSHA standards. If the client's procedures and policies meet or exceed this document, the client policy and procedures shall be used. **THIS POLICY AND PROCEDURE IS LIMITED TO EXCAVATIONS OF LESS THAN 20 FEET IN DEPTH. EXCAVATIONS THAT EXCEED 20 FEET REQUIRE SHORING SYSTEMS DESIGNED BY A QUALIFIED PROFESSIONAL ENGINEER.**

2. **DEFINITIONS:**

Accepted Engineering Practices are those requirements that are compatible with standards of practice required by a registered professional engineer.

Aluminum Hydraulic Shoring is a pre-engineered shoring system comprised aluminum hydraulic cylinders (cross braces) use in conjunction with vertical rails (uprights) or horizontal rails (whalers). The system is designed specifically to support the side walls of an excavation and prevent cave-ins.

Bell-Bottom Pier Hole is a type of shaft or footing excavation, the bottom is made larger than the cross section above to form a belled shape.

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

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

Competent Person is one who is capable of identifying existing and predictable hazards in the surroundings or working conditions which are unsanitary, hazardous or dangerous to employees. A Competent Person has the ability and authority to take prompt corrective measures to eliminate the previously mentioned conditions.

Cross Braces are 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.

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

Failure is the breakage, displacement or permanent deformation of a structural member or connection that would reduce its structural integrity and its support capabilities.

Hazardous atmosphere is an atmosphere that may be harmful, cause death, illness or injury by being explosive, poisonous, flammable, corrosive, oxidizing, irritating or toxic.

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

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

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

Registered Professional Engineer is a professional engineer registered in the state where the work is to be performed.

Sheeting are the members of a shoring system that retain the earth in position and are supported by other members of the shoring system.

Shield (Trench Box, Trench Shield) is a structure that is able to withstand the forces of a cave-in. Shields can be permanent structures that can be designed to be portable and moved along as the work progresses, pre-manufactured, or job built in accordance with 1926.652(c)(3).

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

Sloping (Sloping System) excavation to form sides of an excavation that are inclined away from the bottom of the excavation. The angle of incline required to prevent a cave-in varies with differences in factors such as the soil type, environmental conditions of exposure and application of surcharge loads.

Stable Rock is a solid mineral material that can be excavated with vertical sides and shall remain intact while exposed. (see the standard for methods of converting unstable rock to stable rock.)

Structural Ramp is a ramp made of steel or wood and usually used for vehicle access. Soil or rock ramps are not considered structural.

Support System is 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 are tables and charts approved by a registered professional engineer and used to design and construct a protective system.

Trenches are a narrow excavation, in relation to length, made below the surface of the ground. Generally, the depth is greater than the width, but the width of a trench measured at the bottom is not greater than 15 feet. If forms or other structures are installed or constructed in an excavation and reduce the dimension from the structure to the side to 15 feet or less the excavation is considered a trench.

Uprights are vertical members of a trench shoring system placed in contact with the earth and usually positioned so that individual members do not come in contact with each other. Uprights in contact with each other are sheeting.

Wales are 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.

Confined Space for the purpose of the excavation standard is defined as one:

- I. Having limited access and egress.
- II. Which could produce or contain a hazardous atmosphere.
- III. Is not designed for continuous human occupancy.
- IV. Is not deeper than 4 feet.

3. PRE-EXCAVATION CHECKS:

- A. Hidden obstructions or hazards may be identified by obtaining and checking site plans identifying underground pipes or utilities in the area of the excavation.
- B. Care should be used as these plans and records may not be up-to-date or accurate.
- C. Check the area for previously disturbed ground.
 - I. Excavations in previously disturbed ground may require additional bracing and shoring.
 - II. Previously disturbed ground near a new excavation may also require use of bracing and shoring in the new excavation.

4. SHORING USE: (Workers kneeling in a trench less than 5 feet can still be exposed to the hazards of cave-ins or hazardous environments.)

- A. All trenches over 5 feet in depth shall be shored, sloped, or shield provided to protect workers.
- B. Excavations shallower than 5 feet shall also be sloped or shored if they are in unstable soil.
- C. The depth of an excavation shall be measured at its greatest vertical dimension.
- D. Spoil piles, located close to the edge of an excavation shall affect the vertical depth.

5. SLOPING: There are three methods of sloping a trench to protect workers.

- A. **Sloping** is cutting back the trench walls to the proper angle of repose. (Refer to Table B-1 of 29 CFR 1926 subpart F)
- B. **Angles of repose** are dependent upon soil classification, water condition, previous soil disturbances, etc.
 - I. The proper angle should be independently determined by a competent person for each site and if conditions require, each trench at the same site.
 - II. Where the excavation has water conditions, silty material, loose boulders, and areas where erosion, deep frost action, and slide planes appear, the angle of repose shall be flattened.

6. SHORING OF THE TRENCHES: Trench shoring is installed to resist or replace the force on the excavation face.

- A. **Shoring of a trench** may be accomplished with the use of wood timbers, screw jacks, hydraulic rams or combinations of all of these methods.
- B. **Timbers** shall be in sound condition and free of major defects. They shall be equal to the grade size specified. Workers shall be alert for the warning signs of splintering or separating wood fibers. **FAILURE OF THE SHORING IS EMINENT WHEN THESE SIGNS ARE DETECTED AND WORKERS MUST EVACUATE THE EXCAVATION.**
- C. **Steel shoring** components provide little warning before failure and workers shall check and be alert for bent or damaged members.
- D. **Pressure Gauges**, cylinders and rails shall all be in good condition if hydraulic shoring is used. Signs of fluid leakage shall be detected and repaired.

7. TRENCH SHORING METHODS: The type of shoring to be use is determined by the soil type and soil conditions. Ground water and water intrusion can weaken the soil face and add weight, adding additional force on the shores. If the excavation is below the water line, the shoring should be driven below the bottom of the surface of the trench to prevent undermining.

A. **Tight sheeting** shall be provided where seepage occurs. The excavation should be kept dry 24 hours per day to avoid the possibility of saturation and possible failure of the excavation wall.

B. **Shoring in Hard Compact Soil** is commonly accomplished by open sheeting or "skip shoring".

I. Struts shall be placed in a true horizontal position and square to the sides of the trench at a maximum vertical spacing not to exceed OSHA 29 CFR 1926 Subpart B Tables C1.1-C1.3, C2.1-C2.3, D1.1-D1.3 or the manufacturers tabulated data.

II. The ends shall be secured to prevent slippage or kickouts.

III. The lateral spacing between struts shall no exceed OSHA Tables C1.1 to C1.3, C2.1-C2.3, D1.1-D1.3 or manufactures tabulated data or a professional engineer's specification.

IV. Struts shall be inspected daily for movement or decreased bearing pressure. Repairs, replacement or reinstatement shall be accomplished before workers are allowed into the excavation OR around the upper edges.

C. **Shoring in loose unstable soil** can be considerably greater than is stable soil, due to the pressure exerted on shoring.

I. Increased strut size and or decreased strut spacing is required.

II. Very Loose soil shall require closed sheeting with tight edge-to-edge contact.

III. Wood or locking steel sheeting may be used when joints shall be watertight.

8. MANDATORY SHORING PROTECTION:

A. All workers working in a trench with a depth that exceeds 5 feet shall be protected by a shoring system or shield.

B. The placement of shores shall be accomplished prior to any worker entering the trench.

C. All shoring systems used in an excavation below 20 feet in depth shall be designed by a registered professional engineer.

D. In trenches or excavations where a hazardous condition may exist, the space shall be treated as a permit required confined space and confined space requirements shall be followed.

E. All workers in the excavation or trench shall be provided with personal protective equipment as specified in this manual, OSHA and client standards.

9. INSTALLATION OF SHORING SYSTEMS: All installation should be in a top down method.

A. Struts shall be in a true horizontal position with the ends secured to prevent slippage or sliding.

B. The uppermost shores shall be placed first.

C. If possible, the workers should not be in the trench when the shores are lowered.

D. To prevent slough off and greater risk of cave-in, the shoring work should follow the trenching and excavation work as closely as possible.

10. REMOVAL OF SHORING SYSTEMS: Removal of shoring should be in a bottom to up method. Hydraulic shoring, however, may be removed from above.

- A. Workers removing shoring shall remain in a protected zone.
- B. Premature removal of shoring shall expose workers to an unnecessary hazard.
- C. Timber or steel jacks are usually removed while inside the trench.
- D. Before removal, some force shall replace the force exerted by the shores against the trench face., e.g., bottom and intermediate struts should not be removed until they have been effectively replaced by backfill.

11. HAZARDS AFFECTING TRENCH SAFETY:

- A. Weather conditions can affect the water content of the soil through excess water from rain or melting ice and snow. Water can liquefy firm soil and increase pressure on the shores.
- B. Freezing of the ground and quick thaw can undermine a shoring system and cause failure.
- C. Soils can change properties from exposure to the air. Air exposure can turn hard, solid soil to soft, slippery soil.
- D. Vibrations from machinery, roadways, railroad tracks, explosives, flares, etc., shall cause increased loads on a shoring system and extra sheeting and shoring may be needed.
- E. The location of the Spoil Bank may also affect the pressure on a shoring. **Spoil Piles should be kept no closer than 2 feet from the trench and distances increased when site conditions warrant.**
- F. The edges of all open trenches shall be protected. Barricades shall be erected to prevent accidental entry, and if possible, bumpers should be provided to prevent equipment from falling into the excavation.
- G. All tools, equipment and supplies shall be kept back from the excavation edge to prevent accidental slippage into the site.
- H. Hydrocarbon vapors are heavier than air. In locations where hydrocarbon vapors may be present, atmospheric monitoring and confined space procedure are required.
- I. All welding and cutting torches shall be shut down at the source when workers depart the excavation or trench.

12. EXCAVATION EQUIPMENT:

- A. Excavation equipment shall be operated by trained and qualified personnel only.
- B. Workers in the excavation shall not place themselves below a load being lifted overhead.
- C. Equipment shall be shut down when the operator dismounts the equipment.
- D. Refueling of equipment shall not take place in the immediate vicinity of the site.
- E. A knowledgeable signal person shall be in place when equipment operators cannot see the bottom of the excavation.

13. DAILY INSPECTIONS OF THE EXCAVATION AND SHORING:

- A. Daily inspections of the excavation and shoring equipment shall be made by a competent person and documented.
- B. Should an unsafe condition be discovered, work shall stop immediately in the affected area and corrective action taken.
- C. Inspections shall also be accomplished after rainstorms, snowstorms or any other occurrence which may alter the condition and hazard of the site.

14. COMPETENT PERSONS: The Contractor is responsible for the designation of a Competent Person at excavation sites. R C Foster Corporation reserves the right to review the qualifications of any client or Sub-Contractor furnished Competent Person.

15. ACCESS AND EGRESS: A means of access and egress (usually ladders) shall be provided within 25 feet of every worker.

- A. Ladders shall be in good condition, extend 3 feet over the top of the trench and be secured in such a manner as to prevent movement while in use.
- B. Access and egress shall be provided for all excavations in excess of 4 feet in depth.
- C. Walkways, runways and sidewalks shall be kept clear of excavated material or other obstructions.
- D. No sidewalk, ramp walkway, etc, shall be undermined unless properly shored.

CHECKLIST FOR TRENCH/EXCAVATION

(SHAFT/EARTHWORK 5 FEET OR MORE IN DEPTH)

1. Obtain permit from the Division of Occupational Safety and Health District Office (DOSH).
2. The permit must be available for inspection at the jobsite.
3. Job notification must be given to the nearest District Office of DOSH prior to digging.
4. Determine and locate underground utilities by calling 1-800-422-4133 (USA) and company must be notified within 48 hours.
5. A Qualified Person must supervise the trench or excavation at all times.
6. Remove trees, poles, boulders, and similar objects that may be hazardous to workers.
7. The Qualified Person shall assess the job site from possible moving ground, also after rainstorm, earthquake, or other events prior to the employees' exposure to the excavation.
8. Workers shall be protected by shoring, sloping, benching, casing or other equivalent alternative methods. Protective devices or materials which are utilized shall conform with the type of soil present at the jobsite. (see T-8 CCR 1540-1547).
9. Spoils/dirt shall be kept 2 feet from the edge of the trench/excavation. Check for cracked and sloughing around and above the excavation area. 1540 (e)(1).
10. Provide a convenient way for workers to enter and leave the excavation, ladders shall be a minimum 25 feet from one another. 1540 (g)(1).
11. If crossing is placed above trench/excavation, a standard guardrail shall be installed when the depth of the excavation is 7 ½ feet or more.
12. Do not excavate beneath the base of an adjacent foundation, retaining wall or other structure so as to undermine such structure. Support undermined sidewalk and adjoining structures if these conditions exist.
13. Do not use an existing wall or structure as a retaining wall until it will safely support the expected load. This must be determined by the qualified personnel.
14. Protective barrier, barricade, caution sign shall be provided at the excavation on remote area, or area where the employee works so they may not fall into the excavation.
15. Backfill temporary well, pits, and shafts immediately upon completion of the operation.
16. Shoring and sloping shall comply with the State of California Code of Regulations. The shoring design of an excavation/trench with a depth of 20 feet or more shall be prepared by a Registered Civil Engineer in the State of California.
17. Employees shall wear an appropriate type of steel-toed boots or shoes at the jobsite.
18. Hard hats shall be worn at the construction site.
19. Ladders/ramps used as access in the excavation shall be free of defects.
20. Employer shall read, understand and follow the Construction Safety Orders, Rules and Regulations prescribed by Title 8 California Code of Regulations.

“CODE OF SAFE PRACTICES FOR TRENCH/EXCAVATION/SHAFT”

1. Obtain permit from the Division of Occupational Safety and Health District office if the depth is 5 feet or deeper.
2. A copy of the permit must be available at the jobsite.
3. Job notification must be given to the nearest District Office of DOSH prior to digging (for annual permit holder).
4. Determine and locate underground utilities by calling (USA) 1-800-422-4133 within 48 hours.
5. A Competent Person must supervise the trench/excavation/shaft at all times.
6. Remove trees, poles, boulders and/or similar objects that may be hazardous to the employees.
7. The Competent Person shall assess the job site from possible moving ground, also after rainstorm, earthquake, or other events prior to the employees' exposure to the trench/excavation/shaft.
8. Workers shall be protected by shoring, sloping, benching, casing or other equivalent alternative methods. Protective devices or materials that are utilized shall conform with the type of soil present at the jobsite.
9. Spoil/dirt shall be kept 2 feet from the edge of the trench/excavation. Check for cracks and sloughing around and above the excavation area.
10. Provide a convenient way for workers to enter and leave the trench/excavation. A ladder, ramp or other safe means of egress shall be in trench/excavations that are 4 feet or deeper so as to require no more than 25 feet of lateral travel for employees.
11. Where employees or equipment are required or permitted to cross over excavation deeper than 6 feet and wider than 30 inches, walkways or bridges with standard guardrails shall be provided.
12. Do not excavate beneath the base of an adjacent foundation, retaining wall or other structure so as to undermine such structure. Support undermined sidewalk and adjoining structures if these conditions exist.
13. Do not use an existing wall or structure as a retaining wall until it will safely support the expected load. This must be determined by a Competent Person.
14. Protective barriers, barricades, and/or caution signs shall be provided at the trench/excavation in remote area, or area where the employee could fall into the trench/excavation.
15. Backfill temporary wells, pits, and shafts immediately upon completion of the operation.
16. Shoring, sloping, benching or any other equivalent protective method shall comply with Title 8, California Code of Regulations. The protective method shall be designed by a Registered Civil Engineer in the State of California, if the trench/excavation is deeper than 20 feet.
17. Employees shall wear an appropriate type of safety shoes/work boots at the jobsite. (Big NO for tennis shoes at the jobsite.)
18. Head protection shall be provided at the construction site.
19. Ladders/ramps used as an access to the trench/excavation/shaft shall be free of any defects.
20. Employer shall read, understand and comply with the Construction Safety Orders, Rules and Regulations prescribed by Title 8, California Code of Regulations.

R C FOSTER CORPORATION

Assured Grounding Conductor Program

Title 8 2405.4 and CFR1926.4000

Scope:

The Assured Grounding Conductor Program is to be implemented on all construction sites covering all 120-volt, AC, single-phase, cord sets, and receptacles that are not a part of permanent wiring. Exception: This program will not be required on any construction site where ground fault circuit interrupters are in use with all 120-volt, AC, Single-phase, 15 and 20-ampere that are not a part of permanent wiring.

Purpose:

To avoid injury due to electrical hazards.

Implementation:

The qualified person responsible for the Assured Grounding Conductor program is Cathy Fernandez.

Guidelines for inspection program:

- A. Maintain a copy of the inspections for cords, equipment and receptacles at both R C Foster Corporation's office and the construction site.
- B. Inspect all cords, receptacles, and equipment for damage prior to use each day.
- C. Tagout on any damaged equipment, cords or receptacles that are defective with a red tag that is signed. Label "DANGER DO NOT USE" and remove from site back to R C Foster Corporation's yard.
- D. Equipment, cords, and receptacles shall be tested upon initial use, after repair, after any incident were it is reasonable to think damage may have occurred and every 90 days.
- E. Indicate the equipment, cords and the receptacles that have been tested by a color tagging system.
 1. Winter - blue tape (January, February, March).
 2. Spring - green tape (April, May, June).
 3. Summer - red tape (July, August, September).
 4. Fall - yellow tape (October, November, December).

Criteria for Inspections:

1. Visual inspection for damage.
2. An approved continuity tester.
3. Electrically continuous.
4. Each receptacle and attachment cap or plug shall be tested for correct attachment of the equipment grounding conductor. The equipment grounding conductor shall be connected to its proper terminal.

Exception: Double insulated tools or other similar equipment are not required to be grounded.

Logging Inspections:

1. Date inspected.
2. Item inspected - identify equipment, cords, and receptacles by number (use serial # if applicable).
3. Result of test (pass/fail/discarded).
4. Color code tape applied.
5. Name of person who conducted test.

Log Form:

1. Program log available in the office and in the field for affected employees.

WELDING AND CUTTING SAFETY PROCEDURES

The greatest hazard of welding and burning operations is the possibility of eye injuries. Ultra-violet radiation is generated during these operations. After exposure to excessive ultra-violet radiation, eyes may develop sharp pains and/or become red and irritated. Without proper protection, it is possible to damage eyes permanently.

The following are recommended shades of lenses for various welding and burning operations:

<u>OPERATION</u>	<u>SHADE NUMBER</u>
Soldering	2
Torch Brazing	3 or 4
Light Cutting up to one inch	3 or 4
Medium Cutting, one to six inches	4 or 5
Heavy Cutting, six inches and over	5 or 6
Gas Welding (light) up to 1/8 inch	4 or 5
Gas Welding (medium) up to 1/8 to 1/2 inch	5 or 6
Gas Welding (heavy) 1/2 inch and over	6 or 8
Shielded Metal-Arc Welding, 1/16 to 5/32 inch electrodes	10
Inert-Gas Metal-Arc Welding (non-ferrous) 1/16 to 5/32 inch electrodes	11
Inert-Gas Metal-Arc Welding (ferrous) 1/16 to 5/32 inch electrodes	12
Shielded Metal-Arc Welding 3/16 to 1/4 inch electrodes	12
Shielded Metal-Arc Welding 5/16 to 3/8 electrodes	14
Carbon-Arc Welding	14

It must be remembered that some plated and/or painted metals can give off harmful fumes or vapors when subjected to the high temperatures of welding or burning. These fumes or vapors could cause a health problem if breathed for too long. Welding and burning should be performed in a well-ventilated area or if working outside, position yourself "up-wind" from the point of operation. Respiratory Protection may be required - ask your Supervisor if you have any questions.

When chipping slag, be sure to wear eye protection!

In all welding and burning operations be sure the necessary fire protection and measures are taken.

Do not store oxygen and acetylene bottles in the same area and protect them from physical damage.

Specialists in welding and cutting must not only protect themselves from injury but must also assume a certain responsibility for their helper, their co-worker in other trades, and in some instances, the public. Accident records indicate that others near arc welding operations are injured more often than the operator.

Also, there is the ever-present chance of fire. Fires caused from welding and cutting cost hundreds of thousands of dollars annually. You just can't substitute oxygen for air to produce artificial ventilation. Air is usually supplied by a forced draft to all such operations.

There is no good reason at all for taking a chance by welding or cutting in a confined area that does not have proper ventilation. Remember that oxygen does not burn, but it does support combustion. Do proper testing of atmosphere in confined space areas.

Responsibility for safety in welding and cutting goes all the way up and down the line from Superintendent, Foreman and Operator. Everyone concerned should do their share in making these operations safe.

Accident records indicate that certain conditions and acts caused most cutting and welding accidents. Precautions for preventing welding and cutting accidents are:

1. Before you start to weld or cut in confined spaces, be sure there is proper ventilation. Follow all confined space requirements.
2. Keep a proper type fire extinguisher within reach at all times.
3. Use only a wrench of the proper size on cylinder apparatus and keep all connections right.
4. Keep oil away from oxygen valves.
5. Inspect all work areas and place required shields and welding blankets before welding or cutting; see that there are no explosives, dangerous gases or flammable materials nearby.
6. Never stand on wet floors or touch other ground when changing electrodes.
7. Don't allow anyone to stand too near the work or stare at the arc.
8. Keep your job area clean. Get rid of rubbish.
9. Be sure that floor gratings are covered with no cracks through which sparks can drop to lower levels.
10. Whenever possible, do your work out-of-doors.
11. Take extra precautions and use the proper respirator when working on or around metals like lead and cadmium that give off highly dangerous fumes. Follow all respiratory requirements.
12. See that your helper is as well equipped as you are.
13. Don't start work in an area that is full of dust.
14. Inspect your equipment before you start work.
15. Have only qualified persons repair or adjust equipment.
16. Oxygen and acetylene bottles should be secured at all times.
17. Request a fire watch if a burning hazard exists.

18. All parts of the body should be protected from radiant energy, sparks, and molten metal splashes. Clothing made from wool, or wool blends, is generally better than cotton. Some cutting operation such as inert-gas metal arc welding will cause exposed cotton clothing to rapidly deteriorate. Leather capes, jackets, leggings, and aprons provide additional protection especially in vertical, overhead operations. Use of dark clothing will help reduce reflected light.

Perhaps one of the most important things for you to remember as an operator is that you can't expect others to follow safe practices unless you set the example. All safety infractions are subject to written violations and/or termination.

Accidents resulting from cutting and welding are preventable. Most of them can be eliminated by inspection of an area before starting to work and using properly maintained equipment and proper training.



**New Cal/OSHA Permit Requirements affect GC's and Subs.
October 31, 2006**

Sam Iler

SafeCon Consulting Group Inc., AGC San Diego Safety Director.

To: All AGC San Diego Members,

A new regulation recently passed by the Cal/OSHA Standards Board becomes effective TODAY! The Division of Occupational Health and Safety - DOSH (Cal/OSHA) is tasked with the enforcement of this new regulation, and in a public statement says it will be immediately enforceable!

Reality Check - The internal training that is required for Cal/OSHA to actually enforce the new regulation will not take place until mid November, so the reality is that enforcement will not take place until shortly after that date. In addition, AGC SD and many others attended meetings last Friday at which the final details on enforcement policies were still being worked out, so no one was ready on the effective date, not even OSHA!!

This new regulation affects all **General Contractors, CM's, Owners, and Subcontractors (including several new classes of subcontractors)** performing structural work on buildings or structures 3 stories or 36 feet in height.

The first group (**General Contractors, CM's, Owners**) now classified as **Project Administrators**, (those who manage and control the project - see definition below) need to pull a **Project Permit** much like in the past. These permits are required on all projects that meet the height criteria, and once pulled are valid for the duration of the project. Only one is needed per project and must be in place prior to pouring footings.

Subcontractors that perform structural type work on projects 3 stories or 36 feet in height are now required to pull an annual permit, and then submit activity notifications to Cal/OSHA on each project that meets the height criteria. A list of the types of work, that when performed by subcontractors at or above the height requirement, are required to have annual permits is listed below.

Subcontractors (if working in the trades listed) are urged to apply immediately for their annual permit, as the act of submitting and application will forestall enforcement activity until near the end of the year. (See reality check above)

Project Administrators (General Contractors, CM's, Owners) are required to pull Project Permits and are urged to required affected subcontractors to supply them with copies of their annuals (or applications) starting November 1st, in order to avoid any possible enforcement action. (See reality check above)

Definitions:

Project Administrator: means a person or entity that has overall onsite responsibility for the planning, quality, management, or completion of a project involving the erection or demolition of a structure. Examples of Project Administrators include, without limitation, general contractors, prime contractors, owner/builders, joint ventures, and construction managers.

Structure: means any creation by human activity of a piece of work, formation, or series of parts joined together, including but not necessarily limited to the following:

Billboards	False work	Tanks or tank towers
Bridges	Outdoor signs	Transmission or communications towers
Buildings	Powerhouses	
Chimneys	Scaffolding	
Dams	Silos	
Elevated highways	Smokestacks	

Project Permits are required for:

Project Administrators (General Contractors, CM's, Owners)

Demolition or dismantling of any building or structure more than 36 feet in height;
(project administrator and project permit)

For a site where any or all of the following activities will take place on a structure that will be 36 feet in height or greater:

- Steel Erection or Placement including structural members made of other materials than steel (Rebar placement is exempted)
- Metal decking
- Concrete structures and concrete decks on steel structures
- Structural wood framing including roof framing and panelized roof systems
- Installation of curtain walls, precast panels or fascia

Annual Permits are required for:

Subcontractors (in the following trades) **These are new requirements**

All of the following activities for those subcontractors who perform these trade tasks on structures 36 feet in height and higher: (Project Administrators pulling Project Permits may add these activities to the Project Permit)

- Structural Steel Placement
- Metal Deck Placement
- Concrete Placement
- Precast Panel Installation
- Curtain wall or fascia installation
- Concrete Tilt-up

Annual or Project Permits **This part did not change**

Contractors who perform the following tasks may obtain **either** annual or project specific permits. (Project Administrators pulling Project Permits may add these activities to the Project Permit)

- Construction of trenches deeper than 5 feet into which any person is required to descend
- Erection and placement of scaffolding, vertical shoring or false work intended to be more than 36 feet in height

***Note: All annual permits require an activity notification on all permitted projects**

***Note: For multiple prime contracts, the owner or CM would pull the Project Permit, and the appropriate subcontractors would provide annuals with activity notifications.**

Permit Applications and Costs (these costs will go up in the next year)

Project Permit / Annual Permit

Project permits will cost \$50. An annual permit will cost \$100.

The application form (used for both types of permits) is also attached along with the activity notification form for subcontractors. Forms are also available on the Cal OSHA Web Site (<http://www.dir.ca.gov/DOSHPol/forms/cosh41-1.pdf>) and at District Offices.

In addition, the website provides a checklist of items to bring into the Cal/OSHA office to obtain each kind of permit. It is highly recommended that you use the checklist to ensure the completeness of your presentation to OSHA and to avoid delays in receiving your permit. Renewals are done by mail.

The Cal/OSHA San Diego District Office covering San Diego and Imperial County is located at:

7575 Metropolitan Drive,
Ste. 207,
San Diego 92108
(619) 767-2280
fax (619) 767-2299

For additional information or questions please contact the AGC, or Sam Iler Directly at Sam@SafeCon.net .

Special Thanks to Bob Downey and Woodruff-Sawyer and Company for contributions to this bulletin.

PERMIT APPLICATION FORM

Buildings Structures Scaffolding Falsework Demolition Trenches Excavations

Sections 6500, 6501 and 6502 of the California Labor Code require that certain activities, which by their nature involve substantial risk of injury, may not be performed without a permit issued by DOSH. The Labor Code requires that the applicant supply, and that the Division review, information necessary to evaluate the safety of the workplace subject to permit requirements. A permit will not be issued until evidence has been demonstrated that the place of employment will be safe and healthful.

Employer: _____	Employers' Rep.: _____
Address: _____	Title & Phone No.: _____
_____	State Contractor's License No.: _____
Phone: _____	Fax: _____

Check Applicable Items:

Applicant is:

_____ General Building Contractor

_____ General Engineering Contractor

_____ Specialty Contractor

_____ Other

Type _____

Applicant refers to contractor or knowledgeable representative in a position of authority and responsibility for the activity covered by this permit.

Type of Permit Sought:

_____ Annual

_____ Single Project

_____ Temporary Permit (Plan Check Only)

_____ Multiple Project (if projects covered are similar in all important aspects, work is performed by the same employer and information concerning each project is provided)

For:

_____ Construction of: _____ Building

_____ Structure

_____ Scaffolding, Falsework and/or Vertical Shoring

_____ Demolition of: _____ Building

_____ Structure

_____ Trench and/or Excavation

Any permit based on this application is issued with the understanding that the applicant has knowledge of occupational safety and health orders applicable to the project(s) described in the application and attachments and that the applicant and supervising personnel will take special care to ensure compliance with safety orders reviewed with the applicant by the Division in the application process.

Issuance of the permit is also conditioned upon the following:

- 1) Upon initiation of any new project not described in the application the holder of an Annual Permit will provide the Division with a completed Activity Notification Form for Holders of Annual Permits describing the new project prior to the start of work preferably at least one week in advance of the start-up date.
- 2) The applicant has implemented a written Injury and Illness Prevention Program and Code of Safe Practices which meet the requirements of 8 CCR Sections 1509 & 3203.
- 3) The Division will be notified of significant changes in information provided with the application if such changes might affect the safety of the activity.
- 4) The applicant for a Trench and/or Excavation Permit shall designate a competent person in accordance with the requirements of 8 CCR 1504, 1541 and 1541.1. for each Trench and/or Excavation project.

5) The applicant understands that under the permit program DOSH schedules routine inspections by authorized personnel for the purpose of verifying that holders of Annual or Activity Permits are meeting their obligation to provide a safe work place for their employees. The Division reserves the right to revoke or suspend a permit if it is unable to promptly verify compliance with the terms and conditions of the permit and its issuance.

6) The applicant understands that failure to comply with any of the above listed conditions for obtaining a permit could result in denial, suspension, or the revocation of the permit. Employers may appeal these actions to the Director of the Department of Industrial Relations (California Labor Code Section 6500 et. Seq. and 8 CCR 34i)

Is the applicant conducting any activities to be covered by this Permit Application Form, as a partnership or joint venture with any other persons or corporations conducting activities requiring permits?

Yes _____ No _____ If yes, give details _____

Have any permits for any project to be covered by this permit application previously been applied for or obtained? Yes _____ No _____ If yes, when _____

from what district office _____

in whose name _____

DIVISION USE ONLY

Fee _____

Paid _____

Approved _____

Conference _____

Other _____

I hereby certify that to the best of my knowledge all information and assertions made on the Permit Application and/or Activity Notification Form are true and correct and that I/the applicant have knowledge of and will comply with the foregoing.

Signature: _____

Title: _____

Date: _____

ACTIVITY NOTIFICATION FORM

Buildings Structures Scaffolding Falsework Demolition Trenches/Excavations

Company Name: _____	Field Phone: _____
Annual Permit Number: _____	Office Phone: _____
Specific Activity Location: _____	Number of Employees: _____
Nearest Major Cross Street: _____	Starting Date: _____
City: _____	Anticipated Completion Date: _____
County: _____	High Voltage Lines in Proximity? No _____ Yes _____

INSTRUCTIONS: The appropriate item(s) must be completed and signed by a person knowledgeable about the project for each activity covered by a permit. Please fill in or check off the blanks where appropriate.

Construction: Building _____ Structure _____ Type: Steel Frame _____ Tiered _____ Concrete _____
Tilt-up _____ Wood Frame _____ Liftslab _____ Precast _____ Slip Form _____ Depth _____ No. of Stories _____

Description: _____

(See 8 CCR 1709-30: Appendix A Plate A-2a & b)

Scaffolding: Height _____ Metal _____ Wood _____ Wood over 60 Feet _____ Metal over 125 Feet _____

Metal > 125 Feet or Wood > 60 Feet requires design by California Registered Civil Engineer & Plans at Site. (See 8 CCR 1644(c)(7))

Description: _____

Falsework/Vertical Shoring: Maximum Height _____ Maximum Span _____ Material _____

Description: _____

(See 8 CCR 1717)

Demolition Of: Building _____ Structure _____ Height _____ No. of Stories _____ Type: Steel Frame _____

Wood Frame _____ Concrete _____ Demolition Ball _____ Clam _____ Explosives _____

Loader/Tractors _____ Other _____

(See 8 CCR 1734 - 37)

Trenches/Excavations: Depth Range(Min/Max) * _____ Width Range(Min/Max) _____ Total Length _____

Ground Protection Method: Shoring _____ Sloping _____ Trench Shield _____ Professional Engineer _____

Underground Services Alert(USA) Number _____ (NORTH 1-800-642-2444/SOUTH 1-800-422-4133)

Soil Analysis to be done? Yes _____ No _____ If No, You Must Slope 1.5 to 1.

Description: _____

* Ground protection methods for excavations deeper than 20 feet must be designed by a Registered Professional Engineer.
See 8 CCR 1541.1, Appendix F.

SANITATION PLAN

Company Name will ensure that a minimum of one separate toilet and washing facility will be provided for every 20 employees or fraction thereof of each gender. Such facilities may include both toilets and urinals provided that the number of toilets shall not be less than one half of the minimum required number of facilities.

Exception: Where there are less than 5 employees, separate toilet facilities for each gender are not required provided the toilet facilities can be locked from the inside and contain at least one toilet.

Company Name will also ensure that the Cal/OSHA Code of Regulations §1526 and §1527 are followed as outlined:

- Be maintained in a clean and sanitary condition;
- Have an adequate supply of water for effective washing;
- Have a readily available supply of soap or other suitable cleansing agent;
- Have a readily available supply of single-use towels or a warm-air blower;
- Be located and arranged so that any time a toilet is used, the user can readily wash; and
- When provided in association with a non-water carriage toilet facility in accordance with Section 1526(c),
 - Provide a sign or equivalent method of notice indicating that the water is intended for washing; and
 - Be located outside of the toilet facility and not attached to it.

Exception: Where there are less than 5 employees, and only one toilet facility is provided, the required washing facility may be located inside of the toilet facility.

PERSONAL PROTECTIVE EQUIPMENT ASSESSMENT

Personal Protective Equipment (PPE) is vital to the prevention of injury. All employees who may need or are required to wear PPE must be properly trained and/or retrained.

Initial training is required prior to performing a task that requires PPE. Training includes, at least, the following:

- What PPE is necessary at our facility?

- When must PPE be worn at our facility?

- How do we properly don, doff, adjust & wear PPE? (Note: The employee must be fitted with these items)

- What are the limitations of PPE?

- List the following procedures for PPE:
 - Proper care _____
 - Cleaning _____
 - Maintenance _____
 - Useful life _____
 - Disposal _____
- What is the procedure for selection of and reasons for the PPE selected for each employee? _____

(Hazards vs. Selection must be discussed.)

Retraining of an employee is required when the following occurs:

- The workplace changes, making the earlier training obsolete
- The type of PPE changes
- When the employee demonstrates lack of use, improper use, or insufficient skill or understanding

The certification training must include the employee name, the dates of training, and the certification subject.

Employee Owned Equipment

If employee-owned equipment is used, employees must still participate in the training mentioned above. The employee must notify the company of the desire to use employee-owned equipment. The Company will then verify its adequacy, maintenance & sanitation.

Defective or Damaged Equipment

Defective or damaged PPE must not be used under any circumstances.

Note: To properly protect against the hazards of the job processes or the environment (inhalation, absorption, physical contact) PPE must be provided, used, and maintained in a sanitary and reliable condition.

Hazard Assessments

Written hazards assessments must be performed and include the following:

- List if hazards are present or likely to be present that require P.P.E:

- What PPE is required to protect against the hazards?

Certifier's name, signature, date:

Name _____

Signature _____

Date _____

EMERGENCIES

I. FIRE PREVENTION AND EMERGENCY EVACUATION PLAN

Scope:

This Fire Prevention and Emergency Evacuation Plan will cover fire prevention procedures, housekeeping and maintenance controls, and training.

Fire Prevention Plan:

The purpose of this Fire Prevention Plan is to prevent injuries and fatalities. Additionally, it is to protect the company from property damage due to a fire or smoke.

Fire Prevention:

The priority of this company is to prevent fires before they start. This can be achieved by identifying potential fire hazards, through proper handling and storage procedures, by controlling potential ignition sources, and having set-up the proper fire fighting systems and equipment.

Potential Fire Hazards:

- a. Combustible materials will be kept in separate storage areas from flammable materials. Combustible materials will be protected by a welding blanket, shield, or 25 foot distance from any open flame operation. Combustibles will also be kept a safe distance from all ignition sources. Combustible materials will be stored in neat stacks and clear of aisles and passageways.
- b. Flammable and combustible liquids will be stored in approved containers that are properly labeled. Flammable and combustible liquids will be stored in approved cabinets when not in use. When in use, flammable and combustible liquids will be used in a manner that prevents spills. Whenever feasible, substitute flammable liquids for a non-flammable material that is non-toxic.
- c. Electrical fixtures, panels, boxes, outlets and cords should be wired to all applicable codes to prevent fire or explosion. Avoid the use of extension cords whenever possible. Fix any exposed or frayed wiring. Do not overload outlets or electrical systems. Label all outlets and electrical panels for voltage. Replace any reoccurring popping circuit breaker and/or smoking outlet.
- d. Smoking should be done in designated areas only.

Proper Handling and Storage:

- a. Use and store all chemicals in accordance with the Material Safety Data Sheets.
- b. Store separately all incompatible chemicals that may cause a fire to start or spread. An example would be an oxygen cylinder next to acetylene.
- c. Store all flammable and combustible liquids in approved cabinets. Not more than 120 gallons of Class I, Class II, or Class IIIA liquids may be stored in a cabinet. Of this total, not more than 60 gallons may be stored of Class I or Class II liquids.

- d. **Storage inside buildings must comply with the following conditions: The flammable or combustible liquids/gasses must not obstruct any egress. Flammable or combustible liquids must have lids kept tightly closed when not in use to avoid fumes or vapors. Remove only as much as needed for operation and replace lid. If a flammable or combustible storage facility is used, it will be a one-story building containing only flammable or combustible liquids. The building will have 2-hour fire rated exterior walls having no openings within 10 feet of such wall. (These can be superseded by any Federal, State or local regulation.) Ventilation inside a storage room will have a mechanical fan installed to all Federal, State and local regulations.**

Controlling Ignition Sources:

- a. **Static electricity will be controlled by grounding and bonding all equipment that transfers or transports flammable liquids or any other potentially explosive chemical.**
- b. **Open flames, such as from welding and cutting torches, welding units, heaters, or matches, should be kept from all flammable liquids or gasses.**
- c. **Motors, switches, and circuit breakers, etc., should be eliminated where flammable liquids or gasses are handled or stored.**
- d. **Only non-sparking tools should be used where flammable liquids or gasses may be present.**

Fire Fighting Systems and Equipment:

- a. **Portable fire extinguishers should be used for small fires only. Fire extinguishers will be conspicuously located and marked with arrows to clearly identify location, especially when material may block view of location. Open access will always be kept to fire extinguishers and fire fighting equipment. Persons using a fire extinguisher should be trained and use the proper type of extinguisher for the type of fire. All fire extinguishers will be clearly marked for type and clearly identified by a sign when two different extinguishers are located together. Fire extinguishers will be located next to egress, near flammable operations, and where all other Federal, State and local law requires. There are four general classifications of fires depending on the materials involved. The fire extinguisher that will be used will be rated for the materials involved in the fire.**
 - 1) **Class A fires have materials such as wood, paper, rags/cloth which produce embers, ash and char.**
 - 2) **Class B fires have materials such as flammable gasses and liquids or grease, which often create vapors or fumes that will combust.**
 - 3) **Class C fires have live electrical equipment/lines or materials near electrically powered equipment.**
 - 4) **Class D fires have combustible metals like sodium, potassium, or magnesium.**
- b. **Fire extinguishers must be serviced annually and inspected monthly. Additionally, all fire extinguishers must be maintained fully charged. In the event a fire extinguisher is used, a back-up fire extinguisher will be put in place while service is completed.**
- c. **Fire sprinkler system must be maintained and tested in accordance with Federal, State and local regulations. Notify the Fire Department upon activation.**
- d. **The Superintendent/Foreman/Supervisor/Manager will maintain equipment and systems that prevent and control ignitions or fires.**

Housekeeping and Maintenance Controls:

Housekeeping and maintenance practices are essential in preventing fires and furthering the spread of fires. The housekeeping and maintenance controls that will be an essential part of the Fire Prevention Plan are storage of flammable and combustible waste, maintenance of aisles, stairways and exits, and posting evacuation maps.

Flammable Storage Waste:

- a. Maintain all flammable materials in approved containers and approved cabinets. Do not exceed maximum quantities.
- b. Label all flammable materials clearly.
- c. Store away from ignition sources.

Combustible Storage Waste:

- a. Maintain all debris, scraps and trash in proper disposal containers.
- b. Maintain all combustible waste neatly and away from ignition sources.

Maintenance of Aisles, Stairways, and Exits:

- a. Keep aisles free of clutter or debris that may cause a trip hazard.
- b. Do not block aisles, passageways or exits.
- c. Keep all exits unlocked during work hours.
- d. Clearly mark exits with signs.
- e. Light all stairways, aisles and exits that would not have proper illumination in a fire.
- f. Maintain all fire fighting equipment and systems.
- g. The Superintendent/Foreman/Supervisor/Manager will maintain the accumulation of flammable and combustible waste.
- h. Regular inspections will be performed for fire hazards by the Fire Captain.

Post Evacuation Map:

- a. Post a diagram showing exits, fire extinguishers, emergency shut-offs, flammable and combustible storage, and staging area in areas where every person on site will see it.

Training:

All employees are trained on the fire hazards of the job and emergency evacuation. This is done on an annual basis and during orientation upon hire. Training is an essential way to avoid a fire, and in the event of a fire, avoid an injury or fatality. Training includes but is not limited to the following topics - fire hazards and fire prevention, use of fire extinguisher, evacuation routes, fire evacuation, fire drills and fire emergency procedures.

Emergency Evacuation:

In the event of a fire, the person who discovers the fire will immediately notify all persons on site by pulling an alarm, use of the public address system, or oral communication. A Supervisor or Fire Captain, when available, will dial 911 and the public address system will be used to evacuate the site. When the alarm is heard or a notice to evacuate has been communicated, all persons will exit the building by using the closest and safest exit route and continue on to meet at the staging area for roll call.

Fight Fire Only If:

- a. 911 has been called and the Fire Department has been notified.
- b. The fire is small and confined.
- c. You have a way out that is not threatened by the fire.
- d. You have the training, the right type and size extinguisher, and the extinguisher is in good working order.
- e. There are no explosive materials near the fire.
- f. You have another person in the vicinity observing or fighting the fire.

When an Alarm Sounds:

- a. Evacuate the building or area through the safest exit. Do not use elevators. Leave personal effects behind. Close doors, windows and gas valves in your area as you exit.
- b. Leave the building and go to the staging area for roll call and get assignments to help direct Emergency Services.
- c. Report all information to the Fire Captain.
- d. Do not re-enter building until instructed to do so by a Supervisor, Fire Captain or Emergency Services.

Fire Captain Duties:

- a. Call 911 or designate a person to call 911.
- b. Take roll and account for all persons on site or assigned to you.
- c. Help with evacuation process including disabled persons.
- d. Use a fire extinguisher when appropriate.
- e. Direct Emergency Services to location of fire or hazard.
- f. Direct Emergency Services as to conditions, locations and hazards of the facility.
- g. Direct personnel on site to help Emergency Services.

II. EARTHQUAKE

Earthquakes occur without warning. The greatest danger comes from falling objects, whether inside a building or outdoors.

INDOORS:

1. **MOVE AWAY** from windows, glass partitions, shelves, cabinets, products, electrical panels, and battery charging area.
2. **TAKE SHELTER** under a desk or table or brace yourself in an interior doorway until the shaking stops.
3. **REMAIN INDOORS** if possible, unless otherwise instructed. Proceed with caution.

OUTDOORS:

1. **MOVE AWAY** from buildings, overhead wires, and poles if possible.
2. **TAKE COVER** in a doorway or other shelter if unable to reach a clear area.

FOLLOWING AN EARTHQUAKE:

1. **USE flashlights** to check for injuries and trapped persons.
2. **RENDER** first aid as needed. Do not move an injured person, unless necessary for safety.
3. **CHECK** for fires and fire hazards, especially damaged electrical wiring and gas leaks.
4. **CHECK** building for damage and move to a safe area, if necessary.
5. **DO NOT** use telephones for outside calls except for genuine emergencies.
6. **PREPARE** for aftershocks.
7. **Fire Captain** shall be responsible for proper shut down of all computer systems and high voltage lines.
8. **Fire Captain** should do roll call after evacuation and should carry First Aid Emergency Kit to the assembly point. All employees must remain in the assembly area until instructed to either re-enter the building or to go home.

III. MEDICAL

In the event of a major emergency that is a life-threatening situation (e.g., difficulty in breathing, unconsciousness, severe chest pain, burns, and shock) requiring that normal operations be disrupted, the following procedures must be followed:

CALL THE PARAMEDICS OR FIRE DEPARTMENT *DIAL 911*

1. Give your location, work area and how to get to the victim.
2. Describe the victim's condition as accurately as you can: burned, bleeding, broken bones, etc.
3. Remain on the line if the emergency agency has further questions or instructions on what to do until help arrives.
4. NOTIFY Receptionist immediately that an emergency exists and that a call has been placed for assistance.
5. NOTIFY your Supervisor(s).
6. DO NOT move the victim unless there is a danger of further injury if not moved.
7. CONTACT any available person trained in CPR or first aid, pending the arrival of professional help.
8. KEEP the victim warm by covering with a coat or blanket until help arrives.
9. ASSIGN someone to meet the responding agency and direct them to the victim.

IV. POWER FAILURE

1. If your work area loses power, lighting and electrical outlets will be affected.
2. It is seldom necessary for occupants to evacuate a building unless there is a prolonged power outage.
3. Remain in your immediate area until the expected duration of the outage can be determined and you receive further instructions.
4. If you are asked to leave the building, go directly to the nearest exit.
5. Keep flashlights on hand in various areas for power outages.
6. Larger installations should provide emergency battery-operated lighting in strategic areas, such as hallways, computer rooms, and telephone rooms.
7. Data processing departments with computers should have Uninterrupted Power Source (UPS) systems available.

V. BOMB THREATS

Compared with other facility emergencies, the covert and criminal nature of terrorism, including bombing incidents, bomb threats, and the taking of hostages, is a highly complex problem for management and emergency service personnel.

The persons chiefly responsible for the security of your building are you and your fellow employees. It does not matter how carefully the emergency plans for your building are prepared and rehearsed, or how attentive maintenance personnel are. If you do not observe ordinary safety precautions, a bomb may be planted in your building or in your work area. You should:

- a) Always be alert to people who look or act suspiciously.
- b) Always be aware of those items, packages, and parcels that belong in your office.
- c) Be alert to foreign or suspicious items that do not appear to belong where they are observed.
- d) Always report to your Supervisor or to the police if you observe a suspicious person or item.
- e) Be acquainted with your building emergency plan.
- f) Be prepared to take appropriate action if you receive a bomb threat.

1. Telephone Threats

Most threats are made by telephone. If you receive a bomb threat call, remember:

- a) Remain calm.
- b) Keep the caller on the line as long as possible.
- c) Attempt to record the conversation verbatim. Follow the "Bomb Threat Call Checklist" at the end of this section.
- d) Listen closely to the caller's voice.
- e) Notify your Supervisor immediately.

2. Direction & Control

The Safety Director shall immediately analyze the information given by the caller and will call 911 to request assistance from the police. Thereafter, the Safety Director will advise employees that a bomb threat has been made and instruct employees:

- a) To remain calm.
- b) To immediately examine their work area for any "object" that does not belong.

If an object is located, DO NOT TOUCH, JAR, MOVE, OR PICK UP ANY SUSPICIOUS OBJECT!

- c) After the preliminary work area search, the Safety Director will make the immediate decision as to whether employees should evacuate the premises based upon the facility search and information obtained from the police agencies.
- d) Do not evacuate the premises unless instructed to do so. The bomb may be concealed along your evacuation route or outside the premises. Evacuation may deprive you of the protection afforded by the structure itself.

3. EMERGENCY EVACUATION

If the employees are advised to evacuate, the Safety Director will instruct them to shut down all computers and electrical equipment within their immediate work area. If time permits, precious metals, sensitive tools, instruments, original drawings and blueprints, and vital records should be placed in locked storage.

The receptionist shall take any employee log and guest logs to the evacuation assembly point. All employees shall proceed with emergency evacuation procedures.

The Safety Director will ensure that all electrical and gas mains are shutoff prior to vacating the premises.

- a) Diagrams to show where to turn off the utilities shall be posted with the emergency evacuation procedures.
- b) All employees must remain within the evacuation area until instructed "to leave or return to their work place."
- c) All employees shall cooperate with the police, emergency bomb squads, or FBI at all times. Instructions from individuals within these agencies take precedence over these policies and procedures.
- d) The Safety Director will ensure that all non-English-speaking employees understand warning signals and know where and how to evacuate the workplace.

EMERGENCY PROCEDURES

DEPARTMENT OR AREA: _____

FIRE OR EXPLOSION:

Notify _____
Use of Fire Extinguishers _____
Evacuation _____
Other _____

EARTHQUAKE:

Notify _____
Other _____

EMPLOYEE ILLNESS OR INJURY:

Notify _____
First Aid _____
Other _____

FLOOD OR WATER LINE BREAK:

Notify _____
Other _____

CHEMICAL SPILLS:

Chemical	Notify	Absorbent	Dispose of as Hazardous	Protective Equipment
_____	_____	_____	_____	_____
_____	_____	_____	_____	_____
_____	_____	_____	_____	_____

OTHER:

EMERGENCY

AMBULANCE: _____

FIRE/RESCUE: _____

HOSPITAL: _____

PHYSICIAN: _____

**ALTERNATIVE
PHYSICIAN:** _____

POLICE: _____

OSHA: _____

FBI BOMB THREAT CALL CHECKLIST

QUESTIONS TO ASK

EXACT WORDING OF THE THREAT

1. When is bomb going to explode?
2. Where is it right now?
3. What does it look like?
4. What kind of bomb is it?
5. What will cause it to explode?
6. Did you place the bomb?
7. Why?
8. What is your address?
9. What is your name?

Sex of Caller _____ Age _____ Race _____ Length of Call _____

CALLER'S VOICE:

- | | | | |
|----------------------------------|-----------------------------------|--|---|
| <input type="checkbox"/> Calm | <input type="checkbox"/> Laughing | <input type="checkbox"/> Lisp | <input type="checkbox"/> Disguised |
| <input type="checkbox"/> Angry | <input type="checkbox"/> Crying | <input type="checkbox"/> Raspy | <input type="checkbox"/> Accent |
| <input type="checkbox"/> Excited | <input type="checkbox"/> Normal | <input type="checkbox"/> Deep | <input type="checkbox"/> Familiar _____ |
| <input type="checkbox"/> Slow | <input type="checkbox"/> Distinct | <input type="checkbox"/> Ragged | |
| <input type="checkbox"/> Rapid | <input type="checkbox"/> Slurred | <input type="checkbox"/> Clearing Throat | |
| <input type="checkbox"/> Soft | <input type="checkbox"/> Nasal | <input type="checkbox"/> Deep Breathing | |
| <input type="checkbox"/> Loud | <input type="checkbox"/> Stutter | <input type="checkbox"/> Cracking Voice | |

BACKGROUND SOUNDS:

- | | | | |
|--|---|--|--|
| <input type="checkbox"/> Street noises | <input type="checkbox"/> House noises | <input type="checkbox"/> Factory Machinery | <input type="checkbox"/> Local |
| <input type="checkbox"/> Crockery | <input type="checkbox"/> Motor | <input type="checkbox"/> Animal Noises | <input type="checkbox"/> Long Distance |
| <input type="checkbox"/> Voices | <input type="checkbox"/> Office Machinery | <input type="checkbox"/> Clear | <input type="checkbox"/> Mobile |
| <input type="checkbox"/> PA System | <input type="checkbox"/> Music | <input type="checkbox"/> Static | <input type="checkbox"/> Booth |
| <input type="checkbox"/> Other | | | |

THREAT LANGUAGE:

- | | | | |
|--|---|--|--|
| <input type="checkbox"/> Well spoken
(Educated) | <input type="checkbox"/> Foul
Irrational | <input type="checkbox"/> Incoherent
Taped | <input type="checkbox"/> Message read by
Threat Maker |
|--|---|--|--|

REMARKS: _____

Fill out completely, immediately after bomb threat.

Date _____

Name _____ Position _____

EMERGENCY MEDICAL PLAN

Provision of Services

A map of the clinic and hospital closest to the jobsite will be posted. A cell phone or two-way radio will be provided on all sites to contact emergency services. Contact of emergency services will be made prior to the beginning of job to ensure availability and access to location of job.

Appropriately Trained Personnel

The following is a list of personnel on _____ jobsite trained to render First Aid:

Name _____	Type of Certification _____	Expiration Date _____
Name _____	Type of Certification _____	Expiration Date _____
Name _____	Type of Certification _____	Expiration Date _____
Name _____	Type of Certification _____	Expiration Date _____
Name _____	Type of Certification _____	Expiration Date _____
Name _____	Type of Certification _____	Expiration Date _____

First Aid Kit

A First Aid kit approved by a physician shall be available on each site at all times. The First Aid kit will be inspected regularly to ensure that it contains adequate supplies. The following is a list of recommended supplies for a jobsite.

<i>Supplies for First Aid</i>	<i>Type of Supply Required by Number of Employees</i>			
<u>Dressings in adequate quantities consisting of:</u>	<u>1-5</u>	<u>6-15</u>	<u>16-200</u>	<u>over 200</u>
1. Adhesive dressings	X	X	X	X
2. Adhesive tape rolls, 1-inch wide	X	X	X	X
3. Eye dressing packet	X	X	X	X
4. 1-inch gauze bandage roll or compress		X	X	X
5. 2-inch gauze bandage roll or compress	X	X	X	X
6. 4-inch gauze bandage roll or compress		X	X	X
7. Sterile gauze pads, 2-inch square	X	X	X	X
8. Sterile gauze pads, 4-inch square	X	X	X	X
9. Sterile surgical pads suitable for pressure dressings			X	X
10. Triangular bandages	X	X	X	X
11. Safety pins	X	X	X	X
12. Tweezers and scissors	X	X	X	X
<i>* Additional equipment in adequate quantities consisting of:</i>				
13. Cotton-tipped applicators			X	X
14. Forceps			X	X
15. Emesis basin			X	X
16. Flashlight			X	X

R C Foster Corporation
CPR/First Aid

#	Name	Type of Certification	Taken On	Expiration Date
1	Steven Beard	CPR/First Aid	4/8/2006	2008
2	Gar Bright A	CPR/First Aid	5/20/2006	2008
3	Bryan Victor	CPR/First Aid	4/8/2006	2008
4	David Clark	CPR/First Aid	5/20/2006	2008
5	Richard Contreras	CPR/First Aid	4/8/2006	2008
6	Angel Corralejo	CPR/First Aid	5/20/2006	2008
7	Dave Croft	CPR/First Aid	5/20/2006	2008
8	Anthony Espinoza	CPR 2000	8/12/2006	2008
9	James Harvey	CPR/First Aid	5/20/2006	2008
10	John Jenista	CPR/First Aid	4/8/2006	2008
11	Randy Keefer	CPR 2000	8/12/2006	2008
12	Don Lee	CPR/First Aid	4/8/2006	2008
13	Jose Lopez	CPR/First Aid	5/20/2006	2008
14	Richard Ortiz	CPR/First Aid	5/20/2006	2008
15	Steve Potter	CPR/First Aid	6/10/2006	2008
16	Isdrio Rodriguez	CPR/First Aid	5/20/2006	2008
17	Aurelio Roman	CPR/First Aid	5/20/2006	2008
18	Ben Roman	CPR/First Aid	5/20/2006	2008
19	Francisco Roman	CPR/First Aid	5/20/2006	2008
20	Mario Roman	CPR/First Aid	4/8/2006	2008
21	Robert Roman	CPR/First Aid	4/8/2006	2008
22	Matt Thompkinson	CPR/First Aid	5/20/2006	2008
23	Louis Valles	CPR 2000	8/12/2006	2008
24	Randy Wyckoff	CPR/First Aid	5/20/2006	2008

*Additional equipment in adequate quantities consisting of:	1-5	6-15	16-200	over 200
17. Magnifying glass			X	X
18. Portable oxygen and its breathing equipment				X
19. Tongue depressors				X
Appropriate Record Forms	X	X	X	X
Up-to-date 'Standard' or 'Advanced' First Aid Textbook, Manual or equivalent	X	X	X	X

*To be readily available but not necessarily within the First Aid kit.

Other supplies and equipment, when provided, shall be in accordance with the documented recommendations of an employer-authorized, licensed physician upon consideration of the extent and type of emergency care to be given based upon the anticipated incidence and nature of injuries and illnesses and availability of transportation to medical care. Drugs, antiseptics, eye irrigation solutions, inhalants, medicines, or proprietary preparations shall not be included in First Aid kits unless specifically approved, in writing, by an employer-authorized, licensed physician.

In Case of Injury or Illness

The employee shall immediately notify a supervisor of injury or illness. The injury will be reviewed by a trained First Aid certified employee to determine course of medical attention. In the event the certified person is not available on site or is involved in the injury or illness, 911 will be called.

Post the Following Numbers

A cell phone or two-way radio will be used to contact emergency services.

- (1) A Physician and at least one alternate if available _____
- (2) Hospitals _____
- (3) Ambulance Services _____
- (4) Fire Protection Services _____

Emergency Washing Facilities

On jobs where the eyes or body of any employee may be exposed to injurious or corrosive materials, suitable facilities for drenching the body or flushing the eyes with clean water shall be conspicuously and readily accessible.

Emergency Call Systems

A two-way voice emergency communication system shall be installed, for buildings and structures five or more floors or 48 feet or more above or below ground level, to notify persons designated in the emergency medical services plan. The location and condition of the employee shall be able to be communicated over the system. The use of the construction passenger elevators for medical emergencies shall take precedence over all other use.

Basket Litter

At least one basket or equally appropriate litter equipped with straps and two blankets, or other similar warm covering, shall be provided for each building or structure five or more floors or 48 feet or more either above or below ground level.

FIRST AID EMERGENCY PROCEDURES

First aid is the treatment given a victim prior to the arrival of professional medical assistance. Note: First aid in no way replaces the attention of a physician. If there is any question about the seriousness of an accident victim's injury, contact a doctor as soon as possible. Give the following information:

1. What has happened and when.
2. Where the victim is located.
3. What first aid has been provided.

While the following guidelines are not a substitute for first aid training, they will help you provide first aid in six serious emergency situations.

I. BROKEN BONES

Call for medical assistance. If a doctor or ambulance can arrive within a short time, make no attempt to move the victim unless absolutely necessary. Attempt to immobilize the injured limb to prevent further injury. If the victim must be moved, splint the injured part with any available rigid material long enough to reach above and below the break. Secure the splint above and below the break. Never attempt to set a broken bone – wait for a doctor. Watch for signs of shock and treat as discussed below.

II. BLEEDING

Call for medical assistance. If bleeding is severe, apply firm, steady pressure to the wound with layers of sterile gauze pads or bandages. If they aren't available, use any cloth. Do not remove this dressing. If the pad becomes saturated with blood, add more layers. Bandage the pads firmly in place. If no gauze or cloth is available, close the wound with your fingers, holding it closed. Keep the victim lying down until a physician arrives. Elevate the bleeding part to help control blood loss. Never use a tourniquet to control bleeding unless you are dealing with an amputated, crushed, or mangled limb. Use a tourniquet **ONLY** as a last resort effort to save a victim's life, because applying a tourniquet improperly may result in loss of limb.

III. BURNS

Minor burns: Immerse burned parts in clear, cold water or apply ice for pain relief. Bandage with sterile pad or clean cloth. If pain persists, apply mild burn ointment.

Severe Burns: Call for medical assistance. Take immediate steps to relieve pain, prevent infection, and treat victim for shock as described below. If burn was caused by fire, boiling liquid, or hot metal, do not strip away clothing covering the affected area. Keep air away from burn by covering area loosely in place. Apply **NO** grease or ointment. Keep victim lying down. If conscious, give victim plenty of water.

Chemical Burns: Flush burn with large amounts of water. Cover burn with cleanest cloth available, and have victim lie down until a doctor arrives. For chemical burns of the eye, flush with great amounts of water immediately, cover the eye, and rush the victim to the doctor.

IV. POISONING

Call a doctor or poison control center at once. If victim loses consciousness, give no other first aid. If breathing stops, start mouth-to-mouth resuscitation. Follow the instructions of the doctor or poison control center.

V. SHOCK

Can occur after any injury – a condition in which vital body functions are slowed down. The symptoms include: weakness; cold, pale, clammy skin with beads of perspiration on face and palms; rapid, weak pulse; chill; nausea; irregular breathing. Any or all of these symptoms may be evident.

First aid involves keeping the victim warm – covered with blankets to prevent loss of body heat and lying down. Keep victim's airway open. If victim vomits, turn his head to the side. If victim is conscious and able to swallow, give water. If victim becomes nauseated, stop liquids. Contact a doctor as soon as possible.

VI. BREATHING

If breathing stops for any reason, begin mouth-to-mouth resuscitation immediately. If possible, have someone else contact a doctor. Follow these steps:

1. Place victim on his or her back and determine if there is anything in the victim's mouth. If there is, turn the victim's head to one side and wipe out the mouth with a finger.
2. Straighten the victim's head and tilt it back so that the chin points up. Push down to keep the victim's tongue from blocking the airway.
3. Place your mouth over the victim's and pinch his nostrils shut with your fingers.
4. Breathe into the victim's mouth until the chest rises.
5. Remove your mouth and listen for the sound of escaping air. If you don't hear it, check the victim's head and jaw positioning and repeat the process. If there is no sound of escaping breath this time, turn the victim on his or her side and slap on the back between the shoulders. Check the mouth again for foreign matter.
6. Repeat steps 2, 3, and 4, removing your mouth to allow breath to escape from the victim's lungs. This process should be repeated 12 times per minute for an adult. Above all, keep repeating the process until help arrives.

The First Aid Form must be completed every time first aid is administered. Following are the instructions for completing the First Aid Form.

FIRST AID FORM INSTRUCTION SHEET

EMPLOYEE NAME:

The employee's full name is required here, including middle initial.

SSN (SOCIAL SECURITY NUMBER):

The employee's correct Social Security number is required. Supervisory employees completing the form should ensure entry of the correct number.

DATE AND TIME OF INJURY:

The exact date of injury as provided by the injured employee should be entered here. It is important to be as precise as possible.

INJURY:

A brief description of the cause(s) of injury, including body parts involved.

TYPE OF FIRST AID:

A brief description of the first aid rendered should be entered here, along with the name of the administrator.

OUTSIDE MEDICAL TREATMENT OFFERED:

Whether professional medical treatment by legally certified doctors or nurses was offered, yes or no.

SIGNATURE OF INJURED:

The injured employee should both sign and provide the date of signature in this entry. It is mandatory that the injured employee complete both items.

SIGNATURE OF PREPARER:

The supervisory/administrative employee that questioned the injured employee and completed the general entries should sign here and enter the date.

ALL ENTRIES MUST BE COMPLETED AS INSTRUCTED. THESE GENERAL INSTRUCTIONS SHOULD BE KEPT IN A FIRST AID LOG BINDER FOR EASY REFERENCE BY THE SAFETY DIRECTOR. IT IS NOT NECESSARY TO COMPLETE A FIRST AID LOG ENTRY ON OCCASIONS WHEN ASPIRIN, ETC., ARE PROVIDED TO EMPLOYEES FOR NON-WORK-RELATED CONDITIONS.

FIRST AID FORM

NAME

SSN#

DATE & TIME OF INJURY

AM

PM

OUTSIDE TREATMENT REQUIRED

INJURY

TYPE OF FIRST AID

SIGNATURE OF INJURED

DATE

SIGNATURE OF PREPARER

DATE

FIRST AID AT A GLANCE

CHECK

- Check the scene for safety
- Check the victim for consciousness, breathing, signs of circulation, pulse, and severe bleeding

CALL

- Dial 9-1-1 or local emergency number

CARE

- Care for the conditions you find

To Control Bleeding



STEP 1

Apply direct pressure and elevate limb above heart



STEP 2

Apply a bandage



STEP 3

If bleeding doesn't stop:

Apply pressure to a nearby artery



LEG

ARM:
Inside upper arm, between shoulder and elbow

LEG:
Crease at front of hip, in the groin

Care for Burns



STEP 1

- Stop the burning
- Cool burned area with large amounts of cool water



STEP 2

- Cover the burn with dry clean dressings

Shock

Shock is likely to develop in any serious injury or illness.

Signals of Shock

- Restlessness or irritability
- Altered consciousness
- Pale, cool, moist skin
- Rapid breathing
- Rapid pulse



Caring for Shock

- Have the victim lie down or rest in a comfortable position
- Control bleeding
- Maintain normal body temperature
- Reassure the victim
- Elevate the legs unless you suspect head, neck, or back injuries or possible broken bones
- Do not give anything to eat or drink
- Call your local emergency number

ARTIFICIAL RESPIRATION

ARTIFICIAL RESPIRATION



FIGURE 1

If victim appears to be unconscious, tap and shout, "Are you okay?" Open airway; use head tilt-chin lift and check breathing 3-5 secs. (Fig 1): no breathing, give 2 breaths 1-1 1/2 secs per breath (fig 2). Check pulse at side of neck (fig 3) & breathing for a minimum of 5 secs. no more than 10 secs. Pulse but no breathing give 1 breath every 5 secs for an adult (fig 4).

FIRST AID FOR CHOKING



FIGURE 2

Conscious Victim

Ask, "Are you choking?" Assure the victim you are there to help. Stand behind the victim placing the fist of one hand below the edge of the rib cage and above the navel. Clasp your fist with your other hand press fist into abdomen with a quick upward thrust 6-10 times: (fig 5) repeat the sequence until the object is dislodged or until the victim becomes unconscious.

Goes Unconscious

If the victim becomes unconscious call for help: use tongue jaw lift to open mouth and perform finger sweep: attempt to ventilate. Straddle victims thighs, place the heel of one hand below the edge of the rib cage and above the navel. Place the second hand on top of the first, press into abdomen with a quick upward thrust 6-10 times (fig 6); perform finger sweep: attempt to ventilate. Repeat sequence until successful.



FIGURE 3



FIGURE 4



FIGURE 5



FIGURE 6

Positions



If a conscious victim has a head wound or is having trouble breathing, elevate the head and shoulders



If possible head, neck or back injury, or if unsure of the victim's condition, keep flat



If bleeding from the mouth, vomiting, or may vomit, roll victim on side

TYPE OF INJURY OR ILLNESS	SIGN & SYMPTOMS	FIRST AID
FRACTURES & DISLOCATIONS	<ul style="list-style-type: none"> • Pain & tenderness • Difficulty moving injured part • Obvious deformities • Swelling and discoloration 	<ul style="list-style-type: none"> • Keep broken bone ends and adjacent joints from moving • Give care for Shock and CALL for an ambulance
CARE FOR SUDDEN ILLNESS	<p>Whenever a person becomes suddenly ill, he or she often looks sick.</p> <p>Common signals include:</p> <ul style="list-style-type: none"> • Light-headedness • Changes in skin color (pale/flushed) • Sweating • Nausea or vomiting • Diarrhea <p>Some sudden illnesses may also include:</p> <ul style="list-style-type: none"> • Changes in consciousness • Seizure • Paralysis or inability to move • Slurred speech • Difficulty seeing • Severe headache • Breathing difficulty • Persistent pressure or pain 	<p>CARE FOR ANY LIFE-THREATENING CONDITIONS FIRST, THEN:</p> <ul style="list-style-type: none"> • Help the victim rest comfortably • Keep victim from getting chilled or overheated • Reassure the victim • Watch for changes in consciousness and breathing • Do not give anything to eat or drink unless victim is fully conscious <p>If the Victim:</p> <ul style="list-style-type: none"> • Vomits - Place on his or her side • Faints - Position on back, elevate legs 8 to 10 inches- if you do not suspect head or back injury • Diabetic Emergency - Give victim some form of sugar • Seizure - Do not hold or restrain the person or place anything between the victim's teeth; remove any nearby objects that might cause injury; cushion the victim's head using folded clothing or a small pillow
POISON	<p>Symptoms vary greatly.</p> <p>How to determine if poison is involved:</p> <ul style="list-style-type: none"> • Information from victim or witness • Presence of poison container • Condition of victim (sudden onset of pain or illness) • Burns around lips • Breath odor • Pupils constricted 	<p>All Victims</p> <ul style="list-style-type: none"> • CALL 9-1-1 • CALL Poison Control Center • Save label or container for I.D. • Save sample of vomit <p>Conscious Victims</p> <ul style="list-style-type: none"> • Have the victim rest comfortably • CALL Poison Control Center • Do not give anything to drink or induce vomiting unless instructed to do so by the Poison Control Center <p>Unconscious Victims</p> <ul style="list-style-type: none"> • Roll victim onto side • Keep airway open • Give Rescue Breathing or CPR if necessary until rescue squad arrives and takes over • Do not give any fluids or induce vomiting
COLD AND HEAT-RELATED ILLNESSES	<p>Hypothermia:</p> <ul style="list-style-type: none"> • Shivering, numbness, glassy stare, apathy, • Weakness, impaired judgement or loss of consciousness <p>Heat Exhaustion</p> <ul style="list-style-type: none"> • Cool, moist, pale or flushed skin • Headache, nausea, dizziness, weakness, exhaustion • Heavy sweating <p>Heat Stroke, Life-threatening!</p> <ul style="list-style-type: none"> • Red, hot, dry skin • Changes in level of consciousness • Vomiting 	<p>CARE for Hypothermia: CHECK Pulse & Breathing</p> <ul style="list-style-type: none"> • Send someone to CALL for an ambulance • Move person to warm place • Remove wet clothing and dry the person • Warm person SLOWLY! DO NOT WARM TOO QUICKLY! Can cause problems with heart <p>CARE for Heat Illness: CHECK Pulse & Breathing</p> <ul style="list-style-type: none"> • Send someone to CALL for an ambulance • Move person to cool place • Loosen tight clothing • Remove perspiration-soaked clothing • Fan the person • If conscious, give cool water to drink <p>If person refuses water, vomits, or starts to lose consciousness, CALL for ambulance immediately</p> <ul style="list-style-type: none"> • Place person on side, continue to cool, monitor pulse and breathing
FIRST AID KIT Available through your local American Red Cross	<p>First Aid Kit Tips:</p> <ul style="list-style-type: none"> • Be prepared for an emergency • Keep a first aid kit in your home and your car • Carry a first aid kit when doing outdoor activities • Know locations of first aid kits where you work • Check your kit regularly for replacement of batteries and supplies • Personalize your first aid kit by stocking it with over-the-counter medications (pain reliever, cold tablets, medication to control diarrhea, etc.) • Keep an emergency supply of any vital prescription medication (or prescription slip) that you or a family member must have to ensure your well-being 	<p>A First Aid Kit Should Include:</p> <ul style="list-style-type: none"> • Small flashlight (extra batteries and bulb) • Scissors & tweezers • Emergency blanket • Triangular bandages • Antiseptic towelettes (hand cleaner) • Adhesive strips (assorted sizes) & adhesive tape • Gauze pads and roller bandage (assorted sizes) • Disposable gloves • Rescue breathing face shield or mask • Cold pack, plastic bags • Syrup of ipecac & activated charcoal • List of emergency telephone numbers • Copy of American Red Cross First Aid book

WRITTEN HAZARD COMMUNICATION PROGRAM

R C Foster Corporation has developed a Hazard Communication Program to enhance our employee's health and safety.

The hazard communication manager, Cathy Fernandez, has full authority and responsibility for implementing and maintaining this program. We provide information about the hazardous substances in our workplace, the associated hazards, and the control of these hazards through a comprehensive hazard communication program that includes the elements listed below.

1. CONTAINER LABELING AND OTHER FORMS OR WARNING

It is the policy of this Company that no container of hazardous substances will be released for use until the following label information is verified:

- Containers are clearly labeled as to the contents (Primary and Secondary Containers).
- Appropriate hazard warnings are noted (Primary and Secondary Containers).
- The name and address of the manufacturer are listed (Primary Containers).

This responsibility has been assigned to Cathy Fernandez.

To further ensure that employees are aware of the hazards of materials used in their work areas, it is our policy to label all secondary containers.

The supervisor _____ in each section will ensure that all
(name/position)
secondary containers are labeled with either an extra copy of the original manufacturer's label or with generic labels, which have a blocks for identity and hazard warning.

2. PROPOSITION 65 LIST OF CHEMICALS

Cathy Fernandez is responsible for obtaining updates of Proposition 65 listed chemicals and providing new information to affected employees. In the case of newly added chemicals to the Proposition 65 list, warning requirements take effect 12 months from the date of listing.

3. MATERIAL SAFETY DATA SHEETS (MSDS)

Copies of MSDS for all hazardous substances to which employees of this company may be exposed are kept in _____ and _____.
(location) (location)

Cathy Fernandez will be responsible for obtaining and maintaining the data sheet system for the company.

Cathy Fernandez will review incoming data sheets for new and significant health/safety information. This person will see that any new information is passed on to the affected employees immediately.

MATERIAL SAFETY DATA SHEETS (MSDS) (Continued)

MSDS are readily available for review to all employees in their work area and during each work shift. If MSDS are missing or new hazardous substance(s) in use do not have MSDS, or if an MSDS is obviously incomplete, please contact Cathy Fernandez immediately, and a new MSDS will be requested from the manufacturer. If we are unable to obtain the MSDS from the vendor within 25 calendar days of the request, we will either call our local Cal/OSHA compliance office or write to:

**Division of Occupational Safety and Health
Deputy Chief of Health and Engineering Services
P. O. Box 420603
San Francisco, CA 94142-0603**

If we use alternatives other than paper MSDS computer or microfiche machines with printers or fax machines we will make sure that employees have ready access to and know how to operate these devices for retrieval and printing of legible hard copies. Our backup system in the event of failure of the primary MSDS retrieval system will require employees to request paper MSDS by telephone. An MSDS hard copy will be provided to the requester as soon as possible after the telephone request is made.

4. EMPLOYEE INFORMATION AND TRAINING

Employees are to attend a health and safety orientation set up by Cathy Fernandez prior to starting work for information and training on the following:

- An overview of the requirements contained in the Hazard Communication Regulation, including employees' rights under the Regulation.
- Inform employees of any operation in their work area, including non-routine tasks, where hazardous substances or Proposition 65 carcinogens/reproductive toxins are present and exposures are likely to occur.
- Location and availability of the Written Hazard Communication Program.
- Physical and health effects of the hazardous substances.
- Methods and observation techniques used to determine the presence or release of hazardous substances in the work area.
- How to lessen or prevent exposure to hazardous substances through usage of engineering controls, work practices, and/or the use of personal protective equipment.
- Protective practices the Company has taken to lessen or prevent exposure to these substances.
- Emergency and first aid procedures to follow if employees are exposed to hazardous substance(s).
- How to read labels and review MSDS to obtain hazard information.
- Symptoms of overexposure.

EMPLOYEE INFORMATION AND TRAINING (Continued)

- The location and interpretation, if needed, of warning signs or placards to communicate that a chemical known to cause cancer or reproductive toxicity is used in the workplace.

Employees will receive additional training when a new hazard is introduced into the workplace or whenever employees might be exposed to hazards at another employer's work site.

NOTE: It is critically important that all of our employees understand the training. If you have any additional questions, please contact Cathy Fernandez.

5. LIST OF HAZARDOUS SUBSTANCES

Cathy Fernandez will prepare and keep current an inventory list of all known hazardous substances present in our workplace. Specific information on each noted hazardous substance(s) can be obtained by reviewing the Material Safety Data Sheets.

SAMPLE LIST

Hazardous Substances (i.e.)	Work Area or Process (i.e.)
_____	_____
Trichloroethylene Sulfuric Acid	Finish Dept. - Degreaser Prep. Dept. - Metal Cleaner.

6. HAZARDOUS NON-ROUTINE TASKS

Periodically, employees are required to perform hazardous non-routine tasks. Prior to starting work on such projects, each affected employee will be given information by their Supervisor about hazards to which they may be exposed during such an activity.

This information will include:

- Specific hazards.
- Protective/safety measures which must be utilized.
- Measures the Company has taken to lessen the hazards including ventilation, respiratory protection, presence of another employee and emergency procedures.

Examples of non-routine tasks performed by employees of this company:

TASK	<i>EXAMPLE</i>	HAZARDOUS SUBSTANCE
_____		_____
()		()

7. LABELED / UNLABELED PIPES (if applicable)

Above-ground pipes transporting hazardous substances (gases, vapors, liquids, semi-liquids, or plastics) shall be identified in accordance with Local and State Regulations.

Other above-ground pipes that do not contain hazardous substances but may have associated hazards if disturbed or cut (e.g., steam lines, oxygen lines) shall be addressed as follows:

Before employees enter the area and initiate work, Cathy Fernandez will inform them of:

- The location of the pipe or piping system or other known safety hazard
- The substance in the pipe
- Potential hazards
- Safety precautions

8. INFORMING CONTRACTORS

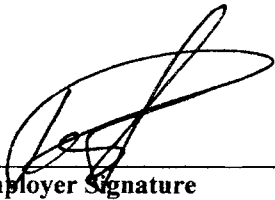
To ensure that outside contractors work safely in our plant and to protect our employees from chemicals used by outside contractors, Cathy Fernandez is responsible for giving and receiving the following information from contractors:

- Hazardous substances, including Proposition 65 chemicals, to which they may be exposed while on the job site as well as substances they will be bringing into the workplace. (To this end, we will provide contractors with information on our labeling system and access to MSDS.)
- Precautions and protective measures the employees may take to minimize the possibility of exposure.

If anyone has questions about this plan please contact Cathy Fernandez. Our plan will be monitored by ROBERT C. FOSTER to ensure that the policies are carried out and that the

(person/position)

plan is effective.



Employer Signature

10/06/2000

Date

Company Name _____

Notice of Safety Violation

Name of Sub-Contractor _____ Date _____

Description of Safety Violation

Corrective Action

Date of Abatement _____

List of Any Special Actions During Abatement

Foreman/Supervisor/Superintendent in violation

Date

It is the responsibility of the Foreman/Supervisor/Superintendent to notify all his/her employees of this notice of violation.

Superintendent of General Contractor

Date

CC:

Foreman in violation

Company Owner in violation

Project Manager

Other:

**INJURY & ILLNESS PREVENTION PROGRAM
VIOLATION WARNING NOTICE**

DATE: _____

LOCATION: _____

DEPARTMENT: _____

EMPLOYEE NAME: _____

1st Violation

2nd Violation

3rd Violation

You are hereby warned and have been counseled on:

Disciplinary action taken:

Issued by: _____
Supervisor

Reviewed by: _____
Director of Safety

I agree to comply with the safety procedures as discussed and outlined above.

Date

Employee Signature

This employee speaks Spanish only. I have translated this and explained fully.

Date

Director of Safety

The following disciplinary actions may be taken:

1. The employee will be removed from the hazardous exposure and required to discuss this matter, in detail, with the Supervisor and Manager.
2. The employee will be re-instructed by his Supervisor in the safety procedure which must be followed.
3. The employee must certify in writing that he will comply in the future and understands that termination may result from any further non-compliance.

*Although the above procedure details disciplinary actions that are possible, each infraction will be taken independently and will result in some kind of disciplinary action, possibly including discharge.

**PROGRAMAS PREVENTIVOS DE ENFERMEDAD Y LESIONES
AVISO DE VIOLACION**

FECHA: _____

LOCALIDAD: _____

DEPARTAMENTO: _____

NOMBRE DEL EMPLEADO: _____

Primera violación

Segunda violación

Tercera violación

Ud. ha sido avisado acosenjado sobre lo siguiente:

Accion disciplinaria tomada por la compania:

Supervisor

Reviewed by: _____
Director of Safety

_____ Yo hablo Español solo pero no led. Mi Supervisor me ha leído este aviso en Español y yo lo comprendo todo. (I speak Spanish only and do not read. My Supervisor has read this to me in spanish and I understand completely.)

Yo me comprometo A seguir los procedimientos de seguridad discutidos y escritos arrilsa.

Fecha (Date)

Firma de Empleado (Signature of Employee)

Las siguiente son las acciones disciplinarias:

1. El empleado se quitara desde la exposicion peligrosa y reguerido que discuta la materia en forma detallada con el Supervisor y gerente.
2. El empleado sera readiestrado por su Supervisor en politicas y los procedimientos que deben seguirse.
3. El empleado debe, por escrito, certificar que el cumplira en el futuro. Comprende terminacion pueden.

*Although the above procedure details disciplinary actions that are possible, each infraction will be taken independently and will result in some kind of disciplinary action, possibly including discharge.



LAYNE CHRISTENSEN COMPANY

HEALTH AND SAFETY PROGRAM

*Policy Issue Date:
September 1, 1999*

Revised: 5/24/00

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TABLE 12-1 - EMERGENCY INFORMATION

ACCIDENT PREVENTION POLICY STATEMENT

We must eliminate accidents and injuries, reduce all likely hazards from the work place and always operate with the safety of employees, customers and the public in mind. These are our highest priorities.

As employees of Layne Christensen Company, we believe that:

1. All injuries can be prevented. This is a realistic goal. Unless we fully believe that all injuries can be prevented, accidents will become acceptable.
2. Management is dedicated to preventing injuries and illnesses. Safety management is as important as any other aspect of our business.
3. All hazards must be controlled. Sources of danger will be eliminated and hazards will be controlled through special training, safety devices and protective equipment and clothing.
4. Safety is a condition of employment. From the first day on the job, we are accountable for safe working habits. Safety is as important as all other job responsibilities.
5. Employees will be trained to work safely. There will be safety rules and procedures for all jobs. Training is an ongoing process.
6. People are the most important element of our safety program. Intelligent, trained, motivated people make the safety program work.
7. Safety is important off-the-job. An off-the-job injury is no less painful than one suffered on-the-job and no less disruptive of our business.
8. Preventing injuries is good business. A safe business is a more productive business. Better safety management results in higher company morale.

These eight beliefs will be realized when all employees follow every safety procedure and cooperates fully with our accident prevention effort. Working safely is for your benefit as well as the benefit of others. Safety is not to be compromised on any job, nor shall expediency, productivity, or economics be substituted for safety when approaching a task.

Additional safety policies and procedures will be developed as new hazards are discovered in our industry and as government agencies mandate. All employees must fully understand and observe the safety practices and supervisors must continuously reinforce them to prevent accidents.

SECTION 1: INTRODUCTION

The Layne Christensen Company has a comprehensive health and safety program which covers all aspects of its operations. Layne Christensen Company recognizes the inherent dangers associated with the services it provides. The main purpose of this program is to anticipate all known hazards and establish a practical set of procedures to prevent injury, exposure or loss of life. The protection of the health, safety and well being of Layne Christensen employees and all others involved is of primary concern. The program complies with all applicable laws, rules and regulations concerning the health and safety of employees, the public and the environment.

Layne Christensen Company Project Managers, Field Superintendents, Engineers, Geologists, and Safety Coordinators utilize this document as a guide. It is written with the intent of developing the awareness of field personnel to the health and safety hazards which may exist during company operations.

Health and safety programs require extraordinary precautions to prevent injury, loss of life, or health hazards to employees and the public. This responsibility transcends all others related to company operations.

This program is administered by Layne Christensen Safety and Environmental Health Sciences (SEHS) department and is intended to provide basic guidelines for safe company operations. These procedures will help direct field operations on all projects. All work will be performed in accordance with applicable local, state, and federal rules and regulations including those of the U.S. Environmental Protection Agency, Occupational Safety and Health Administration, and Mine Safety and Health Administration. Strict Adherence to all sections of the following regulations will be enforced.

29 CFR 1926	"OSHA Construction Industry Standards"
30 CFR 1-99	"Mine Safety and Health Regulations"
29 CFR 1910.120	"Hazardous Waste Operations and Emergency Response"
40 CFR 311	"Worker Protection Standards for Hazardous Waste Operations & Emergency Response"
29 CFR 1910.134	"Respiratory Protection"
29 CFR 1910.146	"Confined Space Entry"
29 CFR 1910.1000	"Air Contaminants"
29 CFR 1910.95	"Occupational Noise Exposure"

49 CFR 172.101

"Hazardous Materials Tables, Hazardous Materials Communications Requirements and Emergency Response Information Requirements"

SECTION 2: RESPONSIBILITIES

Accident prevention is everyone's responsibility. We are all responsible for our actions and the resulting consequences. No job shall be considered efficiently performed unless all employees have followed every precaution to protect themselves and their fellow employees from injury. See Section 2: Responsibilities in the Layne Accident Prevention manual for corresponding information.

2.1 Project Manager

The project manager will direct the site operations. The project manager has the primary responsibility for:

- Assuring that all personnel are aware of the potential hazards of the site and the proper procedures for handling those hazards including any health and safety provisions in this program.
- Provide authorization to perform work on-site for personnel meeting medical surveillance and training requirements.
- Assuring required personal protection equipment is available and utilized properly by all site personnel.
- Monitoring the safety performance of personnel to ensure that mandatory health and safety procedures are adequate and correcting any performances that do not comply with this health and safety program.
- Consulting with Health and Safety Officer.
- Preparation and submittal of any and all project reports including progress, accident, incident and contractual.

2.2 Site Health and Safety Officer

The initial site health and safety officer will be a professional safety officer, trained in safety and industrial hygiene. After the project starts and the health and safety officer has had time to evaluate the potential for hazardous site conditions, he or she may determine that a member of the project team may assume the duties. The primary responsibilities of the site health and safety officer are:

- Advise the project manager on all health and safety related matters involved at the site.

- Implementation of the health and safety plan.
- Conduct worker exposure assessment (monitoring) to determine levels of personal equipment protection.
- Monitor workers for signs of heat or cold stress.
- Ensure that the field crews observe the appropriate work practices and decontamination procedures.
- Stop-work authorization which will be executed upon determination of an imminent safety hazard, emergency situation, or other potentially dangerous situations, (i.e. weather conditions) where this action is appropriate.
- Report any safety violations to the project manager.

2.3 Safety Supervisor

The safety supervisor for the drill crew will, in most cases, be the drill rig operator. The safety supervisor responsibilities are to:

- Consider the "responsibility" for safety and the "authority" to enforce safety to be a matter of first importance.
- Be a role model by in using proper personal safety gear and set an example in following the rules that are being enforced on others.
- Enforce the use of proper personal safety equipment and take appropriate corrective action when proper personal protective safety equipment is not being used.
- Understand that proper maintenance of tools and equipment and general "housekeeping" on the drill rig will provide the environment to promote and enforce safety.
- Ensure that the operator (who may be the safety supervisor) has had adequate training and is thoroughly familiar with the drill rig, its controls and its capabilities prior to commencement of drilling activities.
- Inspect the drill rig at least daily for structural damage, loose bolts and nuts, proper tension in chain drives, loose or missing guards or protective covers, fluid leaks, damaged hoses and/or damaged pressure gauges and pressure relief valves.
- Check and test all safety devices such as emergency shut-down switches at least daily and preferably at the start of a drilling shift. Drilling should not be permitted until all

emergency shutdown and warning systems are working correctly. Do not wire around, bypass or remove an emergency device.

- Check that all gauges, warning lights and control levers are functioning properly and listen for unusual sounds on each starting of an engine.
- Ensure that all new drill rig workers are informed of safe operating practices on and around the drill rig. Provide each new drill rig worker with a copy of the organization's drilling operations safety manual, and when appropriate the drill rig manufacturer's operations and maintenance manual. The safety supervisor should assure that each new employee reads and understands the safety manual.
- Ensure a first-aid kit and fire extinguisher are available and properly maintained on each drill rig and on each additional vehicle.
- Be well trained and capable of using first-aid kits, fire extinguisher and all other safety devices and equipment.
- Maintain a list of addresses and telephone numbers of emergency assistance units (ambulance services, police, hospitals, etc.) and inform other members of the drill crew of it's location.
- Carefully instruct a new worker in drilling safety and observe the new worker's progress towards understanding safe operating practices.
- Observe the mental, emotional and physical capability of each worker to perform the assigned work in a proper and safe manner. Dismiss any worker from the drill site whose mental and physical capabilities might cause injury to the worker or co-workers.

2.4 Drilling Crew and Other Field Personnel

These individuals will be those employees involved in field work. All personnel engaged in site activities are required to become thoroughly familiar with, and to conform to, the provisions of this plan, and such other safety directives as may be considered appropriate by Project Managers, Safety Officers, and Supervisors. Personnel are encouraged to offer ideas, suggestions or recommendations regarding any operational condition, procedure or practice, that may enhance the safety of site personnel or the public. Their primary responsibilities will be:

- Perform all required work safely.
- Familiarize themselves with and understand the site health and safety plan, including proper use of personal protective equipment.
- Report any unsafe conditions to supervisory personnel.
- Be aware of signs and symptoms of potential exposure to site contaminants and thermal stress.

SECTION 3: SITE ACCESS

3.1 Access

Access to contaminated work areas shall be regulated and limited to authorized persons. Personnel entering the site will meet the personal protective equipment requirements for the operation being conducted. Barricades and barricade tape will be utilized to control access to, or delineate various work areas. Any visitors to the site must present proper identification and be authorized for site access. Visitors must comply with all aspects of the health and safety plan.

SECTION 4: HAZARD ANALYSIS

4.1 Hazard Assessment

Different levels and types of hazards can be expected to be encountered during site operations. Each activity presents specific occupational hazards which must be addressed. The purpose of this assessment is to identify suspected conditions or activities that may pose routine occupational hazards or immediate danger to life or health of site personnel. This assessment also provides information for selection and application of personal protective equipment (PPE) and environmental monitoring methods.

4.1.1 Physical Hazards

Physical hazards expected to be encountered during work activities are listed below as:

slipping, tripping, falling, strains, cuts, bruises, puncture wounds, pinch points from heavy equipment, falling objects and splinters.

Exposure to these hazards will be minimized by using safe work practices and personnel protective equipment such as steel toe, steel shank boots, hardhat, gloves, etc.

4.1.2 Chemical Hazards

Exposure to contaminated soil and ground water during implementation of this plan is a possibility. Site personnel must be cautious of the flammability, skin absorption, skin contact, and inhalation routes of exposure. Environmental monitoring and the use of personal protective equipment will minimize exposure to potential site contaminants.

4.1.3 Biological Hazards

Biological hazards such as poisonous snakes, disease-bearing ticks and mosquitos may be encountered on several sites. To protect against these hazards, on-site personnel will wear long pants and boots that extend over the ankle. Insect repellent should also be applied as an effective deterrent.

**TABLE 4-1
HAZARD ANALYSIS**

WORK PHASE	HAZARD IDENTIFICATION	CONTROL METHOD
Site Setup/Survey	Ground Stability	Site preparation, visual clearance of overhead hazards, engineering clearance of underground hazards, safe work procedures and procedures, client involvement, crew training and communications, proper maintenance and inspections
	Ground Surface	
	Drill Pad Dimensions/Clearances	
	Overhead Hazards	
	Underground Hazards	
Equipment Movement/Setup	Mud Pit	Barricade or tape <i>immediately</i> after completion
	Loading/Unloading Rig from Transport	Safe work procedures
	Obstacles - equipment, employees, and others	Proper dill site organization and planning, use spotters, communication
	Leveling Jacks	Communication, safe work procedures
	Mast Elevation	Communication, visual clearance
	Setup Water Tanks	Proper material handling, PPE
	Setup Cyclone	Communication, safe work procedures
	Sample Hose Connections	Safe work procedures, safe use of tools
	Other Air/Water Hose Connections	Safe work procedures, safe use of tools
	Rod Stacking	Proper material handling, PPE
	Drilling Fluid Preparation	PPE, safe work procedures
	Drill Bit Setup	Communications, safe work procedures

**TABLE 4-1
HAZARD ANALYSIS**

WORK PHASE	HAZARD IDENTIFICATION	CONTROL METHOD
Drilling Operations	Rod Rotation	Physical guards, visual hazard identification, training
	Other Rotating Hazards (belts, chains, drive lines, etc.)	Physical guards, visual hazard identification, training
	Running and Pulling Rods	Safe work procedures, proper material handling
	Noise	Engineering, administration, PPE
	Dust	Engineering, administration, PPE
	High Pressure Hoses	Whip checks, visual inspection
	Breaking Rod Joint	Safe work procedures
	Blow Back/Blow Down Subs	Safe work procedures, PPE
	Water Swivel	Proper maintenance, inspection
	Knife Valve	Safe work procedures, PPE
	Down Hole Surveys/Cameras	Safe work procedures, PPE, training
	Core Recovery - pulling and emptying inner tube, assembly of inner tube and barrel.	Safe work procedures, PPE, training
	Changing Overshot Lifting Dogs	Safe work procedures, PPE, training
Maintenance	Batteries - jumping, servicing	Safe work procedures, PPE, training
	Tire Changing	Safe work procedures, PPE, training
Maintenance - Continued	Engine Maintenance	Safe work procedures, PPE, training
	Refueling	Safe work procedures, PPE, training
	Servicing Pressure Systems	Safe work procedures, PPE, training

**TABLE 4-1
HAZARD ANALYSIS**

WORK PHASE	HAZARD IDENTIFICATION	CONTROL METHOD
Miscellaneous - These types of hazards may be found in some or all of the operations listed above.	Night Work (visibility)	Proper lighting, safe work procedures
	Chemical Hazards	Safe work procedures, PPE, training
	Noise	Engineering, administration, PPE
	Dust	Engineering, administration, PPE
	Working at Height	Safe work procedures, PPE, training
	Equipment Fires	Safe work procedures, training, safety inspections
	Oxygen/Acetylene Cutting	Safe work procedures, PPE, training
	Arc Welding	Safe work procedures, PPE, training
	Wire Rope	Safe work procedures, PPE, training
	Housekeeping	Safe work procedures, safety inspections
	Material Handling	Safe work procedures, training
	Natural Chemicals	Stop work and notify a supervisor immediately

4.2 Environmental Monitoring

4.2.1 Overview

If necessary, Layne Christensen Company has the capability for ambient air characterization at hazardous work sites. Equipment is available for determining oxygen levels, explosive limits, concentrations of inorganic and organic gases and vapors, aerosols (dust mist and fumes) radionuclides and noise levels. Most of these instruments are direct reading for on the spot determinations; however, some may be determined on an eight (8) hour basis in order to obtain time weighted averages for hazardous work areas.

Airborne contaminants can present a significant threat to the health and safety of site personnel. Monitoring for these airborne contaminants is an essential component of this health and safety plan. Results of this monitoring will be used for:

- delineating areas where personal protection is needed.
- selecting personal protective equipment.
- assessing the potential health effects of occupational exposure.
- determining the need for specific medical monitoring.
- regulatory compliance.

Two principle areas will be monitored during site operations. These consist of organic vapors and explosive vapors/gasses. On-site use of direct reading instruments will be used for this purpose. Organic vapor monitors, oxygen/explosive meters, colorimetric tubes, multi-gas meters, etc. are all examples of equipment that may be incorporated. Selection of the appropriate equipment shall be made by the site Health and Safety Officer based on historical information, physical state of the contaminants, and operational activities. Any equipment used on site must be calibrated and maintained in accordance with manufactures requirements.

4.2.2 Available Equipment List

- Draeger grab-sampling gas detector bellows with colorimetric indicator tubes.
- Gillian GilAir high/low flow pump with Gilibrator
- Dupont Model CMK-1 and MK-2 audio dosimeter/sound level meter.
- Quest Sound Level Meter, Model 215 and Quest CA-12 acoustical calibrator.
- Hnu Photoionization Detectors with 10.2eV and 11.7 eV probes.
- Foxboro Century 128 GC organic vapor analysis flameionization detector.
- BioSystems Models PHD 2 and PHD Plus four gas meters.
- Industrial Scientific Personal Explosimeter and H₂S meters.
- Radiation Alert Monitor (RAM4).
- Ludlum Model 3 Survey Meter with GM pancake probe and Alpha scintillator.
- PPM hand held aerosol monitor.

Calibration procedures are outlined in Appendixes A through F for the Organic Vapor Meters, Combustible gas Indicators, Handheld Aerosol Monitor, and the Draeger pump.

4.3 Action Levels

If necessary, action levels will be established to determine the levels of protection or actions required in the event contaminants are detected. Any action taken will be the decision of the site Health and Safety Officer. Table 4-2 lists the type of monitoring equipment, action levels, and actions to be taken.

TABLE 4-2 GENERAL ACTION LEVELS*			
Hazard	Monitoring Equipment	Action Level	Protective Measures
Organic Vapors	Hnu, OVA	0 ppm	Level D
		>0 ppm	Evacuate area and reassess.
Oxygen	O2/Explosive Meter PHD 2 or PHD Plus	<19.5 %	Evacuate area.
		19.5 - 23.0 %	Continue work.
		>23.0 %	Evacuate area.
Explosive Vapors	O2/Explosive Meter PHD 2 or PHD Plus	<10 % LEL	Continue work.
		>10 % LEL	Evacuate area.
Radionucleides	Ludlum 3 RAM 4	<0.02 mR/hr	Evacuate area and notify SEHS.
Aerosols	Hand-held Aerosol Monitor (HAM)	<10 mg/m ³	Evacuate area and reassess.

* *Action levels are subject to change based on site specific conditions.*

4.4 Overhead and Buried Utilities

The use of a drill rig on a site or project within the vicinity of electrical power lines and other utilities requires that special precautions be taken by both supervisors and the members of the crew. Electricity can shock, burn, and cause death.

- Overhead and buried utilities should be located, noted and emphasized on all boring location plans and boring assignment sheets.
- When overhead electrical lines exist at or near a drilling site or project, consider all wires to be alive and dangerous.
- Watch for sagging power lines before entering a site. Do not lift power lines to gain entrance. Call the utility and ask them to raise the power lines or de-energize(turn off) the power.

- Before raising the drill rig mast(derrick) on a site in the vicinity of power lines, walk completely around the drill rig. Determine what the minimum distance from any point on the drill rig to the nearest power line will be when the mast is raised and/or being raised. The minimum distance from the rig to power lines is 10 feet (3m) and increases as line voltage increases, however, the rig should be set up at a distance from the power lines equal to the length of the mast. This will provide adequate separation. Consult Layne Safety Compliance Procedure B1 for more information..

SECTION 5: PERSONAL PROTECTION

5.1 Overview

If necessary, protective clothing and respiratory protection help prevent on site workers from coming in contact with contaminants. It is imperative that personal protective equipment be appropriate to protect against the known potential hazards for each work site. The selection of protective equipment will be based upon the types, concentrations, and routes of personal exposure that may be encountered.

There are four (4) levels of personal protection recommended by the Environmental Protection Agency. Level D is used, however, a Modified Level D may be required for additional dermal protection. Upgrading to Level C is required when contamination levels require protection from bodily contact and the filtering of breathing air. Level B will be used when contamination requires protection from bodily contact and the use of a supplied breathable air source. Level A provides the highest available protection from bodily contact, respiratory and eye irritation. The following are descriptions of the equipment required for each level of personal protection.

Levels of Protection:

- Level D - Work uniform.
Gloves - leather or chemically resistant.
Safety boots (steel toe and shank).
Hardhat.
Eye protection.
Hearing protection (as applicable).

- Modified Level D - Chemically resistant tyveks (polycoated/saranex).
Inner latex gloves.
Outer chemically resistant gloves.
Chemically resistant safety boots.
Hardhat.
Eye protection.
Hearing protection (as applicable).

- Level C - Chemically resistant tyveks (polycoated/saranex).
Inner latex gloves.
Outer chemically resistant gloves.
Chemically resistant safety boots.
Outer disposable chemically resistant boots.
Full-face, air purifying respirator (APR).
NIOSH/MSHA approved air purifying cartridges (HEPA).
Emergency escape respirator (as applicable).
Hardhat.
Hearing protection (as applicable).

- Level B - Chemically resistant tyveks (polycoated/saranex).
 Inner latex gloves.
 Outer chemically resistant gloves.
 Chemically resistant safety boots.
 Outer disposable chemically resistant boots.
 Full-face supplied air respirator.
 Emergency escape 5 minute air supply.
 Hardhat.
 Hearing protection (as applicable).

5.2 Respiratory Protection - General

- Only properly cleaned, maintained, NIOSH/MHSA approved respirators shall be used on-site.
- Selection of respirators, as well as any decisions regarding upgrading or downgrading of respiratory protection will be made by the Health and Safety Officer.
- Air purifying cartridges shall be replaced at the end of each shift or when load-up or breakthrough occur.
- Only employees who have had pre-issue qualitative fit tests and semi-annual fit tests thereafter, shall be allowed to work in atmospheres where respirators are required.
- Contact lenses are not to be worn.
- Excessive facial hair (e.g. beards) prohibits proper face fit and effectiveness of air purifying respirators. Persons required to wear respiratory protection must not have beards, etc. All personnel will be required to be clean shaven prior to each day's shift.
- Regular eyeglasses cannot be worn with full face respirators (breaks the facepiece seal). Inserts must be utilized.
- The respiratory protection utilized on-site will be in compliance with OSHA, 29 CFR 1910.134.

5.3 Communication Procedures

The following standard hand signals will be used in case of failure of radio communications:

- Hand gripping throat.....Out of air, can't breathe
- Gripping partners wrist or put both hands around partners wrist.....Leave area immediately.
- Hands on top of head.....Need assistance
- Thumbs up.....OK, I am all right, I understand
- Thumbs down.....No, negative

SECTION 6: HEALTH AND SAFETY PROCEDURES

6.1 Unsafe Situations

- All employees are directed to bring to the attention of the most readily accessible supervisor any unsafe condition, practice, or circumstance associated with or resulting from site activities.
- In case of immediate hazard to employees or the public, any employee on the scene should take all practicable steps to eliminate or neutralize the hazard, this may include leaving the site. Follow-up consultation with the Project Manager or Supervisor must then be made at the first opportunity. In such circumstances the Project Manager or Supervisor must take, or cause to be taken, the necessary steps to ensure that the project can be completed safely. Such steps may include changes in procedure, removal or neutralization of a hazard, or consultation with appropriate experts. In cases where the hazard is not immediate, the employee should consult the supervisor or management regarding appropriate corrective measures. Application of this rule requires exercising good judgment and common sense by all employees.

6.2 Personal Precautions

- Eating, drinking chewing gum or tobacco, smoking, or any practices that increase the probability of hand-to-mouth transfer and ingestion of material is prohibited in any area designated as contaminated.
- Hands and face must be thoroughly washed upon leaving potentially contaminated work areas.
- Whenever decontamination procedures for outer garments are in effect, the entire body should be thoroughly washed as soon as possible after the protective garment is removed.
- Contact with contaminated or suspected contaminated surfaces should be avoided. Whenever possible, do not walk through puddles, leachate, or discolored surfaces; or lean, sit, or place equipment on drums, containers, or on soil suspected of being contaminated.
- Medicine and alcohol will not be used during work activities. Prescribed drugs will not be taken by personnel where the potential for absorption, inhalation, or ingestion of toxic substances exists unless specifically approved by a qualified physician. Alcoholic beverages intake is prohibited during company operations.

6.3 On-site Personal Requirements

- All personnel going on site must be thoroughly briefed on anticipated hazards, and trained on equipment to be worn, safety procedures, emergency procedures, and communications.
- Personnel on site must use the buddy system when wearing respiratory protective equipment.
- Visual contact must be maintained between crew teams on site and site safety personnel. Drilling crew members should remain close together to assist each other during emergencies.
- All field personnel should make full use of their senses to alert themselves to potentially dangerous situations which they should avoid.
- Personnel should practice unfamiliar operations prior to operations.
- Field personnel, shall be familiar with the physical characteristics of the site, including:
 - * wind direction in relation to the working area.
 - * accessibility to associates, equipment, and vehicles.
 - * communications.
 - * operation zones.
 - * site access.
 - * nearest water sources.
- Personnel and equipment in the working area should be kept to a minimum, consistent with effective site operations.
- Procedures for leaving a work area must be planned and implemented prior to going on site in accordance with the site health and safety plan.
- All visitors to the job site must comply with the health and safety plan procedures. Personal protective equipment may be modified for visitors depending on the situation. Any modifications must be approved by the site Health and Safety Officer.
- The nearest hospital or medical care facility shall be located. Emergency phone numbers (police, fire, hospital, ambulance, poison center) shall be available on-site in case of incident.

6.4 General Work Practices

- At least one copy of this procedure shall be available at each job work site.

- Contaminated reusable protective equipment, such as respirators, hoses, boots, etc., shall not be removed from the regulated area until it has been cleaned, or properly packaged and labeled.
- Legible and understandable precautionary labels shall be affixed prominently to containers of contaminated scrap, waste, debris, and clothing.
- Removal of contaminated soil from protective clothing or equipment by blowing, shaking, or any other means which disperse contaminants into the air is prohibited.
- Transportation and disposal of contaminated materials shall comply with all applicable local, state, and federal regulations. These items will be addressed by the transporter and disposer.
- Contaminated materials shall be stored in tightly closed containers in well ventilated areas.
- Containers shall be moved only with the proper equipment and shall be secured to prevent dropping or loss of control during transport.
- All trenching, shoring, and excavation work must comply with all federal OSHA rules.
- Disposable equipment, such as protective clothing, shall be disposed of in containers labeled in accordance with appropriate state and federal standards.
- Portable or fixed emergency shower/eyewash stations shall be located near work activities.

6.5 Confined Space Entry Practices

On occasion personnel must enter a confined space that is characterized by having limited openings for entry or exit, has lack of natural air movement, or is not designed for continuous occupancy due to air contaminants in dangerous levels or limited movement. For these reasons, our personnel need specific procedures to follow for entry and instruments to determine safe entry and work. Safety Compliance Procedures can be found in Attachment 2.

6.6 Drilling Specific Safety Procedures

6.6.1 Housekeeping

The first requirement for safe field operations is that the safety supervisor understands and fulfills the responsibility for maintenance and "housekeeping" on and around the drill rig.

- Suitable storage locations should be provided for all tools, materials and supplies so that tools, materials and supplies can be conveniently and safely handled without hitting or falling on a member of the drill crew or a visitor.
- Avoid storing or transporting tools, materials or supplies within or on the mast (derrick) of the drill rig.
- Pipe, drill rods, casing augers and similar drilling tools should be orderly stacked on racks or sills to prevent spreading, rolling or sliding.
- Penetration or other driving hammers should be placed at a safe location on the ground or be secured to prevent movement when not in use.
- Work areas, platforms, walkways, scaffolding and other accesses should be kept free of materials, debris and obstructions and substances such as ice, grease or oil that could cause a surface to become slick or otherwise hazardous.
- Keep all controls, control linkages, warning and operation lights and lenses free of oil, grease and/or ice.
- Do not store gasoline in any portable container other than a non-sparking, red safety container with a flame arrester in the fill spout and having the word "gasoline" easily visible.

6.6.2 Maintenance

Good maintenance will make drilling operations safer. Also, maintenance should be performed safely.

- Wear safety glasses when performing maintenance on a drill rig or on drilling tools.
- Shut down the drill rig engine to make repairs or adjustments to a drill rig or to lubricate fittings (except repairs or adjustments that can only be made with the engine running). Take precautions to prevent accidental starting of an engine during maintenance by removing or tagging the ignition key.
- Always block the wheels or lower the leveling jacks or both and set hand brakes before working under a drill rig.
- When possible and appropriate, release all pressure on the hydraulic systems, the drilling fluid system and the air pressure systems of the drill rig prior to performing maintenance. In other words, reduce the drill rig and operating systems to a "zero energy state" before performing maintenance. Use extreme caution when opening drain plugs and radiator caps and other pressurized plugs and caps.
- Do not touch an engine or the exhaust system of an engine following its operation until the engine and exhaust system have adequate time to cool.

- Never weld or cut on or near a fuel tank.
- Do not use gasoline or other volatile or flammable liquids as a cleaning agent on or around a drill rig.
- Follow the manufacturer's recommendations for applying the proper quantity and quality of lubricants, hydraulic oils and/or coolants.
- Replace all caps, filler plugs, protective guards, panels, high pressure hose clamps, chains or cables that have been removed for maintenance.

6.6.3 Hand Tools

There are almost an infinite number of hand tools that can be used on or around a drill rig and in repair shops and more than an equal number of instructions for proper use. "Use the tool for its intended purpose" is the most important rule. The following are a few specific and some general suggestions which apply to safe use of several hand tools that are often used on and around drill rigs.

- When a tool becomes damaged, either repair it before using it again or get rid of it.
- When using a hammer, any kind of hammer for any purpose, wear safety glasses and require all others around you to wear safety glasses.
- When using chisel, any kind of chisel, for any purpose, wear safety glasses and require all others around you to wear safety glasses.
- Keep all tools cleaned and orderly stored when not in use.
- Use wrenches not nuts - don't use pliers on nuts.
- Use screwdrivers with blades that fit the screw slot.
- When using a wrench on a tight nut - first use some penetrating oil, use the largest wrench available that fits the nut, when possible pull on the wrench handle rather than pushing, and apply force to the wrench with both hands when possible and with both feet firmly placed. Don't push or pull with one or both feet on the drill rig or the side of a mud pit or some other blocking-off device. Always assume that you may lose your footing - check the place where you may fall for sharp objects.
- Keep all pipe wrenches clean and in good repair. The jaws of pipe wrenches should be wire brushed frequently to prevent an accumulation of dirt and grease which would otherwise build up and cause wrenches to slip.
- Never use pipe wrenches in place of a rod holding device.
- Replace hook and heel jaws when they become visibly worn.

- When breaking tool joints on the ground or on a drilling platform, position your hands so that your fingers will not be smashed between the wrench handle and the ground or the platform, should the wrench slip or the joint suddenly let go.

6.6.4 Clearing Work Area

Prior to drilling, adequate site clearing and leveling should be performed to accommodate the drill rig and supplies and provide a safe working area. Drilling should not be commenced when tree limbs, unstable ground or site obstructions cause unsafe tool handling conditions.

6.6.5 Start-Up

- All drill rig personnel and visitors should be instructed to "stand clear" of the drill rig immediately prior to and during starting of an engine.
- Make sure all gear boxes are in neutral, all hoist levers are disengaged, all hydraulic levers are in the correct non-actuating positions and the cathead rope is not on the cathead before starting a drill rig engine.
- Start all engines according to the manufacturer's manual.

6.6.6 Drilling Operations

Safety requires the attention and cooperation of every worker and site visitor.

- Do not drive the drill rig from hole to hole with the mast (derrick) in the raised position.
- Before raising the mast (derrick) look up to check for overhead obstructions. (Refer to Section 11 on Overhead and Buried Utilities.)
- Before raising the mast (derrick), all drill rig personnel (with the exception of the operator) and visitors should be cleared from the areas immediately to the rear and the sides of the mast. All drill rig personnel and visitors should be informed that the mast is being raised prior to raising it.
- Before the mast (derrick) of a drill rig is raised and drilling is commenced, the drill rig must be first leveled and stabilized with leveling jacks and/or solid cribbing. The drill rig should be relevelled if it settles after initial set up. Lower the mast (derrick) only when the leveling jacks are down and do not raise the leveling jack pads until the mast (derrick) is lowered completely.
- Before starting drilling operations, secure and/or lock the mast (derrick) if required according to the drill manufacturer's recommendations.

- The operator of a drill rig will only operate a drill rig from the position of the controls. If the operator of the drill rig must leave the area of the controls, the operator should shift the transmission controlling the rotary drive into neutral and place the feed control lever in neutral. The operator should shut down the drill engine before leaving the vicinity of the drill.
- Throwing or dropping tools should not be permitted. All tools should be carefully passed by hand between personnel or a hoist line should be used.
- Do not consume alcoholic beverages or other depressants or chemical stimulants prior to starting work on a drill rig or while on the job.
- If it is necessary to drill within an enclosed area, make certain that exhaust fumes are conducted out of the area. Exhaust fumes can be toxic and some cannot be detected by smell.
- Clean mud and grease from your boots before mounting a drill platform and use hand holds and railings. Watch for slippery ground when dismounting from the platform.
- During freezing weather, do not touch any metal parts of the drill rig with exposed flesh. Freezing of moist skin to metal can occur almost instantaneously.
- All air and water lines and pumps should be drained when not in use if freezing weather is expected.
- All unattended bore holes must be adequately covered or otherwise protected to prevent drill rig personnel, site visitors or animals from stepping or falling into the hole. All open bore holes should be covered, protected or backfilled adequately and according to local or state regulations on completion of the drilling project.
- "Horsing around" within the vicinity of the drill rig and tool and supply storage areas should never be allowed, even when the drill rig is shut down.
- When using a ladder on a drill rig, face the ladder and grasp either the side rails or the rungs with both hands while ascending or descending. Always use adequate fall protection and a full body harness when climbing above 6 feet of the ground. Do not attempt to use one or both hands to carry a tool while on a ladder. Use a hoist line and a tool "bucket" or a safety hook to raise or lower hand tools.

Evaluated derrick platform should be used with the following precautions:

- When working on a derrick platform, use a full body harness and a fall protection. The harness should fit snugly but comfortably. The lifeline, when attached to the derrick, should be less than six feet (2 m) long and attached to a fall arrester. The harness and lifeline should be strong enough to withstand the dynamic force of a 250 pound (115 kg) weight (contained within the belt) falling six feet (2 m).
- When climbing to a derrick platform that is higher than 6 feet (2 m), a fall arresting device must be used.

- When a rig worker is on a derrick platform, the lifeline should be fastened to the derrick just above the derrick platform and to a structural member that is not attached to the platform or to other lines or cables supporting the platform.
- When a rig worker first arrives at a derrick platform, the platform should immediately be inspected for broken members, loose connections and loose tools or other loose materials.
- Tools should be securely attached to the platform with safety lines. Do not attach a tool to a line attached to your wrist or any other part of your body.
- When you are working on a derrick platform, do not guide drill rods or pipe into racks or other supports by taking hold of a moving hoist line or a traveling block.
- Loose tools and similar items should not be left on the derrick platform or on structural members of the derrick.
- A derrick platform over four feet (1.2 m) above ground surface should have toe boards and safety railing that are in good condition.
- Workers on the ground or the drilling floor should avoid being under rig workers on elevated platforms, whenever possible.

Be careful when lifting heavy objects:

- Before lifting any object without using a hoist, make sure that the load is within your personal lifting capacity. If it is too heavy, ask for assistance.
- Before lifting a relatively heavy object, approach the object by bending at the knees, keeping your back vertical and straight while obtaining a firm footing. Grasp the object firmly with both hands and stand slowly and squarely while keeping your back vertical and straight. In other words, perform the lifting with the muscles in your legs, not with the muscles in your lower back.
- If a heavy object must be moved some distance without the aid of machinery, keep your back straight and straight. Change directions by moving your feet, not by twisting you body.
- Move heavy objects with the aid of hand carts or lifting devices whenever possible.

Drilling operations will be terminated during an electrical storm and all crew members will move away from the drill rig. If lightning is observed, shutdown all rig operations immediately.

6.6.7 Use of Wire Line Hoists, Wire Rope and Hoisting Hardware

The use of wire line hoists, wire rope and hoisting hardware should be as stipulated by the American Iron Steel Institute Wire Rope Users Manual.

- All wire ropes and fittings should be visually inspected during use and thoroughly inspected at least once a week for: abrasion, broken wires, wear, reduction in rope diameter, reduction

in wire diameter, fatigue, corrosion, damage from heat, improper reeving, jamming, crushing, bird caging, kinking, core protrusion and damage to lifting hardware. Wire ropes should be replaced when inspection indicated excessive damage according to the Wire Rope Users Manual. All wire ropes which have not been used for a period of a month or more should be thoroughly inspected before being returned to service.

- End fittings and connections consist of spliced eyes and various manufactured devices. All manufactured end fittings and connections should be installed according to the manufacturer's instructions and loaded according to the manufacturer's specifications.
- If a ball-bearing type hoisting swivel is used to hoist drill rods, swivel bearings should be inspected and lubricated daily to assure that the swivel freely rotates under load.
- If a rod slipping device is used to hoist drill rods, do not drill through or rotate drill rods through the slipping device, do not hoist more than 1 foot (.3 m) of the drill rod column above the top of the mast (derrick), do not hoist a rod column with loose tool joints while the rod column is being supported by a rod slipping device. If drill rods should slip back into the bore hole, do not attempt to break the fall of the rods with your hands or by applying tension to the slipping device.
- Most sheaves on exploration drill rigs are stationary with a single part line. The number of parts of line should not ever be increased without first consulting with the manufacturer of the drill rig.
- Wire ropes must be properly matched with each sheave - if the rope is too large, the sheave will pinch the wire rope - if the rope is too small, it will groove the sheave. Once the sheave is grooved, it will severely pinch and damage larger sized wire ropes and therefore must be replaced.

The following procedures and precautions must be understood and implemented for safe use of wire ropes and rigging hardware.

- Use tool handling hoists only for vertical lifting of tools (except when angle hole drilling). Do not use tool handling hoists to pull on objects always from the drill rig; however, drills may be moved using the main hoist if the wire rope is spooled through proper sheaves according to the manufacturer's recommendations.
- When struck tools or similar loads cannot be raised with a hoist, disconnect the hoist line and connect the stuck tools directly to the feed mechanism of the drill. Do not use hydraulic leveling jacks for added pull to the hoist line or the feed mechanism of the drill.
- When attempting to pull out a mired down vehicle or drill rig carrier, only use a winch on the front or rear of the vehicle and stay as far as possible away from the wire rope. Do not attempt to use tool hoists to pull out a mired down vehicle or drill rig carrier.
- Minimize shock loading of a wire rope - apply loads smoothly and steadily.
- Avoid sudden loading in cold weather.

- Never use frozen ropes.
- Protect wire rope from sharp corners or edges.
- Replace faulty guides and rollers.
- Replace damaged safety latches on safety hooks before using.
- Know the safe working load of the equipment and tackle being used. Never exceed this limit.
- Clutches and brakes of hoists should be periodically inspected and tested.
- Know and do not exceed the rated capacity of hooks, rings, links, swivels, shackles and other lifting aids.
- Always wear gloves when handling wire ropes.
- Do not guide wire rope on hoist drums with your hands.
- Following the installation of a new wire rope, first lift a light load to allow the wire rope to adjust.
- Never carry out any hoisting operations when the weather conditions are such that hazards to personnel, the public or property are created.
- Never leave a load suspended in the air when the hoist is unattended.
- Keep your hands away from hoists, wire rope, hoisting hooks, sheaves and pinch points as slack is being taken up and when the load is being hoisted.
- Never hoist the load over the head, body or feet of any personnel.
- Never use a hoist line to "ride" up the mast (derrick) of a drill rig.
- Replacement wire ropes should conform to the drill rig manufacturer's specifications.

6.6.8 Use of Cathead and Rope Hoists

The following safety procedures should be employed when using a cathead hoist.

- Keep the cathead clean and free of rust and oil and/or grease. The cathead should be cleaned with a wire brush if it becomes rusty.
- Check the cathead periodically, when the engine is not running, for rope wear grooves. If a rope groove forms to a depth greater than 1/8 inches (3 mm), the cathead should be replaced.

- Always use a clean, dry, sound rope. A wet or oily rope may "grab" the cathead and cause drill tools or other items to be rapidly hoisted to the top of the mast.
- Should the rope "grab" the cathead or otherwise become tangled in the drum, release the rope and sound an appropriate alarm for all personnel to rapidly back away and stay clear. The operator should also back away and stay clear. If the rope "grabs" the cathead, and tools are hoisted to the sheaves at the top of the mast, the rope will often break, releasing the tools. If the rope does not break, stay clear of the drill rig until the operator cautiously returns to turn off the drill rig engine and appropriate action is taken to release the tools. The operator should keep careful watch on the suspended tools and should quickly back away after turning off the engine.
- The rope should always be protected from contact with all chemicals. Chemicals can cause deterioration of the rope that may not be visibly detectable.
- Never wrap the rope from the cathead (or any other rope, wire rope or cable on the drill rig) around a hand, wrist, arm, foot, ankle, leg or any other part of your body.
- Always maintain a minimum of 18 inches of clearance between the operating hand and the cathead drum when driving samplers, casing or other tools with the cathead and rope method. Be aware that the rope advances toward the cathead with each hammer blow as the sampler or other drilling tool advances into the ground.
- Never operate a cathead (or perform any other task around a drill rig) with loose unbuttoned or otherwise unfastened clothing or when wearing gloves with large cuffs or loose straps or lacings.
- Do not use a rope that is any longer than necessary. A rope that is too long can form a ground loop or otherwise become entangled with the operator's legs.
- Do not use more rope wraps than are required to hoist a load.
- Do not leave a cathead unattended with the rope wrapped on the drum.
- Position all other hoist lines to prevent contact with the operating cathead rope.
- When using the cathead and rope for driving or back-driving, make sure that all threaded connections are tight and stay as far away as possible from the hammer impact point.
- The cathead operator must be able to operate the cathead standing on a level surface with good, firm footing conditions without distraction or disturbance.

6.6.9 Use of Augers

The following general procedures should be used when starting a boring with continuous flight of hollow-stem augers:

- Prepare to start an auger boring with the drill rig level, the clutch or hydraulic rotation control disengaged, the transmission in low gear and the engine running at low RPM.
- Apply an adequate amount of down pressure prior to rotation to seat the auger head below the ground surface.
- Look at the auger head while slowly engaging the clutch or rotation control and starting rotation. Stay clear of the auger.
- Slowly rotate the auger and auger head while continuing to apply down pressure. Keep one hand on the clutch or the rotation control at all times until the auger has penetrated about one foot or more below ground surface.
- If the auger head slides out of alignment, disengage the clutch or hydraulic rotation control and repeat the hole starting process.
- An auger guide can facilitate the starting of a straight hole through hard ground or a pavement.
- The operator and tool handler should establish a system of responsibility for the series of various activities required for auger drilling, such as connecting and disconnection auger sections, and inserting and removing the auger fork. The operator must assure that the tool handler is well away from the auger column and that the auger fork is removed before starting rotation.
- Only use the manufacturer's recommended method of securing the auger to the power coupling. Do not touch the coupling or the auger with your hands, a wrench or any other tools during rotation.
- Whenever possible, use tool hoists to handle auger sections.
- Never place hands or fingers under the bottom of an auger section when hoisting the auger over the top of the auger section in the ground or other hard surfaces such as the drill rig platform.
- Never allow feet to get under the auger section that is being hoisted.
- When rotating augers, stay clear of the rotating auger and other rotating components of the drill rig. Never reach behind or around a rotating auger for any reason whatever.
- Use a long-handled shovel to move auger cuttings away from the auger. Never use your hands or feet to move cuttings away from the auger.
- Do not attempt to remove earth from rotating augers. Augers should be cleaned only when the drill rig is in neutral and the augers are stopped from rotating.

6.6.10 Rotary and Core Drilling

Rotary drilling tools should be safety checked prior to drilling:

- Water swivels and hoisting plugs should be lubricated and checked for "frozen" bearings before use.
- Drill rod chuck jaws should be checked periodically and replaced when necessary.
- The capacities of hoists and sheaves should be checked against the anticipated weight to the drill rod string plus other expected hoisting loads.

Special precautions that should be taken for safe rotary or core drilling involve chucking, joint break, hoisting and lowering of drill rods:

- Only the operator of the drill rig should brake or set a manual chuck so that rotation of the chuck will not occur prior to removing the wrench from the chuck.
- Drill rods should not be braked during lowering into the hole with drill rod chuck jaws.
- Drill rods should not be held or lowered into the hole with pipe wrenches.
- If a string of drill rods are accidentally or inadvertently released into the hole, do not attempt to grab the falling rods with your hands or a wrench.
- In the event of a plugged bit or other circulation blockage, the high pressure in the piping and hose between the pump and the obstruction should be relieved or bled down before breaking the first tool joint.
- When drill rods are hoisted from the hole, they should be cleaned for safe handling with a rubber or other suitable rod wiper. Do not use your hands to clean drilling fluids from drill rods.
- If work must progress over a portable drilling fluid (mud) pit, do not attempt to stand on narrow sides or cross members. The mud pit should be equipped with rough surfaced, fitted cover panels of adequate strength to hold drill rig personnel.
- Drill rods should not be lifted and leaned unsecured against the mast. Either provide some method of securing the upper ends of the drill rod sections for safe vertical storage or lay the rods down.

6.6.11 Travel

The individual who transports a drill rig on and off a drilling site should:

- Be properly licensed and should only operate the vehicle according to federal, state and local regulations.

- Know the traveling height (overhead clearance), width, length and weight of the drill rig with carrier and know highway and bridge load, width and overhead limits, making sure these limits are not exceeded with an adequate margin.
- Never move a drill rig unless the vehicle brakes are in sound working order.
- Allow for mast overhand when cornering or approaching other vehicles or structures.
- Be aware that the canopies of service stations and motels are often too low for a drill rig mast to clear with the mast in the travel position.
- Watch for low hanging electrical lines, particularly at the entrances to drilling sites or restaurants, motels other commercial sites.
- Never travel on a street, road, highway with the mast (derrick) of the drill rig in the raised or partially raised position.
- Remove all ignition keys when a drill rig is left unattended.

6.6.12 Loading and Unloading

- Use ramps of adequate design that are solid and substantial enough to bear the weight of the drill rig with carrier - including tools.
- Load and unload on level ground.
- Use the assistance of someone on the ground as a guide.
- Check the brakes on the drill rig carrier before approaching loading ramps.
- Distribute the weight of the drill rig, carrier and tools on the trailer so that the center of weight is approximately on the center-line of the trailer and so that some of the trailer load is transferred to the hitch of the pulling vehicle. Refer to the trailer manufacturer's weight distribution recommendations.
- The drill rig and tools should be secured to the hauling vehicle with ties, chains and/or load binders of adequate capacity.

6.6.13 Off-Road Movement

The following safety suggestions relate to off-road movement:

- Before moving a drill rig, first walk the route of travel, inspecting for depressions, stumps, gullies, ruts and similar obstacles.

- Always check the brakes of a drill rig carrier before traveling, particularly on rough, uneven or hilly ground.
- Check the complete drive train of a carrier at least weekly for loose or damaged bolts, nuts, studs, shafts and mountings.
- Discharge all passengers before moving a drill rig on rough or hilly terrain.
- Engage the front axle (for 4 x 4, 6 x 6, etc. vehicles or carriers) when traveling off highway on hilly terrain.
- Use caution when traveling side-hill. Conservatively evaluate side-hill capability of drill rigs, because the arbitrary addition of drilling tools may raise the center of mass. When possible, travel directly uphill or downhill. Increase tire pressures before traveling in hilly terrain (do not exceed rated tire pressure).
- Attempt to cross obstacles such as small logs and small erosion channels or ditches squarely, not at an angle.
- Use the assistance of someone on the ground as a guide when lateral or overhead clearance is close.
- After the drill has been moved to a new drilling site, set all brakes and/or locks. Always block/chock the wheels.

6.6.14 Tires, Batteries and Fuel

Tires on the drill rig must be checked daily for safety and during extended travel for loss of air and they must be maintained and/or repaired in a safe manner. If tires are deflated to reduce ground pressure for movement on soft ground, the tires should be inflated to normal pressures before movement on firm or hilly ground or on streets, roads and highways. Under inflated tires are not as stable on firm ground as properly inflated tires. Air pressures should be maintained for travel on streets, roads and highways according to the manufacturer's recommendations. During air pressure checks, inspect for:

- Missing or loose wheel lugs.
- Objects wedged between dual tires or embedded in the tire casing.
- Damaged or poorly fitting rims or rim flanges.
- Abnormal wear, cuts, breaks or tears in the casing.
- The repair of truck and off-highway tires should only be made with required special tools and following the recommendations of a tire manufacturer's repair manual.

Batteries contain strong acid. Use extreme caution when servicing batteries.

- Batteries should only be serviced in a ventilated area while wearing safety glasses.
- When a battery is removed from a vehicle or service unit, disconnect the battery ground clamp first.
- When installing a battery, connect the battery ground clamp last.
- When charging a battery with a battery charger, turn off the power source to the battery before either connecting or disconnecting charger leads to the battery posts. Cell caps should be loosened prior to charging to permit the escape of gas.
- Spilled battery acid can burn your skin and damage your eyes. Spilled battery acid should be immediately flushed off of your skin with lots of water. Should battery acid get into someone's eyes, flush immediately with large amounts of water and see a medical physician at once.
- To avoid battery explosions, keep the cells filled with electrolyte, use a flashlight (not an open flame) to check electrolyte levels and avoid creating sparks around the battery by shorting across a battery terminal. Keep lighted smoking materials and flames away from batteries.

Special precautions must be taken for handling fuel and refueling the drill rig or carrier.

- Only use the type and quality of fuel recommended by the engine manufacturer.
- Refuel in a well-ventilated area.
- Do not fill fuel tanks while the engine is running. Turn off all electrical switches.
- Do not spill fuel on hot surfaces. Clean any spillage before starting an engine.
- Wipe up spilled fuel with cotton rags or cloths - do not use wool or metallic cloth.
- Keep open lights, lighted smoking materials and flames or sparking equipment well away from the fueling area.
- Turn off heaters in carrier cabs when refueling the carrier or the drill rig.
- Do not fill portable fuel containers completely full to allow expansion of the fuel during temperature changes.
- Keep the fuel nozzle in contact with the tank being filled to prevent static sparks from igniting the fuel.

- Do not transport portable fuel containers in the vehicle or carrier cab with personnel.
- Fuel containers and hoses should remain in contact with a metal surface during travel to prevent the buildup of static charge.

SECTION 7: MEDICAL SURVEILLANCE PROGRAM

7.1 Medical Monitoring - General

If necessary, all personnel on site shall have successfully completed a baseline medical examination by an occupational physician in accordance with requirements as specified in 29 CFR 1910.120, paragraph (f) and 1910.134, paragraph (e)(6). Personnel shall be found to be medically qualified for work prior to assignment at the project site. If one year has elapsed since the baseline exam, an updated medical history and examination will be required prior to the project start.

7.2 Surveillance Program - Environmental Physicals

The following tests should be performed during baseline or annual environmental physicals for all site personnel.

- Vital Signs.
- Chest x-rays (P/A and lateral)
- Electrocardiogram.
- Pulmonary function (FEV1, FVC).
- Audiometry (500 to 8,000 Hz)
- Visual
- Urinalysis
- SMAC-21 or equivalent.
- Drug and alcohol screening.

Environmental physicals will be conducted in the event of exposure. In addition, pre- and post-exams may be required for a specific project based on the types and levels of contaminants present (i.e. heavy metals, PCB's, etc.).

7.3 Surveillance Program - DOT Physicals

All drivers of commercial motor vehicles (> 10,001 lbs.) must have a physical and be medically certified during the driver qualification process. Thereafter, each driver will receive a physical biennially. Refer to the Layne Fleet Safety Manual for additional information.

SECTION 8: WORKING TRAINING PROGRAM

8.1 General

Layne Christensen Company believes that one of the key ingredients in an effective safety program is to have all employees trained to do their job safely. This safety training results in knowledge and skill to do the job correctly. The following training requirements are the minimum acceptable safety and health training. Training continues throughout our careers - it is not a one time experience.

8.1.1 New Employee Orientation

All persons entering employment with Layne Christensen Company or its divisions, as a new hire or a rehire, must complete a New Employee Orientation. This must be completed before the new employee is entered into the payroll system.

The minimum subjects which must be addressed are outlined on the Layne Safety Practices Manual. Included in the manual is a sign-in sheet and a safety orientation test that must be completed and signed by the employee when training is complete. A copy of the test and sign-in sheet should be retained in the employee's personnel files and the original to SEHS.

8.1.2 Hazard Communication

All employees should receive Hazard Communication training as mandated by OSHA in 29 CFR 1910.1200. Training should be conducted and documented according to the Hazard Communication Training Verification sheet found in Appendix B of Layne's Hazard Communication Manual. A copy of the training verification should be retained in the employee's personnel file and the original sent to SEHS.

8.1.3 First Aid and CPR

This training is offered by the SEHS staff as part of the OSHA 40 hour environmental and MSHA 24 hour training courses, or can be conducted as a separate 8 hour course. All persons performing mine site or environmental work must pass this course. In addition, every driller (water well, exploration, construction, etc.), pump foreman and site supervisor must be trained with current First Aid and CPR certification. Once certified, refresher courses are required to maintain a current certification. Layne Christensen offices should strive to attain 100% certification for all personnel (including office staff). SEHS offers this course throughout the year upon request.

8.1.4 Mine Safety and Health Administration (MSHA) New Miner Training Course

All employees required to work at above ground and underground mine sites (including quarries and rock pits) must participate in and pass this course before engaging in such work. The course will meet requirements of MSHA 30 CFR. An additional three days of supervised field work is required. SEHS offers this course throughout the year or upon request.

8.1.5 MSHA Annual Refresher Training

All employees required to work on above and underground mine sites and who have passed the MSHA New Miner Training Course, must attend and pass the requirements of this course to maintain current certification. Updates are required annually to maintain current mine site certification. The course will meet the requirements of MSHA 30 CFR. SEHS offers this course throughout the year or upon request.

8.1.6 MSHA Task Training

Before beginning work at a mine site, employees must be safety trained in the tasks they are to perform. A classroom discussion followed by a hands on session should be conducted. Eight hours of supervised non-production followed by eight hours of supervised production operations complete this course. Any Layne Christensen supervisor may administer this training. Documentation of training should be sent to SEHS.

8.1.7 Supervisor Drug and Alcohol Training

The Federal Motor Carrier Safety Regulations Part 382.603 requires all supervisors to receive at least 60 minutes of training on alcohol misuse and an additional 60 minutes of training on controlled substance misuse. The training will be used by the supervisors to determine whether reasonable suspicion exists to require a driver to undergo testing.

8.1.8 DOT Driver Orientation

Employees who will be qualified drivers must receive a driver orientation as outlined in the Layne Christensen Fleet Safety Manual Section 2-9.

8.1.9 Additional Training

In addition to the above listed training courses, Layne conducts a Safe Driver Training Program, 10 Hour OSHA Construction, Forklift, Crane, Backhoe, Fire Safety, and HM-126 Initial and Refresher training.

8.2 Environmental Operations

8.2.1 OSHA 40 Hour Hazardous Waste Operations and Emergency Response

All employees required to work on hazardous waste sites must participate in and pass this course before engaging in such work. The course will meet the requirements of OSHA 29 CFR 1910.120. An additional three days of supervised field work is required. SEHS offers this course throughout the year upon request.

8.2.2 8-Hour Hazardous Waste Operations and Emergency Response Update

All employees required to work on hazardous waste sites and who have passed the 40 Hour Hazardous Waste and Emergency Response course, must attend and pass the requirements of this course annually to maintain current certification. Eight hour updates are required annually. The course will meet the requirements of OSHA 29 CFR 1910.120. SEHS offers this course throughout the year or upon request.

8.2.3 Environmental Supervisor Safety Training

Each driller, pump installer, superintendent, manager or other site supervisor must attend this eight hour course. This course provides supervisors the skills to train new employees, prevent accidents, recognize hazards, and investigate accidents when they occur. Every crew must be staffed with someone who has completed this course. SEHS offers this course throughout the year and upon request.

SECTION 9: REGULATED AREAS

9.1 Site Organization/Operation Zones

If necessary, the site organization and the establishment of operation zones are designed to prevent or reduce the transfer of hazardous materials off site by workers and equipment involved on-site operations.

Three (3) operation zones are established to reduce the potential for contaminant migration and the risk of personnel exposure to hazardous substances. Site control involves the physical arrangement and control of the operation zones and the methods for removing contaminants from workers and equipment.

The three (3) operation zones established on the site are:

1. Exclusion Zone (Contamination Zone)
2. Contamination Reduction Zone
3. Support Zone

The Project Manager and Health and Safety Officer shall be responsible for establishing the site and distance between zones at the site. Considerable judgement is required to assure safe working distances for each zone are balanced against practical work considerations.

9.1.1 Exclusion Zone (Contamination Zone)

The exclusion zone constitutes the area where active drilling investigations, or cleanup operations take place. Within the exclusion zone, prescribed levels of protection must be worn by all personnel. The hotline, or exclusion zone boundary, is initially established based upon the presence of actual wastes or apparent spilled material, and is placed around all physical indicators of hazardous substances (i.e., drums, tanks, ponds, liquid runoff, portable pits). The hotline may be readjusted based upon subsequent observations and measurements. This boundary should be physically well defined and easily visible. Under some circumstances, the exclusion zone may be subdivided into zones based upon environmental measurements of expected on site work conditions.

9.1.2 Contamination Reduction Zone

Between the exclusion zone and the support zone is the contamination reduction zone. This zone provides an area to prevent or reduce the transfer of hazardous materials which may have been picked up by personnel or equipment leaving the exclusion area. Some decontamination activities occur in this area. The organization of the contamination reduction zone, and the control of decontamination operations, are described in the next section.

9.1.3 Support Zone (Clean Zone)

The support zone is the outermost area of the site and is considered a non-contaminated or clean area. The support zone contains the headquarters for field operations, first aid station, and other work and cleanup support. Normal work clothes are appropriate apparel within this zone. Potentially contaminated personnel clothing, equipment, etc., are not permitted.

9.2 Labeling

All bags, containers, drums, etc. containing contaminated materials must be labeled according to specifications.

SECTION 10: DECONTAMINATION

10.1 Decontamination Procedures - General

If necessary, this section describes general decontamination procedures.

Personnel working at a site could possibly become contaminated in a number of ways, including:

- Exposure to vapors, gases, mists, or particulates in air.
- Skin contact with contaminated tools or fluids.

Protective clothing and respirators help prevent the wearer from becoming contaminated or inhaling contaminants, while good work practices help reduce contamination on protective clothing, instruments, and equipment. Even with these safeguards, however, contamination may occur. Harmful materials can be transferred into clean areas, exposing unprotected personnel. In removing contaminated clothing, personnel may contact contaminants on clothing or inhale them. To prevent such occurrences, decontamination procedures and methods must be established before anyone enters a site, and must continue and/or be modified when necessary throughout site operations.

10.1.1 Disposal of Contaminated Materials

All materials and equipment used for decontamination must be disposed of properly. Clothing, tools, buckets, brushes and all cleaning solutions and spoils must be secured in drums or other containers and labeled correctly for transportation and disposal.

10.2 Decontamination Procedures - Site Specific

Personnel decontamination is to take place at the safe perimeter boundary of the exclusion zone. Field personnel are to use detergent and water to wash rubber boots, tools, sample containers, etc. All disposable clothing is to be placed in a large plastic garbage bag or barrel. The decon-rinse solution and contaminated material should be left on-site for disposal. Figures 10-1 through 10-3 diagram step-by-step decontamination stations for each level of protection.

Personnel operating a high pressure/steam cleaner must be dressed out in the following PPE:

- Inner chemical resistant gloves (latex).
- Outer chemical resistant gloves.
- Chemical resistant boots.
- Polycoated tyveks.
- Hard hat with splash shield.
- Safety glasses.

SECTION 11: THERMAL EXPOSURE

11.1 Overview

Adverse weather conditions are important considerations in planning and conducting site operations. Extremes in hot and cold weather can cause physical discomfort, loss of efficiency and personal injury.

11.2 Heat Stress

Heat stress can result when the protective clothing decreases natural body ventilation even when temperatures are moderate. Working under various levels of personal protection may require the wearing of low permeability disposable suits, gloves and boots. This clothing will prevent most natural body ventilation. Discomfort due to increased sweating and body temperature (heat stress) will be expected at the work site.

Recommendations to reduce heat stress follow:

- Drink plenty of fluids (to replace loss through sweating)
- Wear cotton undergarments to act as a wick to absorb moisture.
- Make adequate shelter available for taking rest breaks to cool off.

For extremely warm weather, follow these additional recommendations:

- Wear cooling devices to aid in ventilation (the additional weight may affect efficiency).
- Install portable showers or hose down facilities to cool clothing and body.
- Shift working hours to early morning and early evening, avoiding the hottest time of the day.
- Rotate crews wearing the protective clothing.

TABLE 11-1			
Permissible Heat Exposure Threshold Limit Values			
(Degrees Fahrenheit)			
Work Rest Regimen	WORK LOAD		
	Light	Moderate	Heavy
Continuous Work	86	80	77
75% Work 25% Rest each hour	88	82	79
50% Work 50% Rest each hour	90	85	81
25% Work 75% Rest each hour	92	88	86

** outside temperature

Monitoring of personnel wearing personal protective equipment (PPE) should commence when ambient temperatures reach 70 degrees Fahrenheit or above. Frequency of monitoring can be found in Table 10-2, listed below.

TABLE 11-2			
HEAT STRESS MONITORING FREQUENCY			
Temperatures (°F)	Level D	Modified Level	Level C or B
>90°	Every 45 minutes	Every 30 minutes	Every 20 minutes
85-90°	Every 60 minutes	Every 45 minutes	Every 30 minutes
80-85°	Every 90 minutes	Every 75 minutes	Every 60 minutes
75-80°	Every 120 minutes	Every 105 minutes	Every 90 minutes

The site safety officer will conduct the following heat stress monitoring required for those individuals performing continuous work wearing PPE at temperatures greater than 70 degrees Fahrenheit.

- Heart rates (HR) should be measured by counting the radial pulse for 30 seconds as early as possible in the rest period. The HR at the beginning of the rest period should not exceed 110 beats per minute. If the HR exceeds 110 beats per minute the next work period should be shortened by 10 minutes (or 33%), while the length of the rest period stays the same. The HR should be measured again at the end of the rest period to make sure that it has dropped to normal.

- Body temperatures should be measured orally with a clinical thermometer as early as possible in the rest period. Oral temperatures (OT) at the beginning of the rest period should not exceed 99° Fahrenheit (F). If OT exceeds 99°F, the next work period should be shortened by 10 minutes (or 33%), while the length of the rest period stays the same. PT should be measured again at the end of the rest period to make sure that it has dropped below 99°F.

11.3 Cold Exposure

Cold exposure can occur in temperatures at or below freezing. If prolonged exposure to cold occurs without proper protection, the effects of cold exposure can happen in temperatures above freezing. Exposure to cold can cause severe injury (frostbite) or overall drop in body temperatures. Fingers, toes, ears are most susceptible to frostbite.

Both the outdoor temperature and the wind velocity play a part in cold injuries. Wind chill is used to describe the chilling effect of moving air in combination with low temperatures. Cold exposure can be a serious threat to the drilling crew that removes protective clothing and exposes perspiration soaked underclothing to the cool air. The water conducts heat 240 times faster than air rapidly cooling the body and wet clothing. Systemic hypothermia is caused by exposure to freezing or rapidly dropping temperatures.

Its symptoms are usually seen in five stages:

- Shivering
- Apathy listlessness, sleepiness and rapid body cooling.
- Unconsciousness, glassy stare, slow pulse and respiratory rates.
- Freezing of the extremities (most sensitive to freezing first are the fingers, toes and ears).
- Death

Recommended actions to avoid suffering the effects of cold exposure:

- Wear cotton undergarments to absorb perspiration from the body.
- Wear additional layers of light clothing as needed for warmth. The layering effect holds in air, trapping body heat and some layers could be removed as the temperature rises during the work day.
- Pay close attention to body signals and feelings, especially on high surface area to volume ratios of the body - ears, fingers, toes and take the appropriate action to correct any problem indications (such as break from work activity and move to rest area to warm up, add additional clothing).
- Install a wind break at the drill site to break the cold winds from blowing directly at the drilling crew.

- Maintain good eating and drinking habits enabling the body to operate at top capacity.
- Provide a sheltered rest break area to retreat to for resting and warming up.

**TABLE 11-3
WIND CHILL FACTOR TABLE
*Cooling Power of Wind on Exposed Flesh Expressed as Equivalent Temperatures***

Wind Speed (mph)	Actual Temperature Reading (°F)											
	50	40	30	20	10	0	-10	-20	-30	-40	-50	-60
	Equivalent Chill Temperature (°F)											
Calm	50	40	30	20	10	0	-10	-20	-30	-40	-50	-60
5	48	37	27	16	6	-5	-15	-26	-36	-47	-57	-68
10	40	28	16	4	-9	-24	-33	-46	-58	-70	-83	-95
15	36	22	9	-5	-18	-32	-45	-58	-72	-85	-99	-112
20	32	18	4	-10	-25	-39	-53	-67	-82	-96	-110	-121
25	30	16	0	-15	-29	-44	-59	-74	-88	-104	-118	-133
30	28	13	-2	-18	-33	-48	-63	-79	-94	-109	-125	-140
35	27	11	-4	-20	-35	-51	-67	-82	-98	-113	-129	-145
40	6	10	-6	-21	-37	-53	-69	-85	-100	-116	-132	-148
Wind speed greater than 40 mph have little additional effect	LITTLE DANGER in <hr with dry skin. Maximum danger of false sense of security				INCREASED DANGER Dan ger from freezing of ex posed flesh within one minute.				GREATER DANGER Flesh may freeze within 30 seconds			

Trench foot and immersion foot may occur at a ny point on this cha rt.

The face needs extra protection in high winds. Use the buddy system and watch each other's faces to detect frostbite early. Fingers and toes should be examined to maintain circulation and detect numbness. Do not touch cold metal objects with bare skin. Avoid excessive perspiration, and immediately replace damp or wet clothing.

* Developed by U.S. Army Research Institute of Environmental Medicine, Natick, MA.

SECTION 12: EMERGENCY INFORMATION

12.1 Emergency Situation

All site activities present a potential risk to personnel. During routine operations, risk is minimized by establishing good work practices, staying alert, and using proper personal protective equipment. Unpredictable events such as physical injury, chemical exposure, or fire may occur and must be anticipated.

Emergency conditions are considered to exist if:

- Any member of the field crew is involved in an accident or experiences any adverse effects or symptoms of exposure while on site; or
- A condition is discovered that suggests the existence of a situation more hazardous than anticipated.

12.2 Emergency Procedures

12.2.1 Overview

The following emergency procedures should be followed:

Notify all key personnel and agencies in the event of an emergency. A list of the applicable phone numbers should be available at the site. This list should be posted conspicuously at the site.

- Personnel on site should use the "buddy" system (teams).
- Buddies should pre-arrange hand signals or other means of emergency signals for communications in case of being out of hearing range.
- Visual contact should be maintained between "teams" on site with other field personnel remaining in close proximity in order to assist each other in case of emergencies.
- In the event that any member of the field crew experiences any adverse effects or symptoms of exposure while on the scene, the entire drilling crew should immediately halt work and act according to the instructions provided by the Project Manager or site Health and Safety Officer.

- The discovery of any condition that would suggest the existence of a situation more hazardous than anticipated should result in the evacuation of the on site personnel and re-evaluation of the hazard and the level of protection required.
- In the event that an accident occurs, the Project Manager is to complete an Accident Report Form. Follow-up action should be taken to correct the situation that caused the accident.

12.2.2 Personal Injury

In case of personal injury at the site, the following procedures should be followed:

- Any on site personnel trained in first aid can administer treatment to an injured worker.
- The victim should be transported to the nearest hospital or medical center. If necessary, an ambulance should be called to transport the victim.

12.2.3 Contact With Electricity

If a drill rig makes contact with electrical wires, it may or may not be insulated from the ground by the tires of the carrier. Under either circumstance the human body, if it simultaneously comes in contact with the drill rig and the ground, will provide a conductor of the electricity to the ground. Death or serious injury can be the result. If a drill rig or a drill rig carrier makes contact with overhead or underground electrical lines:

- Under most circumstances, the operator and other personnel on the seat of the vehicle should remain seated and not leave the vehicle. Do not move or touch any part, particularly a metallic part, of the vehicle or the drill rig.
- If it is determined that the drill rig should be vacated, then all personnel should jump clear and as far as possible from the drill. Do not step off - jump off, and do not hang on to the vehicle or any part of the drill when jumping clear.
- If you are on the ground, stay away from the vehicle and the drill rig, do not let others get near the vehicle and the drill rig and seek assistance from local emergency personnel such as the police or a fire department.
- When an individual is injured and in contact with the drill rig or with power lines, attempt rescue with extreme caution. If a rescue is attempted, use a long, dry unpainted piece of wood or a long, dry, clean rope. Keep as far away from the victim as possible and do not touch the victim until he is completely clear of the drill rig or electrical lines.

- When the victim is completely clear of the electrical source and is unconscious and a heart beat (pulse) cannot be detected, begin cardiopulmonary resuscitation (CPR) immediately.

12.2.4 Chemical Exposure

If a member of the field crew is exposed to chemicals, the procedures outlined below should be followed:

- Another crew member (buddy) should remove the individual from the immediate area of contamination.
- Precautions should be taken to avoid exposure of other individuals to the chemicals.
- If the chemical is on the individual's clothing, first rinse the clothing if possible, and then the clothing should be removed if it is safe to do so.
- If the chemical has contacted the skin, the skin should be washed with copious amounts of water, for at least 15 minutes.
- In case of eye contact, an emergency eye wash should be used. Eyes should be washed for at least 15 minutes.
- If necessary, the victim should be transported to the nearest hospital or medical center. The nature of the injury may require that an ambulance should be called to transport the victim.
- All chemical exposure incidents must be reported in writing by the Project Manager on an Accident Report Form.

12.3 Site Specific Information

A list of phone numbers for agencies and key personnel for each specific project will be available on site. This list is for use in the event of an emergency and should be conspicuously posted. Directions to the nearest hospital will be included. See Table 12-1.

**TABLE 12-1
EMERGENCY INFORMATION**

AGENCY	PHONE NUMBER
HOSPITAL:	
AMBULANCE	
POLICE	
FIRE	
LAYNE CHRISTENSEN COMPANY Safety & Environmental Health Sciences	(913) 342-4803
DIRECTOR OF SAFETY	(913) 707-5926

ROUTE TO HOSPITAL:

SECTION 13 CONFINED SPACE ENTRY PROCEDURES

13.1 Introduction

A confined space provides the potential for unusually high concentrations of contaminants, explosive atmospheres, limited visibility, and restricted movement. This section discusses requirements for safe entry into, continued work in, and safe exit from confined spaces. Additional information regarding confined space entry can be found in 29 CFR 1910.146, 29 CFR 1926.21, 29 CFR 1910 and NIOSH 80-106. See Layne Christensen Company Permit-Required Confined Space Entry Program for more information.

13.2 Definitions

- Confined Space

As defined in 29 CFR 1910.146 a confined space is an enclosed vessel that includes one or more of the following criteria:

- Is large enough and configured that an employee can bodily enter and perform assigned work.
- Has limited or restricted means of entry or exit.
- Is not designed for continuous employee occupancy.
- Contains a known potential to have a hazardous atmosphere.
- Contains materials which could engulf an entrant.
- Has an internal configuration that could trap or asphyxiate an entrant.

- Confined Space Entry Permit (CSEP)

With this definition OSHA has established requirements for employers such as Layne Christensen to issue "Confined Space Entry Permits" (CSEP). These hazards include, but are not limited to, atmospheric hazards, electrical hazards, toxic materials, communication entry and rescue. From these requirements the person trained in confined space entry will issue a CSEP which will include:

- identifying the confined space
- the purpose of entry
- the date and expected duration of the entry
- known hazards
- personnel
- necessary safety equipment

Once the permit is issued work may commence when all the proper equipment and personnel needed for safe entry are in place and ready for use.

A confined space entry permit may be *revoked* at any time if proper equipment or procedures are not being used.

- Confined Space Entrant

All Confined Space Entry requires at least two (2) people, an attendant and entrant. An entrant is the employee conducting work in the confined space after proper permits and equipment are in place and has been authorized by his/her employer.

- Confined Space Attendant

The attendant is stationed outside the permitted area and must be able to perform the following tasks;

- Continuously maintain an accurate count of persons in the confined space.
- Knows and can recognize potential hazards, both inside and outside the area.
- Maintains effective communication with workers inside the confined space.
- Be able to perform rescue of fellow employee's without entering the confined space.

13.3 General Provisions

- When possible, confined spaces should be identified with a posted sign which reads: "Caution - Confined Space".
- Only personnel trained and knowledgeable of the requirements of these Confined Space Entry Procedures will be authorized to enter a confined space or be a confined space attendant.
- A CSEP must be issued prior to the performance of any work within a confined space. The CSEP will become a part of the permanent and official record of the site.
- Natural ventilation shall be provided for the confined space prior to initial entry and for the duration of the CSEP. Positive/forced mechanical ventilation may be required. However, care should be taken to not spread contamination outside of the enclosed area.
- If flammable liquids may be contained within the confined space, explosion proof equipment will be used. All equipment shall be positively grounded.
- The contents of any confined space shall, where necessary, be removed prior to entry. All sources of ignition must be removed prior to entry.

- Hand tools used in confined spaces shall be in good repair explosion proof and spark proof, and selected according to intended use. Where possible, pneumatic power tools are to be used.
- Hand-held lights and other illumination utilized in confined spaces shall be equipped with guards to prevent contact with the bulb and must be explosion proof.
- Compressed gas cylinders, except cylinders used for self-contained breathing apparatus, shall not be taken into and supply turned off at the cylinder valve when personnel exit from the confined space.
- If a confined space requires respiratory equipment or where rescue may be difficult, safety belts, body harnesses, and lifelines will be used. The outside attendant shall be provided with the same equipment as those working within the confined space.
- A ladder is required in all confined spaces deeper than the employee's shoulders. The ladder shall be secured and not removed until all employees have exited the space.
- Only self-contained breathing apparatus or NIOSH approved airline respirators equipped with a 5-minute emergency air supply (egress bottle) shall be used in untested confined spaces or in any confined space with conditions determined immediately dangerous to life and health.
- Where air-moving equipment is used to provide ventilation, chemicals shall be removed from the vicinity to prevent introduction into the confined space.
- Vehicles shall not be left running near confined space work or near air-moving equipment being used for confined space ventilation.
- Smoking in confined spaces will be prohibited at all times.
- Any deviation from these confined space entry procedures require the prior permission of the HSO.

13.4 Procedure for Confined Space Entry

The HSO and Entry Team shall:

- Apply for a Confined Space Entry Permit identifying the location of work, date, time, hazards, personnel, equipment and any other safety concerns.
- Assemble the necessary equipment and ensure it is in good working order.

- Check the confined space with atmospheric gas testing equipment that has been properly calibrated (see Attachments A and B). At a minimum this will include testing oxygen levels of at least 19.5% and combustible atmospheres. If hazardous materials are suspected additional equipment must be used. Atmospheric testing should be done on two foot (2') intervals from the top of the confined space to the bottom of the vessel. This is especially important if cutting, welding or anything that could be an ignition source, is part of the work scheduled. If cutting, welding or spark producing activities are performed, a hot work permit must be issued and the necessary extinguishing devices present. Monitoring should be ongoing throughout the project and must be performed at least every 30 minutes.
- Entry and exit equipment such as ladders should be installed. Rescue equipment including tripods, lifeline, and harness should be in place and ready to use. Regular work tools should be assembled so the attendant does not have to leave the entry area. (Ladders are required if vessel is higher than the entrants shoulders).
- Electrical hazards, ventilation equipment, and communication devices should all be checked to ensure identified hazards have been addressed. Lockout/tagout procedures apply in every case where electrical hazards are a possibility (Layne Christensen Safety Compliance Procedure B1).
- When the confined space entry permit is completed and safety and procedures have been discussed the authorizing supervisor will sign the permit. Work in the confined space may begin at that time.
- Once work has begun and an entrant is inside the vessel the attendant may not leave the entry area.
- When the necessary work is completed the authorizing supervisor will cancel the confined space entry permit.

Layne Christensen Company Confined Space Entry Permit

Location of Work: _____

Date: _____

Purpose of Entry: _____

Time: _____

Project #: _____

HAZARD POTENTIAL

	Yes	No		Yes	No
Oxygen Deficiency	<input type="checkbox"/>	<input type="checkbox"/>	Electrical	<input type="checkbox"/>	<input type="checkbox"/>
Combustible Atmosphere	<input type="checkbox"/>	<input type="checkbox"/>	Welding/Cutting	<input type="checkbox"/>	<input type="checkbox"/>
Toxic Material	<input type="checkbox"/>	<input type="checkbox"/>	Ventilation Needed	<input type="checkbox"/>	<input type="checkbox"/>
Liquids	<input type="checkbox"/>	<input type="checkbox"/>	Other	<input type="checkbox"/>	<input type="checkbox"/>

SAFETY PROCEDURES AND EQUIPMENT UTILIZED

Electrical Lockout/Tagout <input type="checkbox"/>	GFI Used <input type="checkbox"/>	Hot Work Permit <input type="checkbox"/>	First Aid <input type="checkbox"/>
Tripod/Lifeline/Harness <input type="checkbox"/>	Explosion Proof Lights <input type="checkbox"/>	Ventilation Equipment <input type="checkbox"/>	Barriers <input type="checkbox"/>
Personal Protective Equipment <input type="checkbox"/>	Respiratory Protection <input type="checkbox"/>	Communication Devices <input type="checkbox"/>	Hand Signals <input type="checkbox"/>

SPECIFY

ATMOSPHERIC GAS TESTING

INSTRUMENT	ACTION LEVEL	FREQUENCY OF TESTING

EMPLOYEES PERFORMING WORK

ATTENDANT(S)	ENTRANT(S)

AUTHORIZING SIGNATURES

Attendant(s) Signature: _____ _____ _____	Entrant(s) Signature: _____ _____ _____
--	--

Permit Authorized by: _____	Canceled by: _____
Canceled by: _____	Time: _____

REFERENCES

1. American Conference of Governmental Industrial Hygienists, *Threshold Limit Values and Biological Exposure Indices for 1988-1989*, Cincinnati, Ohio, 1988.
2. DOT/USCG, *Chemical Hazard Response Information System (CHRIS)*, COMDTINST M16465.12A, 1984
3. National Institute for Occupational Safety and Health, *NIOSH Pocket Guide to Chemical Hazards*, Fifth Printing, DHHS (NIOSH) Publication No. 85-114.
4. NIOSH/OSHA/USCG/EPA, *Occupational Safety and Health Guidance Manual for Hazardous Waste Site Activities*, DHHS (NIOSH) Publication No. 85-115.
5. *Patty's Industrial Hygiene and Toxicology*, 3rd edition, John Wiley & Sons, New York, 1985.
6. Sax, N. Irving, *Dangerous Properties of Industrial Materials*, 6th edition, Van Nostrand Reinhold Company, New York, 1984.
7. EPA Region II; *Generic Health and Safety Plan*. Part 7.
8. Layne Christensen Company Accident Prevention Manual.
9. Layne Christensen Company Hazard Communication Manual.
10. Layne Christensen Company Safety Practices Manual.
11. Layne Christensen Company Fleet Safety Manual.

APPENDIX A

HNU CALIBRATION DATA

HNU ORGANIC VAPOR ANALYZER

OPERATION/CALIBRATION

1. Unclamp the cover from the main readout assembly.
2. Remove the inner lid from the cover by pulling out the two fasteners in order to access the probe extension.
3. Connect the probe cable plug to the socket on the readout assembly panel.
4. Screw the probe extension into the probe end cap.
5. Set the SPAN control for the probe being used (10.2, 11.7 eV).
6. Turn the function switch to the BATT position. The needle on the meter will go to the green zone if the battery is fully charged. If the needle is below the green arc or if the Low Battery Indicator comes on, the battery must be recharged before the analyzer is used.
7. Ensure the fan in the probe is operating.
8. Turn the function switch to the STANDBY position and allow the instrument to warmup for 5 minutes in the ambient conditions it will be used in.
9. Turn the zero adjustment until the meter needle is at zero.
10. Connect calibration gas canister hose to probe extension and turn function switch to the 0 - 200 scale.
11. Unlock and adjust SPAN control for appropriate scale deflection according to the probe being used. Relock SPAN control.
12. Disconnect hose from probe and turn function switch to STANDBY.
13. The instrument is now operational.

APPENDIX B

OVA 128GC CALIBRATION DATA

FOXBORO ORGANIC VAPOR ANALYZER (OVA), MODEL 128GC

OPERATION/CALIBRATION DATA

1. Connect the end of the fill hose with the gage to a hydrogen source.
2. Connect fill hose valve to the hydrogen supply inlet on the bottom of the case.
3. Open valve on the hydrogen source.
4. Turn fill valve to the BLEED position to bleed air from fill hose then turn back to OFF position.
5. Open H₂ REFILL valve two full turns.
6. Open H₂ TANK valve two full turns.
7. Turn fill hose valve to the FILL position.
8. The gage on the fill hose and the H₂ TANK gage will increase together.
9. When both gages have stabilized turn the fill valve to the OFF position and close both the H₂ REFILL valve and the H₂ TANK valve.
10. Disconnect fill hose from the OVA and install cap on the inlet.
11. Connect readout assembly to the OVA ensuring sample line is tight.
12. Open H₂ TANK and H₂ SUPPLY valves, H₂ SUPPLY gage should read approximately 15 psi.
13. Place instrument switch to the BATT position, readout should deflect to indicate condition of battery.
14. Place instrument switch to the ON position.
15. Place PUMP switch to the ON position, pump should operate.
16. Press the red ignition button on the side of the instrument to ignite the flame. Pump will not run while button is depressed.
17. Allow instrument to operate for five minutes.
18. Adjust the ZERO ADJ knob to zero the readout.

19. Fill tedlar bag with a sample of 100 ppm methane calibration gas and connect to probe.
20. Place RANGE switch to the X10 position, readout should indicate 100 ppm. Check on the X100 position for 100 ppm.
21. Remove tedlar sample bag from probe, readout should return to zero.
22. Place cover on the instrument.
23. Record calibration data in log book.

APPENDIX C

BIOSYSTEMS PHD 2 AND PHD PLUS OPERATION

BIOSYSTEMS PhD 2 OPERATION

1. The large black push-button on the top of the PhD 2 case is called the “mode” button. It is used to turn the PhD 2 on and off, as well as to control most other operations of the instrument. Pushing the mode button once turns the PhD 2 on.
2. After the detector has been turned on, it will automatically go through an electronic self test and start up sequence that takes approximately twenty seconds. During the self test sequence, the meter display backlight will momentarily turn on, the visual LED alarm lights will flash, and audible alarm will sound. During start-up the LCD display will also display several messages or “screens” in sequence. At the end of the start-up sequence, the last screen will display current gas level readings.
3. The fresh air “zeroing” of the PhD 2 must be done in fresh, uncontaminated air. In this procedure the instrument automatically adjusts its Oxygen, combustible gas, and toxic gas readings to match the concentrations present in fresh air (20.9 % O₂, 0.0 % LEL, 0.0 PPM toxic gas).
 - A. Allow a few minutes after start-up to allow the sensor readings to stabilize.
 - B. Remove the key pad cover exposing the four mini-pushbuttons.
 - C. Press the mini-pushbutton marked “Cal”. The fresh air calibration message will appear briefly in the meter display.
 - D. The fresh air calibration message is followed by the zero-adjustment screen.
 - E. The PhD 2 automatically zeros the instrument readings when the “Cal” button is pushed. An information screen is briefly displayed while the adjustments are being made, and another when the adjustments have been completed.
 - F. After completion of the zero adjustment the PhD 2 automatically returns to the gas reading screen display.
 - G. Replace the key pad cover.
4. To turn off the PhD 2, hold down the mode button for three seconds. After three seconds (marked by three beeps of the audible alarm) the LCD display will display the message “Release button”. After the button is released the LCD display will display the message, (Begin SHUT DOWN Please wait.” Meter display blanks in about ten seconds.

BIOSYSTEMS PhD PLUS OPERATION

1. The large black push-button on the top of the PhD Plus case is called the “mode” button. It is used to turn the PhD Plus on and off, as well as to control most other operations of the instrument. Pushing the mode button once turns the PhD Plus on.
2. After the detector has been turned on, it will automatically go through an electronic self test and start up sequence that takes approximately twenty seconds. During the self test sequence, the meter display backlight will momentarily turn on, the visual LED alarm lights will flash, and audible alarm will sound. During start-up the LCD display will also display several messages or “screens” in sequence. At the end of the start-up sequence, the last screen will display current gas level readings.
3. The fresh air “zeroing” of the PhD Plus must be done in fresh, uncontaminated air. In this procedure the instrument automatically adjusts its Oxygen, combustible gas, and toxic gas readings to match the concentrations present in fresh air (20.9 % O₂, 0.0 % LEL, 0.0 PPM toxic gas).
 - A. Allow a few minutes after start-up to allow the sensor readings to stabilize.
 - B. Press the mode button three times within two seconds. This will “wake up” the instrument from normal operation, and put it into the “Auto =-Calibration” mode. A screen will briefly display the message “One button Auto-Calibration”. This screen will be followed by the “Aero Calibration Adjustment” screen.
 - C. Press the mode button within five seconds causes the fresh air adjustment to be made. An information screen is briefly displayed while the adjustments are being made, and another when the adjustments have been completed.
 - D. After the successful completion of the “zero” auto-calibration adjustment the display will show the “Span Calibration Adjustment” screen. Allow five seconds to pass and the instrument will return to normal operation.

APPENDIX D

PPM AEROSOL MONITOR, MODEL 1000

CALIBRATION/OPERATION DATA

PPM AEROSOL MONITOR, MODEL 1000

CALIBRATION/OPERATION DATA

1. Turn the monitor on by selecting the 1 Sec averaging time constant. Connect the AC charger if necessary (Caution: The plug must be pushed into the unit until a snap is heard to prevent shorting out the AC adapter). Numbers should be displayed with the appropriate decimal point.
2. Close the sample port by rotating the collar and sliding in to cover the sampling hole. Select the 200 mg/m³ scale and check the display for zero. If a stable reading does not appear, try purging the sensor by connecting the zero bulb and pumping a few times. Adjust the 200 Zero potentiometer if necessary to set the display to zero.
3. Rotate and slide the zero collar and insert the Calibration Element into the rectangular slot opposite the sensor collar set screw. Install with the larger end of the cal element facing up and toward the monitor display. (Calibration value should be right-side-up).
4. Watch the reading stabilize. If the final reading is outside the range from the factory calibration table, make a corresponding adjustment on the SPAN potentiometer.
5. Remove the calibration element. Rotate and slide the zero collar to cover the sampling ports. Connect the zero bulb and squeeze 5-10 times to purge the sampling chamber of all particles.
6. Watch the reading stabilize. If the final reading is outside +00.2, adjust the 200 ZERO potentiometer.
7. Switch the range to the 2 scale and watch the readings stabilize. If the final reading is outside +.003, adjust the 2 ZERO potentiometer.
8. Rotate the slide zero collar back to the open position.
9. Select sensitivity and time constant desired. (Use 5 sec for more stable readings and for very low mass concentration areas).
10. Slowly wave unit or rely on natural air movements to move aerosols through the sensing ports. (Typical office air mass concentrations are 10-50 mg/m³ if tobacco smoke is not present).
11. Turn the monitor off after measurement to conserve the battery power.

APPENDIX E

DRAGER PUMP/COLORIMETRIC TUBE USE

DRAGER PUMP/COLORIMETRIC TUBE USE

1. Inspect pump for any obvious defects.
2. Insert sealed colorimetric tube into the sample inlet.
3. Squeeze pump and observe for five minutes. Pump should remain depressed indicating no leaks.
4. Remove tube and break off sealed ends using the tube breaker on the pump.
5. Insert tube into the sample inlet with the arrow on the barrel of the tube pointing towards the pump.
6. Consult instructions accompanying tubes for number of strokes required, expected results, possible interferences, etc.

ATTACHMENT 3

APPLICABLE HEALTH AND SAFETY FORMS

TAILGATE SAFETY MEETING FORM

Date: _____ Time: _____ Job Number: _____

Site Location: _____

Scope of Work: _____

SAFETY TOPICS PRESENTED

Projective Clothing/Equipment: _____

Chemical Hazards: _____

Physical Hazards: _____

Equipment Used: _____

Emergency Procedures: _____

Hospital: _____ Phone: _____ Ambulance Phone: _____

Hospital Address and Route: _____

Noise Impacts and Mitigation: _____

Odor Impacts and Mitigation: _____

Permits Required: _____

ATTENDEES

NAME PRINTED

SIGNATURE

Meeting Conducted by: _____

Signed by: _____

Site Safety Officer: _____

Construction Manager: _____

Daily Issues and Lessons Learned: _____

Daily Site Closure Actions: _____

Accident/Incident Analysis Form	Revision No. 0	Revision Date: 28 April, 2004
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Accident/Incident Analysis

AIA Report Case Number

Employee's Name:	Payroll Number:	Division: Location Name:	Dept or Org. No.
Job Assignment at time of Accident/Incident::			
Time in Job Assignment <input type="checkbox"/> 0-14 days. <input type="checkbox"/> 15-90 days. <input type="checkbox"/> 3 months to 1 year. <input type="checkbox"/> 1-3 years. <input type="checkbox"/> 4-10 years. <input type="checkbox"/> more than 10 years			Job Assigned was a Routine Part of Job <input type="checkbox"/> Yes <input type="checkbox"/> No
Date of Accident/incident (mm/dd/yyyy)	Time: <input type="checkbox"/> AM <input type="checkbox"/> PM	Date Reported to You – Please Specify if Other: <input type="checkbox"/> Same as Accident/Incident <input type="checkbox"/> Other	
Injury Treated by at Time of Accident/Incident <input type="checkbox"/> First Aid <input type="checkbox"/> EMT <input type="checkbox"/> Health Services <input type="checkbox"/> No Treatment		Name(s) of Witness(es)	
Injury Type (cut, bruise, strain, etc.)	Injury Location (hand, foot, lower back, etc.)	Extent of Injury (minor, severe, length of cut, etc.)	
Describe What Happened (Detail what the employee was doing – where the accident/incident occurred – what tools, equipment, or people were involved.) Remember facts are important; fault finding is not. Text box will expand			
OSHA Recordable Incident <input type="checkbox"/> Yes <input type="checkbox"/> No		Last Day Worked (If time lost.)	Date <input type="checkbox"/> Returned or <input type="checkbox"/> Expected Date
Describe Property Damage (if any) Text box will expand		Approximate Costs Associated with Property Damage	
Root Cause and Contributory Causes		Corrective Actions Taken by You or Others	
1		1	
2		2	
3		3	
4		4	
5		5	
Reference Documents			
Manager's Comments/Actions (if any)			
Safety and Health Representative's Comments/Actions			
Employee's Name and Date	Supervisor's Name and Date	Manager's Name and Date	SH/ER Representative's Name and Date

Revision Number	Effective Date	Description of Changes
0	08/12/05	Initial release

ATTACHMENT 4

BATTELLE HEALTH AND SAFETY PROGRAMS AND PROCEDURES

Battelle Science & Technology International

Safety, Health & Emergency Response

Specific Procedure

Title: BSTT SH&ER Emergency Response Procedure
Number: ESHQ-SIH-SP-053
Revision: 1

Originator:

Freddie Kight
Freddie Kight

Safety Advisor

5/21/07

Date

Approved By:

DW Cagle
Donald W. Cagle

Manager, Safety, Health and Emergency Response

5/29/07

Date

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REVISION HISTORY

Rev. No.	Effective Date	Description of Revision
1	06/11/07	Initial release

1.0 PURPOSE

This procedure describes what actions should be taken during an emergency situation and the BSTI ESH&Q/SM Emergency Response roles/responsibilities to achieve greater responsiveness and clarification of roles during an emergency situation.

2.0 SCOPE AND APPLICABILITY

This procedure is applicable to BSTI ESH&Q/SM Response Team members responding to a release and/or spill of a hazardous material to include radioactive material at King Avenue and West Jefferson locations.

This procedure does not address communication with media or the public. These types of communication MUST be routed through the BSTI Emergency Operation Center (EOC) and Corporate Communications.

This procedure does not address program or facility specific training requirements. (Examples include access to less-than-ninety-day hazardous waste accumulation areas, select agent laboratories, chemical weapon convention facilities, and classified areas.)

3.0 PREREQUISITES

The technical training necessary for emergency responders is the responsibility of the applicable managers and supervisors. It is the responsibility of managers and supervisors of emergency responders to ensure that their staff are familiar with the contents of all BSTI emergency plans and project specific procedures that are applicable. Below are the minimum training requirements for BSTI ESH&Q/SM Emergency Response Team. If the work being performed or the materials handled require additional training, persons must maintain appropriate qualifications for that work activity, equipment or material. (Examples include: forklift operation, crane operation, radioactive materials, and controlled substances.)

The following prerequisites must be completed by staff members prior to using this procedure:

3.1 Hazardous Materials (HazMat) Technician

- BCO-0031 – “Annual RCRA Generator Training”
- BCO-0032 – “Hazardous Waste Management Training”
- EN-100 – “Oil Management Training”
- HS-100B – “Respiratory Training”
- HS-101 – “SCBA Training”
- HS-140 – “Fire Extinguisher Training (Hands On)”
- HS-150 – “First Aid”
- HS-151AED – “Adult CPR with AED”
- EP-200 “Bloodborne Pathogens Training” (first year only)
- EP-200S Bloodborne Pathogens Refresher Training (after first year, if training kept current)
- HWO-100 – “Initial 40 Hour HAZWOP Training” (first year only)

- HWO-100R – “Annual 8 Hour HAZWOP Refresher Training” (after first year, if training kept current)
- EP-204 - “Overview of the Incident Command System and the Unified Command”
- RAD-100 BCO Radiation Safety Training - Unsealed Sources (first year only)
- RAD-101 BCO Radiation Safety Refresher Training - Unsealed Sources(after first year, if training kept current)

3.2 HazMat Supervisor

- BCO-0031 – “Annual RCRA Generator Training”
- BCO-0032 – “Hazardous Waste Management Training”
- EN-100 – “Oil Management Training”
- HS-100B – “Respiratory Training”
- HS-101 – “SCBA Training”
- HS-140 – “Fire Extinguisher Training (Hands On)”
- HS-150 – “First Aid”
- HS-151AED – “Adult CPR with AED”
- EP-200 “Bloodborne Pathogens Training” (first year only)
- EP-200S Bloodborne Pathogens Refresher Training (after first year, if training
- HWO-100 – “Initial 40 Hour HAZWOPER Training” (first year only)
- HWO-100R – “Annual 8 Hour HAZWOPER Refresher Training” (after first year)
- EP-204 - “Overview of the Incident Command System and the Unified Command”
- HWO – “ 8 Hour HAZWOPER Supervisor Training”
- RAD-100 BCO Radiation Safety Training - Unsealed Sources (first year only)
- RAD-101 BCO Radiation Safety Refresher Training - Unsealed Sources(after first year)

3.3 Radiation Technician

- EP-204 - “Overview of the Incident Command System and the Unified Command”
- HWO-100 – “Initial 40 Hour HAZWOP Training” (first year only)
- HWO-100R – “Annual 8 Hour HAZWOP Refresher Training” (after first year)
- RAD-100 BCO Radiation Safety Training - Unsealed Sources (first year only)
- RAD-101 BCO Radiation Safety Refresher Training - Unsealed Sources(after first year)
- EP-200 “Bloodborne Pathogens Training” (first year only)

- EP-200S Bloodborne Pathogens Refresher Training (after first year, if training

3.4 Incident Commander (IC)

- EP-204 - “Overview of the Incident Command System and the Unified Command”
- HWO-100 – “Initial 40 Hour HAZWOP Training” (first year only)
- HWO-100R – “Annual 8 Hour HAZWOP Refresher Training” (after first year)

3.5 Safety, Health and Emergency Response (SH&ER) Representative

- EP-204 - “Overview of the Incident Command System and the Unified Command”

4.0 DEFINITIONS

4.1 Document Specific Definitions

The following definitions are specific to this procedure and are not included in QS-RM-001, Environment, Safety, Health and Quality Glossary

- **Emergency Operations Center (EOC):** The primary coordination, resource management, communications and notification center established to provide direction and control, logistical, technical and resource support.
- **Emergency Response:** The reaction to an incident or emergency to assess the damage or impact and to ascertain the level of containment and control activity required. In addition to addressing matters of life safety and evacuation, response also addresses policies, procedures, and actions to be followed during an emergency.
- **Emergency Situation:** A sudden, unexpected event requiring immediate action due to a potential threat to health and safety, the environment, or property.
- **Hazard Assessment:** The process of identifying situations or conditions that have the potential to cause injury to people, damage to property, or damage to the environment.
- **Incident Commander:** The senior emergency response official on-scene. All emergency responders and their communications are coordinated and controlled by the Incident Commander. This person may be a Battelle employee or a representative of a local authority. When Incident Commanders from both Battelle and local authorities are present, they operate under the Unified Command principals, as defined by the National Fire Protection Association and the Federal Emergency Management Agency. For the purposes of this document, the On-Scene Incident Commander is the Emergency Coordinator.
- **Response:** The reaction to an incident or emergency to assess the damage or impact and to ascertain the level of containment and control activity required. In addition to addressing matters of life safety and evacuation, response also addresses policies, procedures, and actions to be followed during an emergency.

- **Response Team:** A team tasked with responding to and remediating Hazardous Material and/or Radiological Emergency Situation. The participants are determined by the nature of the hazards (Radiological, Biological, and/or Chemical) and include all individuals with training requirements identified in Section 3.0.

4.2 Glossary Terms

The following terms are included in QS-RM-001, Environment, Safety, Health and Quality Glossary

- **Assessment**
- **Procedure**
- **Incident**
- **Record**

5.0 REGULATORY/VOLUNTARY STANDARD REFERENCES

This procedure complies with the following regulatory and/or voluntary standard requirements:

- OSHA 29 CFR 1910.120, Hazardous Waste Operations and Emergency Response

6.0 EMERGENCY RESPONSE PROCEDURE

- 6.1 Upon receiving notification of an emergency situation from the BSTI Safety, Health, and Emergency Response Manager or Designee, the HazMat Supervisor or Radiological Response Team, depending on the hazards, will gather their emergency response spill carts and/or equipment; summon needed support; and report to a designed rally point or Emergency Situation.
- 6.2 The Response Team will stabilize the scene until the IC Position has been established. At that point the IC will determine if the stabilization method is appropriate and decide to continue stabilization or modify method.
- 6.3 The IC position will be filled by the:
 - 6.3.1 BSTI Emergency Director
 - 6.3.2 Safety, Health, and Emergency Response Manager or designee
 - 6.3.3 Radiation Safety Manager
- 6.4 A SH&ER Representative will be called to support the IC by providing technical knowledge of the exposure and physical hazards associated with the Emergency Situation. The SH&ER Representative is also responsible for oversight of the safety of the Response Team. If the Response Team begins aggressive containment or remediation activities prior to the arrival of the SH&ER Representative, an interim safety officer will be designated by the IC.
- 6.5 The HazMat Supervisor, and/or Radiological Response Team and SH&ER Representative will conduct a hazard(s) assessment of the situation.
- 6.6 If Personnel Protective Equipment (PPE) is used during the remediation of the incident the Response Team will inspect the PPE before donning to ensure the PPE is operating properly and/or not defective.

- 6.7 If instruments are used during the remediation of the incident the Hazardous Material Technicians, Radiological Technicians, and/or SH&ER Representative will inspect and ensure instruments are calibrated before entering area to ensure proper operation of the instruments.
- 6.8 The Response Team will remediate the hazards of the incident as directed by the IC.
- 6.9 After the hazards associated with the situation have been remediated, the IC, in conjunction with SH&ER Representative and Response Team will conduct a hazards analysis of the area to determine if the scene is below exposure levels.
 - 6.9.1 The area will be monitored and/or sampled with the appropriate industrial hygiene equipment for chemical/biological hazards by or under the direction of the SH&ER Representative.
 - 6.9.2 The area will be monitored and/or sampled with radiological equipment for radiological hazards by or under the direction of the Radiological Response Team.
 - 6.9.3 The area will be monitored and/or sampled with the appropriate environmental equipment for chemical hazards by or under the direction of the Environmental Protection Manager.
- 6.10 The SH&ER Representative, Radiological Response Team, and/or Environmental Protection Manager will inform the IC of the monitoring results.
- 6.11 The IC in conjunction with SH&ER Representative, Radiological Response Team, and/or Environmental Protection Manager will make a decision from this information to release the area back to the occupancy if it was determined to be safe from employee exposures and/or environmental contamination.
- 6.12 Signs, caution rope, supplies, PPE, instruments, and all other items used during the emergency situation will be removed before the area is released.
- 6.13 The IC will hold a de-briefing with all personal involved in the situation to discuss the cause of the incident; actions taken during the remediation; complications during the situation; and to identify any lessons learned.
- 6.14 The IC will ensure a post-Emergency Situation investigation will be performed as required by the SBMS Procedure titled "Post Injury, Accident, Incident, and Near Miss Reporting and Investigations."

7.0 ROLES AND RESPONSIBILITIES

7.1 Hazardous Materials Technician

- 7.1.1 Respond to releases or potential releases for the purpose of stopping and remediating the releases under the direction of the Hazardous Materials Supervisor or IC. Hazardous Materials Technicians are designated, specially trained personnel who are responsible for:
 - 7.1.2 Assisting with the identification of suspect hazardous materials
 - 7.1.3 Assisting with precaution recommendations

- 7.1.4 Establishing a contaminated, decontamination, and exclusion zones. These zones must be within the confines of the security zone established by Security Operations. If needed, the security zone can be expanded to protect staff or permit access for the Response Team.
- 7.1.5 Assisting with air monitoring activities
- 7.1.6 Performing exposed personnel decontamination
- 7.1.7 Remediating release(s)

7.2 Hazardous Materials Supervisor

- 7.1.1 Assist with the overall management of the BSTI Hazardous Materials Emergency Response Program focusing on operational and response activities. Hazardous Materials Supervisors are a team of designated, specially trained personnel who are responsible for:
 - 7.1.2 Identifying suspect hazardous materials
 - 7.1.3 Recommending precautions
 - 7.1.4 Establishing a contaminated, decontamination, and exclusion zones. These zones must be within the confines of the security zone established by Security Operations. If needed, the security zone can be expanded to protect staff or permit access for the Response Team.
 - 7.1.5 Organizing and leading a trained Response Team
 - 7.1.6 Ensuring state of readiness emergency resources
 - 7.1.7 Ensuring high quality emergency response organization
 - 7.1.8 Consulting appropriate groups for recovery/reentry

7.3 Radiation Technician

- 7.1.1 Respond to releases or potential releases for the purpose of stopping and remediating the releases under the direction of the IC. Radiological Responders are designated, specially trained personnel who are responsible for:
 - 7.1.2 Identifying radiological hazardous materials present
 - 7.1.3 Recommending precautions
 - 7.1.4 Establishing a safety zone
 - 7.1.5 Performing air monitoring activities
 - 7.1.6 Performing screen and decontamination activities for contaminated or exposed personnel
 - 7.1.7 Performing radiological release evaluations
 - 7.1.8 Limiting emergency personnel exposure
 - 7.1.9 Issuing dosimetry to emergency responders

7.4 Incident Commander (IC)

- 7.1.1 Manage the BSTI Hazardous Materials/Radiological Emergency Responders during an incident focusing on operational and response activities. The IC is a designated, trained person who is responsible for overall management of the incident:
- 7.1.2 Assess the situation and/or obtain a briefing from the prior Incident Commander
- 7.1.3 Determine incident objectives and strategy
- 7.1.4 Establish immediate priorities
- 7.1.5 Establish Incident Command Post
- 7.1.6 Ensure adequate safety measures are in place
- 7.1.7 Coordinate activity for all Command and General staff
- 7.1.8 Keep Crisis Manager informed of incident status
- 7.1.9 Making recovery and reentry recommendations based on health risks
- 7.1.10 Consulting appropriate groups for technical support
- 7.1.11 Maintaining incident cost recovery

7.5 Safety Health, and Emergency Response representative

- 7.1.1 Provide IC technical knowledge of the hazards associated with the incident and oversight of the Response Team safety. SH&ER Representative is a designated, specially trained person who is responsible for:
- 7.1.2 Recommending precautions
- 7.1.3 Establishing a safety zone
- 7.1.4 Overseeing air monitoring activities
- 7.1.5 Analyzing and interrupting air monitoring data
- 7.1.6 Monitoring Response Team safety

8.0 RECORDS

The following records are generated in the course of following this procedure:

Name of Record	Record Media	Location	Retention Period
Training	Paper	Paper ESH&Q Central Files	Permanent
Accident/Incident Analysis (AIA Form)	Paper	Environment, Safety, Health, and Quality Systems Management	Permanent

9.0 RELATED DOCUMENTS

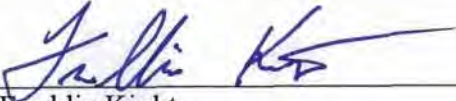
9.1 The following documents are referenced by this procedure:

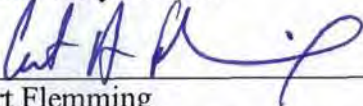
- EP-PP-001 Emergency Operation Plan: King Avenue, West Jefferson and Regional Office Interface
- EP-GP-001, Emergency Operations Center Management Procedure
- EP-PC-01.0, Emergency SCBA
- EP-PP-01, BCO Emergency Action Plan
- EP-RM-001, Contingency for Hazardous Waste Accumulation – West Jefferson
- EP-RM-005, King Avenue Infectious Waste Contingency Plan
- EP-RM-007, Spill Prevention Control and Counter Measures Plan, King Avenue Site
- EP-RM-008, Spill Prevention Control and Counter Measures Plan, West Jefferson Site
- EP-SP-042, Contingency for Hazardous Waste Accumulation – King Avenue
- RS_SP-301, Requirements for Reporting Radiological Incidents and Event Information to the Ohio Department of Health Bureau of Radiation Protection
- RM-RM-045, Event Notification Flow Chart 3
- RCM-SP-002, ESH&Q Event Notification
- SIH-GP-007, Bloodborne Pathogens Program
- SIH-GP-010, Respiratory Protection Program
- SIH-GP-020, Reporting and Recording Occupational Injuries and Illnesses
- SIH-PP-001, Personal Protective Equipment
- SIH-PP-100, Safety and Health Management Plan
- SIH-PP-107, Automatic External Defibrillator
- SBMS Procedure titled “Post Injury, Accident, Incident, and Near Miss Reporting and Investigations.”

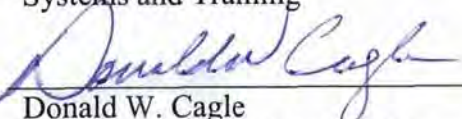
Battelle Science & Technology International

Safety and Industrial Hygiene General Procedure

Title:	Respiratory Protection Procedure
Number:	SIH-GP-010
Revision:	0

Originator:  10-13-04
Freddie Kight Date
BSTI Safety Advisor

Reviewed By:  10/18/04
Curt Flemming Date
BSTI, Manager, Quality Management
Systems and Training

Approved By:  10/15/04
Donald W. Cagle Date
BSTI, Manager, Safety, Health and
Emergency Response

Approved By:  10/17/04
Mark Jackson Date
BSTI, Manager, Regulatory Compliance

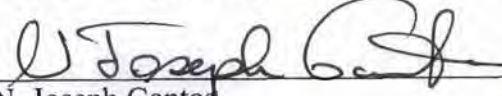
Approved By:  10/23/04
N. Joseph Gantos Date
Vice President, BSTI Environment, Safety,
Health, and Quality

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REVISION HISTORY

Rev. No.	Effective Date	Description of Revision
0	11/04/04	Replaces SIH-PP-010 - Review due to department Re-Organization

1.0 PURPOSE

The purpose of this procedure is to provide guidance for assessment of work areas; to establish personnel responsibilities; to assure proper selection, usage, and maintenance of respiratory protection equipment; and to establish a mechanism for the documentation of these activities in accordance with applicable regulatory requirements and accepted work practices.

2.0 SCOPE AND APPLICABILITY

This procedure applies to Battelle Science and Technology International (BSTI), including regional offices and field operations.

3.0 PREREQUISITES

3.1 Training

- 3.1.1 For the safe and effective use of respiratory protection equipment, it is essential that the user be properly instructed in its purpose, selection, use, and maintenance. Training must be provided by a qualified individual. Prior to being assigned a respirator, every respirator user must receive appropriate training in the following areas:
- 3.1.2 Requirements of the respirator procedure, including responsibilities of associated personnel.
- 3.1.3 Nature of the hazard(s).
- 3.1.4 Exposure control methods.
- 3.1.5 Suitability, capabilities, and limitations of the particular respirator to be used.
- 3.1.6 Recognizing and handling emergencies as appropriate.
- 3.1.7 How to don and doff respiratory protection equipment properly, including positive and negative pressure user seal checks.
- 3.1.8 Requirements for inspection, storage, maintenance, and cleaning of the respirator.
- 3.1.9 Respirator cartridge replacement frequency.
- 3.1.10 The user must demonstrate competency by passing the given test with a score of 80% or greater.
- 3.1.11 Refresher training will be given annually. Retraining also is required when a periodic inspection reveals inadequacies in the staff member's knowledge or use of this procedure.
- 3.1.12 Authorization to use respiratory protection equipment will be revoked by the Safety and Health Representative or designee if refresher training is not satisfactorily completed.

3.2 Medical Evaluation

- 3.2.1 Medical approval is required for those who need to wear respiratory protection equipment. Staff will not be permitted to wear respirators in BSTI operations without a current medical statement approving such use.

- 3.2.2 A Medical Evaluator will determine an individual's physical fitness for respirator use. The intervals for examinations are established by BSTI Health Services. Regardless of the frequency of examination, Health Services (or appropriate medical personnel) staff will evaluate staff files prior to annual refitting. Depending upon the medical condition of the individual, the Medical Evaluator shall determine the extent of medical testing necessary to approve continual respirator usage.
- 3.2.3 The Medical Evaluator will do one of the following:
 - 3.2.1.1 Approve the individual for unrestricted use.
 - 3.2.1.2 Approve the individual for restricted use and describe the restriction(s).
 - 3.2.1.3 Deny use of a respirator to the individual.

3.3 Fit Testing

- 3.3.1 The following requirements must be met prior to a staff member being fitted for respiratory protection: (1) medical approval and (2) training completed.
- 3.3.2 Fit testing is performed by an authorized individual in accordance with the applicable approved quantitative or qualitative fit test protocol. This individual is appointed by the BSTI Safety, Health and Emergency Response Manager.
- 3.3.3 Each different type of respiratory protection equipment that uses a facepiece-to-face seal shall be fit tested. This includes self-contained breathing apparatus (SCBA) masks, air line respirator masks, filtering facepiece (dust mask), and powered or nonpowered air-purifying respirators (APRs). Positive pressure facepieces will be tested in the negative pressure mode.
- 3.3.4 For APRs, a sufficient number of styles and sizes will be made available. The staff member will be allowed to examine each of the respirators available and choose one for his/her fit test.
- 3.3.5 Fit testing will be performed at least annually for staff who remain active in the Respiratory Protection Procedure. Fit testing also will be repeated as necessary for items that could affect the fit (e.g., excessive weight loss or gain, dentures, and/ scars).

4.0 DEFINITIONS

4.1 The following definitions apply only to this procedure:

Exposure Limit—Permissible exposure limit (PEL), as defined by the Occupational Safety and Health Administration (OSHA), is an employee’s exposure to any substance listed in Tables Z-1, Z-2 and Z-3 in any 8-hour work shift of a 40-hour work week, which shall not exceed the 8-hour time weighted average limit given for that substance in the table. Exposure limits also may be expressed in terms of ceiling concentrations. The American Conference of Governmental Industrial Hygienists establishes recommended exposure limits referred to as “threshold limit values.” The National Institute for Occupational Safety and Health (NIOSH) also establishes “recommended exposure limits.”

Immediately Dangerous to Life or Health (IDLH)—An atmospheric concentration of any toxic, corrosive or asphyxia substance that poses an immediate threat to life or would cause irreversible or delayed adverse health effects or would interfere with an individual’s ability to escape from a dangerous atmosphere. (Also see 29 Code of Federal Regulations [CFR] 1910.134 (g)(3))

Oxygen Deficient Atmosphere—Oxygen deficient atmosphere means an atmosphere with oxygen content below 19.5% by volume.

Protection Factor (PF)—The number assigned to indicate the capability of a respirator to afford a certain degree of protection in terms of fit and filter/cartridge penetration. (Various agencies may assign PFs.)

Qualitative Fit Test - (QLFT) —An assessment of the adequacy of respirator fit by determining whether or not an individual using the respirator can detect the odor, taste, or irritation of a contaminant introduced into the vicinity of the user’s head.

Quantitative Fit Test - (QNFT) - —An assessment of the adequacy of respirator fit by numerically measuring concentrations of a challenge agent inside and outside the face piece. The ratio of the two measurements is an index of leakage of the seal between the respirator face piece and the user’s face.

Respirator—Respiratory Protection Equipment—Any device certified by NIOSH and the Mine Safety and Health Administration that is designed to protect the user from inhalation of harmful contaminants. Disposable filtering facepiece and air-pressurized suits (bubble suits; not those that are incidentally pressurized when worn over an air-supplying respirator) are specifically included even when used for nontoxic nuisance contaminants. Excluded are SCUBA and surgical masks. (Note: Surgical masks cannot be used as a substitute where respiratory protection is needed.)

4.2 The following definitions can be found in the BSTI Glossary:

- Administrative Controls
- Authorized Technician
- Engineering Controls
- Qualified Individual
- Qualified User

5.0 REGULATORY/VOLUNTARY STANDARD REFERENCES

- 5.1 OSHA 29 CFR Section 1910.134, “Respiratory Protection.”
- 5.2 Nuclear Regulatory Commission 10 CFR Part 20, “Standards for Protection against Radiation.”
- 5.3 NIOSH Guide to the Selection and Use of Particulate Respirators Certified Under 42 CFR 84.
- 5.4 NIOSH Guide to Industrial Respiratory Protection.
- 5.5 The Occupational Environment – Its Evaluation, Control, and Management. Chapter 36, American Industrial Hygiene Association
- 5.6 Compressed Gas Association G-7.1, “Commodity Specification for Air.”

6.0 RESPONSIBILITIES

6.1 Line Management and Supervision

- 6.1.1 Ensure that the applicable Safety and Health Representative is informed of any planned use or expected need for respirators or a change in process or conditions that may lead to a need for respiratory protection.
- 6.1.2 Ensure that staff under their supervision are qualified and trained prior to using respirators.
- 6.1.3 Implement and apply this procedure in accordance with the information received from the Safety and Health Representative.

6.2 Safety and Health Representatives

- 6.2.1 Maintain detail and current knowledge of regulations, standards, requirements, equipment capabilities, and good practice affecting safe and effective use of respirators.
- 6.2.2 Evaluate implementation and effectiveness of the procedure and make recommendations based on those evaluations.
- 6.2.3 Evaluate staff exposures and work conditions, including random inspections of respiratory protection equipment use.
- 6.2.4 Specify and document the appropriate respiratory protection and associated equipment (e.g., cartridges, sorbents, and cartridges) based on anticipated work conditions or activities.
- 6.2.5 Ensure, in conjunction with management, that staff are properly trained and fitted with the proper equipment when required to use respiratory protection equipment.
- 6.2.6 Verify that breathing air requirements for supplied air respirators are in accordance to OSHA 29 CFR 1910.134 (i).
- 6.2.7 Evaluate anticipated work conditions or activities to determine what respiratory protection is necessary.

6.3 Safety and Health Advisor

- 6.3.1 Administrate respirator fit testing.
- 6.3.2 Inspect and maintain SCBAs located in general areas at King Avenue and West Jefferson sites.
- 6.3.3 Maintain respirator fit testing equipment and ample supply of respiratory protection equipment.
- 6.3.4 Generate documentation of maintenance and inspection records of respiratory protection equipment and respirator fit testing.

6.4 BCO Health Services

- 6.4.1 Determine medical fitness for respirator use.
- 6.4.2 Utilize the OSHA–approved medical questionnaire (29 CFR 1910.134, Appendix C) or equivalent form.
- 6.4.3 Provide medical evaluation to appropriate Line Managers and Safety and Health Representatives.

6.5 Respirator Users

- 6.5.1 Use, maintain, inspect, and store respiratory protection equipment as instructed to meet the procedure requirements.
- 6.5.2 Inform BCO Health Services of any personal health problems that could be aggravated by the use of respiratory protection equipment.
- 6.5.3 Inform BCO Health Services of any changes in health or physical characteristics (e.g., excessive weight changes, dentures, deformation resulting from accidents, pregnancy, etc.) that could affect the use of a respirator.
- 6.5.4 Notify Safety and Health Representative of any changes in respiratory usage, working environment, process, regulations, and laboratory protocols, etc., so that the use of the respirator may be re-evaluated.
- 6.5.5 Provide input to Safety and Health Representatives, management, or others involved in the implementation of this procedure as to its effectiveness and identify problems associated with the implementation.

7.0 PROCEDURE

7.1 Hazard Control

Line Management and Safety and Health Representatives shall work to develop engineering and/or administrative controls to reduce the need for respiratory protection equipment.

7.2 Hazard Assessment

- 7.2.1 Each work place or work activity where BSTI employees are exposed to hazardous conditions shall be evaluated by the appropriate Safety and Health Representative to determine the need for respiratory protection.

7.2.2 Identification of hazards should include, but is not limited to, consideration of the following items:

7.2.2.1 Airborne contaminant(s) present

7.2.2.2 Engineering or administrative controls in place

7.2.2.3 Other potential hazards (e.g., oxygen deficient atmosphere, confined space).

7.2.3 Hazards assessments shall be documented on Form SIH-FM-027, Personal Protective Equipment Hazard Assessment Certification.

7.3 Respirator Selection

7.3.1 The Safety and Health Representative or qualified designee shall become familiar with the types of respiratory protection available and their uses and limitations.

7.3.2 Respirator(s) selected and used shall be NIOSH certified per 29 CFR 1910.134(d) (1) (ii). Selection shall be based on a level of protection equal to or greater than the minimum required to protect the exposed employee(s) from the potential or observed hazards. Selection criteria that must be considered include the following:

7.3.2.1 Emergency situation(s)

7.3.2.2 Presence of carcinogens

7.3.2.3 Contaminant concentration greater than the exposure limit

7.3.2.4 Contaminant concentration greater than the IDLH level

7.3.2.5 Oxygen deficient atmosphere < 19.5% oxygen by volume (also IDLH)

7.3.2.6 Protection Factors

7.3.2.7 Adequate warning properties—taste, odor, irritation

7.3.2.8 Physical state of contaminant (gas/vapor or particulate)

7.3.2.9 Adverse health effects (in the event of breakthrough or leakage)

7.3.2.10 Amount of time respirator will be worn

7.3.2.11 Work activities/stress (physical activity, temperature/humidity)

7.3.2.12 Fit test results (a different respirator must be selected if the one originally selected cannot be fit).

7.4 Maintenance, Inspection, and Care of Respirators

7.4.1 Any supplementary standard operating procedures (SOPs) or protocols governing respirator use will include instructions for the maintenance and care of respirators. The SOP or protocol cannot be less restrictive than this procedure. Regular inspections shall be conducted by a qualified individual to assure respirators are properly used, cleaned, and stored. Items important to maintenance, care, use, and inspection include the following:

- 7.4.1.1 Inspection for defects (facepiece condition, headbands, valves, and cartridges)
- 7.4.1.2 Cleaning, disinfecting, and decontaminating before and after use
- 7.4.1.3 Proper storage
- 7.4.1.4 Store to protect from damage, contamination, dust, sunlight, extreme temperature, excessive moisture, and to prevent deformation of facepiece and exhalation valves.
- 7.4.2 Only an authorized individual, appointed by the BSTI Safety, Health and Emergency Response Manager, shall make repairs and replace parts, using parts designed for the respirator and authorized for use by the manufacturer. Users will make no repairs or modifications to any component, unless specifically instructed to do so by a qualified individual.
- 7.4.3 The user is responsible for maintaining a good facepiece seal in accordance with instructions received during training and fit testing. Respirators that depend on a facepiece seal will not be worn when conditions such as the following prevent an effective facepiece seal:
 - 7.4.3.1 Facial hair in the seal area
 - 7.4.3.2 Eyeglass temples extending through the seal area
 - 7.4.3.3 Shape of the face, facial features or scars; dentures or other conditions that would preclude an accurate measurement of respirator fit
 - 7.4.3.4 Protective clothing in the seal area.
- 7.4.4 The Supervisor, in conjunction with the Safety and Health Representative, is responsible for determining a respirator replacement schedule for respirator cartridges and shall perform periodic inspections to verify that cartridges are being replaced according to this schedule.
- 7.4.5 Information concerning respirator cartridge replacement intervals may be found in Appendix A. The useful life of cartridges varies under user conditions. Conditions of use include, but are not limited to, length of time the respirator is worn, ambient temperature in area of use, humidity in area of use, and anticipated air volume based on the physical exertion of the user. Once this information is determined, the user shall be placed on a schedule to replace the cartridge(s) at 60% of the maximum life expectancy for the selected cartridge. At a minimum, cartridges will be replaced
 - 7.4.5.1 If the projected 60% maximum use limitation is exceeded;
 - 7.4.5.2 If breakthrough is detected;
 - 7.4.5.3 When the end-of-service life indicator shows the cartridge is expired or spent;
 - 7.4.5.4 When instructed based on exposure potential;
 - 7.4.5.5 When there is noticeably increased breathing resistance; or

7.4.5.6 If the cartridges have become damaged.

7.5 Voluntary Use

- 7.5.1 Voluntary use of an APR is permissible if the individual's Safety and Health Representative approves the use in writing (Form SIH-FM-002, Voluntary Respirator Use). Voluntary use is not allowed for any other type of respiratory protection (i.e., supplied air respirators), nor is it allowed if the APR in itself is determined to create a hazard.
- 7.5.2 Voluntary use is allowed only where the use is requested for comfort reasons by the employee from the Safety and Health Representative, who will determine the appropriateness of using an APR. It will not be approved for exposure to toxic substances.
- 7.5.3 When approved, BSTI will provide the appropriate NIOSH-approved APR to be used. Employees will be informed that the APR is to be used only for the purposes for which it was issued and that they are to discontinue use of the APR if they experience any adverse health effects or difficulty breathing while wearing the APR. If this occurs, they must report to BSTI Health Services immediately.
- 7.5.4 The Safety and Health Representative will ensure that the employee requesting an APR under the voluntary use provision has received a medical clearance to wear the respirator. (A medical clearance is not needed for a filtering facepiece.) The Safety and Health Representative will ensure that the employee reads and understands the instructions provided by the manufacturer on use and limitations of the respirator and indicates such by signature on form SIH-FM-002.

7.6 Use of Respiratory Protection by Non-Battelle Staff

- 7.6.1 OSHA (29 CFR 1910.134) requires that respirator users have been (1) medically evaluated to determine medical fitness for respirator use; (2) properly trained in use, care, and limitations; and (3) properly fit tested.
- 7.6.2 Normally, non-Battelle staff are expected to bring their own respirators obtained through their employers' respirator procedure.
- 7.6.3 If a non-Battelle staff member requires a respirator, one can be issued upon verification of his/her physician's approval, training, and fit-test status.

7.7 Atmosphere-Supplying Respirators

7.7.1 SCBAs

- 7.7.1.1 SCBAs are available in areas where a need for such equipment has been recognized. The SCBA units are maintained and ready for emergency use. In addition, SCBAs may be rented or purchased for specific projects. A Safety and Health Representative must approve the purchase and use of any breathing air systems to ensure that they meet the requirements set forth in OSHA's and Battelle's Respiratory Protection Procedures.
- 7.7.1.2 Only individuals specifically trained to use SCBA equipment may do so.
- 7.7.1.3 Inspection and maintenance of those located in general areas at King Avenue and West Jefferson are the responsibility a Safety and Health Advisor. Those purchased for specific projects are the responsibility of the divisions to which they belong. Regional offices and field operations are responsible for inspection of their own SCBAs.
- 7.7.1.4 At a minimum, SCBAs must be inspected monthly and after each use. Annually, they must be flow-checked per manufacturer instructions by an authorized technician. Cylinders must be hydrostatically tested and regulators must be maintained per manufacturer instructions by an authorized technician.
- 7.7.1.5 SCBAs use a portable source of compressed air delivered through a high-pressure hose from the cylinder to the respirator facepiece. Air supply for the cylinders is provided by an authorized vendor and must meet the requirements for Grade D or higher quality, as set forth by Compressed Gas Association G-7.1, "Commodity Specification for Air." Documentation supporting this will be maintained.

7.7.2 Air-Line Respirators

- 7.7.2.1 Air-line respirators are available in areas where a need for such equipment has been recognized. The air-line respirator units are maintained and ready for emergency use. A Safety and Health Representative must approve the purchase and use of any breathing air systems to ensure that they meet the requirements set forth in OSHA's and Battelle's Respiratory Protection Procedures.
- 7.7.2.2 Only individuals specifically trained to use air-line respirators may do so.
- 7.7.2.3 Monthly inspections of those located in general areas at King Avenue and West Jefferson are the responsibility of the air-line respirator user. Other inspections and maintenance required by manufacturer are required by the appropriate division. Regional offices and field operations are responsible for inspection of their own air-line respirators.

- 7.7.2.4 At a minimum, air-line respirators must be inspected monthly and after each use. Annually, they must be flow-checked per manufacturer instructions by an authorized technician. Cylinders must be hydrostatically tested and regulators must be maintained per manufacturer instructions by an authorized technician.
- 7.7.2.5 Air-line respirators use a stationary source of compressed air delivered through a high-pressure hose to the respirator facepiece. The air supply for air-line respirators must meet the requirements for Grade D or higher quality, as set forth by Compressed Gas Association G-7.1, "Commodity Specification for Air." Documentation supporting this will be maintained.
- 7.7.2.6 Breathing air compressors must be equipped with appropriate filtration and monitoring devices (e.g., carbon monoxide and temperature alarms).

7.8 Regional Offices and Field Operations

- 7.8.1 The Safety and Health Representative may delegate an authorized individual to conduct fit tests and manage other aspects of this procedure. The Safety and Health Representative will directly evaluate all off-site requests for performing fit tests and managing an off-site respiratory protection procedure. The Safety and Health Representative will verify and document the qualifications of an individual or individuals to conduct fit tests and to assume any other respiratory protection procedure responsibilities.
- 7.8.2 The Safety and Health Representative will inspect the procedure annually to ensure its effective functioning. The responsibilities of the regional office and field operations Representatives will be reevaluated annually by the Safety and Health Representative. Their authority to conduct fit tests and/or manage the respiratory protection procedure may be revoked when deemed necessary by the responsible Safety and Health Representative.

8.0 RECORDS

Name of Records	Record Media	Location	Retention Period
Respiratory Protection Training	Paper	ESH&Q Central Files	Permanent
Medical Evaluation	Paper	BCO Health Services	Permanent
Respirator Fit Test (< 1 year)	Paper or Electronic	Safety, Health, and Emergency Response	Permanent
Respirator Fit Test (> 1 year)	Paper or Electronic	ESH&Q Central Files	Permanent
Hazard Assessments	Paper or Electronic	Business Groups	Permanent
Approval for APR Voluntary Use	Paper or Electronic	ESH&Q Central Files	Permanent
ESH-137 SCBA Inspection and Cylinder Maintenance	Paper or Electronic	ESH&Q Central Files	Permanent
Air Supply for Atmosphere-Supplying Respirators	Paper or Electronic	ESH&Q Central Files	Permanent
Respirator Cartridge Replacement Schedule	Paper or Electronic	Business Groups	Permanent
SIH-FM-027, Personal Protective Equipment Hazard Assessment Certification	Paper or Electronic	ESH&Q Central Files	Permanent
SIH-FM-002, Voluntary Respirator Use	Paper or Electronic	ESH&Q Central Files	Permanent

9.0 RELATED DOCUMENTS

- BSTI Operating Guide 1340-2.1, “Respiratory Protective Equipment”

APPENDIX A: Respirator Cartridge Service Life Determination

Organic vapor cartridge life expectancy will vary based on ambient relative humidity, flow rate through the cartridge, temperature, and concentration of the contaminant that is being removed from the air stream. The National Institute for Occupational Safety and Health (NIOSH) tests organic cartridges for air-purifying respirators. The NIOSH test protocol requires that the organic cartridge be subjected to a flow rate of 64 linear feet per minute (lfm) at existing room temperature and relative humidity. The protocol also tests the cartridge at 32 lfm and 25% and 85% relative humidity. Through each of these tests, the organic cartridge is subjected to 1,000 parts per million (ppm) carbon tetrachloride and must withstand this concentration for 50 minutes with less than 5 ppm penetration. NIOSH does not test cartridges under varying conditions of use.

Methods for Determining Useful Cartridge Life for Varying Conditions of Use:

This is a compilation of methods for determining the useful life of organic cartridge respirators. Select a method that is conservative, reproducible, and suitable for the needs of the workers. Use available manufacturer's information concerning service life for variable conditions.

Manufacturer's Suggested Respirator Change Schedules:

Cartridge life estimation is available through some manufacturers' Web pages. Use the following Internet addresses to find information for some manufacturers:

- 3M—www.3m.com/occsafety—Then click on Establishing a Chemical Cartridge Change Schedule
- MSA—www.msanet.com/safetyproducts/cartlife/index.html
- Others—Check the Web page of your particular manufacturer.
- OSHA—http://www.osha-slc.gov/SLTC/respiratory_advisor/math_model/yooneelson_model/descriptive_data/descriptive_data.html or http://www.osha-slc.gov/SLTC/respiratory_advisor/mainpage.html

Rule of Thumb Method

In Chapter 36 of the AIHA publication, *The Occupational Environment—Its Evaluation, Control, and Management*, a “rule of thumb” is presented for estimating organic vapor cartridge service life. The suggested rule of thumb is as follows:

- If the chemical's boiling point is $> 70^{\circ}\text{C}$ and the concentration is less than 200 ppm, the expected service life is 8 hours at a normal work rate.
- Service life is inversely proportional to work rate.
- Reducing concentration by a factor of 10 will increase service life by a factor of 5.
- Humidity above 85% will reduce service life by 50%.

**Battelle Science & Technology International
Safety and Industrial Hygiene Program**

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Originator: Stephanie McKinnon 23 Jul 04
Stephanie McKinnon Date
Safety and Health Representative

Approved By: Donald Cagle 7/22/04
Donald Cagle Date
Manager, Safety, Health & Emergency Response

Reviewed By: Curt Flemming 7/22/04
Curt Flemming Date
Manager, Quality Management Systems & Training

Approved By: Mark Jackson 7/22/04
Mark Jackson Date
Manager, Regulatory Compliance

Approved By: N. Joseph Gantos 7/30/04
N. Joseph Gantos Date
Vice President, BSTI ESH&Q

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REVISION HISTORY

Rev. No.	Effective Date	Description of Revision
0	08/11/04	Document re-issued under new numbering system. (Previous Number SIH-PP-01)

1.0 PURPOSE

This program is intended to provide guidance for compliance with the requirements of the Occupational Safety and Health Administration (OSHA) Standard, “General Requirements, Personal Protective Equipment (PPE)” 29 Code of Federal Regulations (CFR) 1910.132 and subsequent PPE regulations in this section of the CFR.

2.0 SCOPE AND APPLICABILITY

This program applies to all Battelle Science & Technology International (BSTI) staff, including required offices and field operations, and to all contractors performing work on Battelle property or on behalf of Battelle. This program establishes minimum performance requirements. This program does not include hearing protection, respiratory protection, PPE used for fall protection or laser eye protection. These items are covered in other programs.

3.0 PREREQUISITES

3.1 Training

New employees working in labs shall be provided with basic PPE awareness training. This is typically included in the new employee safety orientation.

4.0 DEFINITIONS

Personal Protective Equipment (PPE) – clothing and equipment provided to employees to prevent contact from identified workplace hazards.

5.0 REGULATORY/VOLUNTARY STANDARD REFERENCES

- U.S. Department of Labor, OSHA Standard, “General Requirements, Personal Protective Equipment” 29 CFR 1910.132
- U.S. Department of Labor, OSHA Standard, “Eye and Face Protection” 29 CFR 1910.133 and American National Standards Institute (ANSI) Z87.1, Occupational and Educational Eye and Face Protection
- U.S. Department of Labor, OSHA Standard, “Head Protection” 29 CFR 1910.135 and ANSI Z89.1, Standard for Industrial Protective Helmets
- U.S. Department of Labor, OSHA Standard, “Foot Protection” 29 CFR 1910.136 and ANSI Z41.1, Personal Protection – Protective Footwear
- U.S. Department of Labor, OSHA Standard, “Hand Protection” 29 CFR 1910.138
- Battelle “Safe Work Practices Handbook” (Latest Revision)

6.0 RESPONSIBILITIES

6.1 Safety & Health Representatives

- 6.1.1 Assist managers, supervisors and project staff in conducting hazard assessments and identifying proper PPE.
- 6.1.2 Ensure employees receive training on the PPE they are expected to use.
- 6.1.3 Periodically review, update and evaluate the overall effectiveness of the PPE program.

6.2 Managers

- 6.2.1 Ensure hazard assessments are completed for physical areas and projects under their department/section/area.
- 6.2.2 Ensure that all affected staff are properly trained and qualified to use, maintain and store the PPE they are expected to wear.
- 6.2.3 Ensure serviceable PPE is readily available.
- 6.2.4 Ensure defective or damaged equipment is immediately replaced.

6.3 Project Managers

- 6.3.1 Ensure hazards assessments are completed for assigned projects.
- 6.3.2 Ensure staff assigned to projects have PPE training based on the hazard assessments.

6.4 Employees

- 6.4.1 Wear PPE as required
- 6.4.2 Attend required training.
- 6.4.3 Use, maintain and store PPE as required.

6.5 BSTI ESH&Q Training

Ensure new employee safety orientation training is provided on a regular, timely basis.

6.6 Contractors

- 6.6.1 Contractors shall receive a copy of this program. Any questions should be directed to the Battelle contact.
- 6.6.2 Contractors may be asked to provide a copy of their PPE program and/or hazard assessments supporting the work to be performed on Battelle premises or on behalf of Battelle.

7.0 PROCEDURE

7.1 General Requirements

PPE alone should not be relied on to provide protection against hazards, but should be used in conjunction with engineering controls, and administrative controls.

7.2 Hazard Assessment and/or Line Managers and S&H Representatives Shall Evaluate

- 7.2.1 Each work place or work activity where Battelle employees are exposed to hazardous conditions shall be evaluated to determine the need for PPE and what PPE is necessary.
- 7.2.2 The Safety and Health Representative, in conjunction with the Manager/Supervisor, or designee shall evaluate anticipated or actual work conditions, job categories, or activities to determine what PPE is necessary. See Appendix A for examples of hazard categories.
- 7.2.3 Hazard assessments shall be documented; *Safe Work Plans* and *Standard Operating Procedures* are examples of documents which may be used to document hazard assessments. For organizations that do not have an internal method to document, form SIH-FM-027 Personal Protective Equipment Hazard Assessment Certification may be used.

7.2.4 When work place conditions, physical locations, materials in use or activities change, Line Managers and S&H Representatives reassess the hazards and re-evaluate the suitability of the PPE. Update written documentation if necessary.

7.3 PPE Selection

7.3.1 Selection of PPE shall be based upon provision of a level of protection equal to or greater than the minimum required to protect from hazards identified in the hazard assessment.

7.3.2 The OSHA standards in the reference section include specific considerations based on the types of protection necessary (e.g., eye, hand, head). Each of these standards also incorporates, by reference, standards that identify requirements (typically equivalent standards developed by the American National Standards Institute) for PPE. When making PPE selections, familiarity with these references will ensure proper PPE selection. See Appendix B for selection guidance.

7.4 Specialized Training

7.4.1 Use of PPE that requires specialized training will be provided at the time the PPE is issued to or selected for affected employees.

7.4.2 Retraining shall be provided if an employee demonstrates a deficiency in using or caring for PPE based on information provided in previous training.

7.4.3 Retraining also is required if there are significant changes in the workplace that render the previous training obsolete.

8.0 RECORDS

<u>Name of Record</u>	<u>Record Media</u>	<u>Locator</u>
Hazard Assessments	Paper or electronic	Business Groups
Training records	Paper	ESH&Q Central Files

9.0 RELATED DOCUMENTS

- SIH-FM-027 Personal Protective Equipment Hazard Assessment Form
- Battelle “Safe Work Practices Handbook”

Appendix A: Guidelines for Conducting PPE Hazard Assessments

Conduct a walk-through survey of the areas in question. The purpose of the survey is to identify sources of hazards to workers and co-workers.

Consideration should be given to the basic hazard categories:

- Impact
- Penetration
- Compression (roll-over)
- Chemical
- Heat
- Harmful dust
- Light (optical) radiation

During the walk-through observe:

- Sources of motion; i.e., machinery or processes where any movement of tools, machine elements or particles could exist, or movement of personnel that could result in collision with stationary objects.
- Sources of high temperatures that could result in burns, eye injury or ignition of protective equipment, etc.
- Types of chemical exposures.
- Sources of harmful dust.
- Sources of light radiation, i.e., welding, brazing, cutting, furnaces, heat treating, high intensity lights, etc.
- Sources of falling objects or potential for dropping objects.
- Sources of sharp objects which might pierce the feet or cut the hands.
- Sources of rolling or pinching objects which could crush the feet.
- Layout of workplace and location of co-workers.
- Electrical hazards.
- In addition, injury/accident data should be reviewed to help identify problem areas.

Appendix B: Categories of Personal Protective Equipment and Selection Considerations

Eye and face protection: The following chart provides general guidance for the proper selection of eye and face protection to protect against hazards associated with the listed hazard "source" operations.

Source	Assessment of Hazard	Protection
IMPACT - Chipping, Grinding, machining, masonry work, woodworking, sawing, drilling, chiseling, powered fastening, riveting, and sanding.	Flying fragments, objects, large chips, particles, sand, dirt, etc.	Spectacles with side protection, goggles, face shields. See notes (1), (3), (5), (6), (10). For severe exposure, use faceshield.
HEAT-Furnace operations, pouring, casting, hot dipping, and welding.	Hot sparks Splash from molten metals High temperature exposure	Faceshields, goggles, spectacles with side protection. For severe exposure use faceshield. See notes (1),(2),(3). Faceshields worn over goggles. See notes (1), (2), (3). Screen face shields, reflective face shields. See notes (1), (2), (3).
CHEMICALS - acid and chemicals handling, degreasing, plating.	Splash Irritating mists	Goggles, eyecup and cover types. For severe exposure, use face shield. See notes (3), (11). Special-purpose goggles.
DUST - woodworking, buffing, general dusty conditions.	Nuisance dust	Goggles, eyecup and cover types. See note (8).
LIGHT and/or RADIATION - Welding: Electric Arc	Optical radiation	Welding helmets or welding shields. Typical shades: 10-14. See notes (9), (12).
Welding: Gas	Optical radiation	Welding goggles or welding face shield. Typical shades: gas welding 4-8, cutting 3-6, brazing 3-4. See note (9).

Cutting, torch brazing, torch soldering	Optical radiation	Spectacles or welding face-shield. Typical shades 1.5-3. See notes (3), (9).
Glare	Poor vision	Spectacles with shaded or special-purpose lenses, as suitable. See notes (9), (10).

Notes to Eye and Face Protection Selection Chart:

- (1) Care should be taken to recognize the possibility of multiple and simultaneous exposure to a variety of hazards. Adequate protection against the highest level of each of the hazards should be provided. Protective devices do not provide unlimited protection.
- (2) Operations involving heat may also involve light radiation. As required by the standard, protection from both hazards must be provided.
- (3) Faceshields should only be worn over primary eye protection (spectacles or goggles).
- (4) As required by the standard, filter lenses must meet the requirements for shade designations in 1910.133(a)(5). Tinted and shaded lenses are not filter lenses unless they are marked or identified as such.
- (5) As required by the standard, persons whose vision requires the use of prescription (Rx) lenses must wear either protective devices fitted with prescription (Rx) lenses or protective devices designed to be worn over regular prescription (Rx) eyewear.
- (6) Wearers of contact lenses must also wear appropriate eye and face protection devices in a hazardous environment. It should be recognized that dusty and/or chemical environments may represent an additional hazard to contact lens wearers.
- (7) Atmospheric conditions and the restricted ventilation of the protector can cause lenses to fog. Frequent cleansing may be necessary.
- (8) Welding helmets or faceshields should be used only over primary eye protection (spectacles or goggles).
- (9) Non-sideshield spectacles are available for frontal protection only, but are not acceptable eye protection for the sources and operations listed for "impact."
- (10) Ventilation should be adequate, but well protected from splash entry. Eye and face protection should be designed and used so that it provides both adequate ventilation and protects the wearer from splash entry.
- (11) Protection from light radiation is directly related to filter lens density. See note (4). Select the darkest shade that allows task performance.

Filter lenses for protection against radiant energy are listed below for various operations, with the appropriate shade numbers.

Filter Lenses for Protection Against Radiant Energy

Operations	Electric Size 1/32 in.	Arc Current Shade	Minimum Protective*
Shielded metal arc welding	Less than 3	Less than 60	7
	3-5	60-160	8
	5-8	160-250	10
	More than 8	250-550	11
Gas metal arc welding and flux cored arc welding		Less than 60	7
		60-160	10
		160-250	10
		250-550	10
Gas tungsten arc welding		Less than 50	8
		50-150	8
		150-500	10
Air carbon Arc cutting	Light	Less than 500	10
	Heavy	500-1000	11
Plasma arc welding		Less than 20	6
		20-100	8
		100-400	10
		400-800	11
Plasma arc cutting	Light**	Less than 300	8
	Medium**	300-400	9
	Heavy**	400-800	10
Torch brazing		---	3
Torch soldering		---	2
Carbon arc welding		---	14

Filter Lenses for Protection Against Radiant Energy

Operations	Electric Size 1/32 in.	Arc Current Shade	Minimum Protective*				
Gas welding:							
				Light	Under 1/8	Under 3.2	4
				Medium	1/8 to 1/2	3.2 to 12.7	5
Heavy	Over 1/2	Over 12.7	6				
Oxygen cutting:							
				Light		Under 25	3
				Medium		25 to 150	4
Heavy		Over 150	5				

*As a rule of thumb, start with a shade that is too dark to see the weld zone. Then go to a lighter shade which gives sufficient view of the weld zone without going a high yellow light, it is desirable to use a filter lens that absorbs the yellow or sodium line in the visible light of the (spectrum) operation.

** These values apply where the actual arc is clearly seen. Experience has shown that lighter filters may be used when the arc is hidden by the work piece.

Head protection: All head protection (helmets) is designed to provide protection from impact and penetration hazards caused by falling objects. Head protection is also available which provides protection from electric shock and burn. When selecting head protection, knowledge of potential electrical hazards is important.

- Class A helmets, in addition to impact and penetration resistance, provide electrical protection from low-voltage conductors (they are proof tested to 2,200 volts).
- Class B helmets, in addition to impact and penetration resistance, provide electrical protection from high-voltage conductors (they are proof tested to 20,000 volts).
- Class C helmets provide impact and penetration resistance (they are usually made of aluminum which conducts electricity), and should not be used around electrical hazards.

Where falling object hazards are present, helmets must be worn. Some examples include: working below other workers who are using tools and materials which could fall; working around or under conveyor belts which are carrying parts or materials; working below machinery or processes which might cause material or objects to fall; and working on exposed energized conductors. Some examples of occupations for which head protection should be routinely considered are: carpenters, electricians, linemen, mechanics and repairers, plumbers and pipe fitters, assemblers, packers, wrappers, sawyers, welders, laborers, freight handlers, timber cutting and logging, stock handlers, and warehouse laborers.

Foot protection: Safety shoes and boots which meet the ANSI Z41-1991 Standard provide both impact and compression protection. Where necessary, safety shoes can be obtained which provide puncture protection. In some work situations, metatarsal protection should be provided, and in other special situations electrical conductive or insulating safety shoes would be appropriate.

Safety shoes or boots with impact protection would be required for carrying or handling materials such as packages, objects, parts or heavy tools, which could be dropped; and, for other activities where objects might fall onto the feet. Safety shoes or boots with compression protection would be required for work activities involving skid trucks (manual material handling carts) around bulk rolls (such as paper rolls) and around heavy pipes, all of which could potentially roll over an employee's feet. Safety shoes or boots with puncture protection would be required where sharp objects such as nails, wire, tacks, screws, large staples, scrap metal etc., could be stepped on by employees causing a foot injury.

Some occupations (not a complete list) for which foot protection should be routinely considered are: shipping and receiving clerks, stock clerks, carpenters, electricians, machinists, mechanics and repairers, plumbers and pipe fitters, structural metal workers, assemblers, drywall installers and lathers, packers, wrappers, craters, punch and stamping press operators, sawyers, welders, laborers, freight handlers, gardeners and grounds-keepers, timber cutting and logging workers, stock handlers and warehouse laborers.

Hand protection: Gloves are often relied upon to prevent cuts, abrasions, burns, and skin contact with chemicals that are capable of causing local or systemic effects following dermal exposure. OSHA is unaware of any gloves that provide protection against all potential hand hazards, and commonly available glove materials provide only limited protection against many chemicals. Therefore, it is important to select the most appropriate glove for a particular application and to determine how long it can be worn, and whether it can be reused.

It is also important to know the performance characteristics of gloves relative to the specific hazard anticipated; e.g., chemical hazards, cut hazards, flame hazards, etc. These performance characteristics should be assessed by using standard test procedures. Before purchasing gloves, the employer should request documentation from the manufacturer that the gloves meet the appropriate test standard(s) for the hazard(s) anticipated. Other factors to be considered for glove selection in general include:

- (A) As long as the performance characteristics are acceptable, in certain circumstances, it may be more cost effective to regularly change cheaper gloves than to reuse more expensive types.
- (B) The work activities of the employee should be studied to determine the degree of dexterity required, the duration, frequency, and degree of exposure of the hazard, and the physical stresses that will be applied.

With respect to selection of gloves for protection against chemical hazards:

- (A) The toxic properties of the chemical(s) must be determined; in particular, the ability of the chemical to cause local effects on the skin and/or to pass through the skin and cause systemic effects.
- (B) Generally, any "chemical resistant" glove can be used for dry powders.
- (C) For mixtures and formulated products (unless specific test data are available), a glove should be selected on the basis of the chemical component with the shortest breakthrough time, since it is possible for solvents to carry active ingredients through polymeric materials.
- (D) Employees must be able to remove the gloves in such a manner as to prevent skin contamination.

Other broad categories of gloves include:

- Fabric – Made of cotton or fabric blends generally used to improve grip when handling slippery objects. Also help insulate from mild heat or cold.
- Leather – Generally used to guard against injuries from sparks or scraping against rough surfaces. Also used in combination with an insulated liner when working with electricity.
- Metal mesh – Used to protect from accidental cuts and scratches. Used when working with cutting tools or other sharp instruments.
- Aluminized – made of aluminized fabric and designed to insulate hands from intense heat.

Battelle
Safety and Industrial Hygiene
Program Plan

Title:	Chemical Safety Information Program
Number:	ESHQ-SIH-PP-005
Revision:	4

Originator: Bernard Himmelsbach 1/16/09
Bernard Himmelsbach Date
Safety and Health Representative

Reviewed By: Donald Cagle 1/16/09
Donald Cagle Date
Senior Safety Advisor

Approved By: Andrew Carew 1/16/09
Andrew Carew Date
Manager, Safety, Health and Emergency Response

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REVISION HISTORY

Rev. No.	Effective Date	Description of Revision
0	09/24/04	Replaces SIH-PP-05
1	09/29/05	Updates document numbers and clarified information on labeling requirements.
2	11/29/06	Editorial changes, and changes for clarification and updating.
3	11/09/07	Annual review, with changes to BSTI and SBMS
4	1/16/09	Annual review with additional references to SBMS

1.0 PURPOSE

The purpose of this program is to provide Battelle staff with information regarding operations and methods of complying with the requirements of the Occupational Safety and Health Administration's (OSHA) regulations, the "Hazard Communication" or "HAZCOM" (29 CFR 1910.1200) standard and the "Occupational Exposure to Hazardous Chemicals in Laboratories" or "Lab Standard" (29 CFR 1910.1450) standard. Both regulations require written programs. Battelle has addressed the requirements of both standards as they apply to Battelle operations in one written program, the Chemical Safety Information Program (CSIP). The CSIP is to be used both as a written Hazard Communication Program, and a written Chemical Hygiene Plan for general Battelle operations. Specific operations may require job specific hazard communication.

The intent of both standards is to inform staff of:

- How to identify/determine the hazards of the chemicals with which they work
- The steps that can be taken to protect their health and safety
- Measures that they can take to protect themselves from chemical hazards
- The safety and health resources available to them and how they can obtain these resources.

2.0 SCOPE AND APPLICABILITY

This program applies to all Battelle operations that use, handle, or store hazardous chemicals. This includes all laboratories and other locations, such as field operations, pilot plants, machine shops, construction shops and print shops that use, handle, or store hazardous chemicals. This program does not apply to offices and other areas that do not use, handle, or store hazardous chemicals.

3.0 REGULATORY/VOLUNTARY STANDARD REFERENCES

- OSHA 29 CFR 1910.1200, "Hazard Communication"
- OSHA 29 CFR 1910.1450, "Occupational Exposure to Hazardous Chemicals in Laboratories"

4.0 RESPONSIBILITIES

4.1 Product Line Management

Product line management is responsible for implementing processes for compliance with the CSIP in their respective area, especially to ensure that their staff are properly trained and informed. A CSIP Compliance Checklist is attached in Appendix A for guidance in implementing the CSIP.

4.2 Safety and Health Representative

4.2.1 The Safety & Health representatives are responsible for assisting line management with the development and implementation of the Chemical Safety Information Program. They also function as the Chemical Hygiene Officers (CHOs) and/or Hazard Communication Coordinators.

- 4.2.2 Safety & Health representatives in conjunction with line managers are also responsible for ensuring that program effectiveness is evaluated annually and that changes are made based on the evaluation.

5.0 PROCEDURE

5.1 Material Safety Data Sheets (MSDSs)

- 5.1.1 MSDSs that are received for hazardous chemicals/materials are available from the MSDS coordinator (Amy Zelma, 614-424-5889), and the Safety & Health representatives. In addition, the Occupational Health Services MSDS database is available to staff through the Battelle Technical Information Center (TIC) “E-Resources – Site Index” (<http://wwwi.battelle.org/bclscript/tic/>)

NOTE: Not all regional offices have access to the TIC databases. Contact your Safety & Health representative for information on MSDSs.

- 5.1.2 The staff member purchasing a chemical is responsible for requesting an MSDS from the manufacturer at the time of purchase. For assistance, contact the appropriate Safety & Health representative or contact the MSDS coordinator. Also refer to the SBMS “Purchasing Card” (<http://wwwi2.battelle.org/sbms/PA/152/Procedur.html>).
- 5.1.3 If MSDSs are unavailable or new chemicals in use do not have an MSDS, staff should contact the chemical supplier or their respective Safety & Health representative.
- 5.1.4 If the HAZCOM standard applies, OSHA requires that an MSDS be available on-site for all hazardous chemicals used. Therefore, the staff member shall:
- 5.1.4.1 Immediately contact their Manager/Supervisor, or the Safety & Health representative, to obtain one.
- 5.1.4.2 Not use the chemical until a MSDS can be located.
- 5.1.5 If the Lab Standard applies, the staff member shall notify the Safety & Health representatives so that he/she can ensure that precautions are identified, hazards are identified, and labels are appropriate.
- 5.1.6 MSDSs are received in a number of ways depending on the procedures of the supplier. If a staff member receives an MSDS directly from the supplier, he/she is responsible for sending a copy of the MSDS to the MSDS coordinator for the site. An additional copy should be sent to the Battelle Safety, Health & Emergency Response (SH/ER) Office (Room 1319, King Avenue).
- 5.1.7 The Battelle SH/ER Office maintains a central file of MSDSs from the chemical suppliers for Battelle and will supply the most current MSDS available upon request. (See 5.1.1)
- 5.1.8 Each non-laboratory area or section (including pilot plants) will maintain a readily available file of MSDSs for hazardous chemicals or substances used in its operation.

- 5.1.9 Each laboratory operation is encouraged to maintain a file of MSDSs for frequently used chemicals and hazardous chemicals.
- 5.1.10 Whenever a hazardous chemical is transferred (e.g., shipped) to another location, a MSDS must be included with the shipment or provided to the recipient before shipment. See Section 5.4.3.

5.2 Container Labeling

5.2.1 General Requirements

- 5.2.1.1 Original labels and Battelle barcode shall never be removed or defaced. Verify that the information on the label includes the name of the manufacturer or distributor, identity of the material, and hazard warnings.
- 5.2.1.2 When a chemical is dispensed from its original container into a secondary container, the secondary container must be labeled with at least the identity of the material.
- 5.2.1.3 Non-laboratory operations (see Section 7.0 for definition) must include hazard warning(s) on the label for chemicals transferred from their original container (e.g., carcinogen, radiation warnings).
- 5.2.1.4 Whenever a hazardous chemical is transferred (e.g., shipped) to another location, the label must identify the manufacturer, importer or responsible party, and must show any hazard warning(s). See Section 5.4.3.

5.2.2 Proprietary Container Marking

Where contents of containers may not be identified due to proprietary or other reasons, the hazardous properties must be identified (e.g., corrosive, flammable, reactive carcinogen) and/or the container linked to a lab record book by code where such information is identified.

5.2.3 Waste Containers

All waste containers must be properly identified and labeled. Waste containers located at King Avenue and West Jefferson must be marked according to the procedure available on SBMS "Hazardous Waste Management" (<http://wwi2.battelle.org/sbms/PA/82/Procedur.html>). For other Battelle operations, contact your manager/supervisor for waste container labeling requirements.

5.3 Exposure Monitoring

- 5.3.1 When necessary, exposure monitoring will be conducted by SH/ER staff or other qualified designees to determine compliance with OSHA permissible exposure limits (PELs) or with other applicable standards or guidelines [e.g., American Conference of Governmental Industrial Hygienists (ACGIH) Threshold Limit Values (TLVs)].

- 5.3.2 Within 15 working days of the receipt of the results, employees will be notified of the exposure monitoring results in writing¹.

5.4 Hazard Determinations and Evaluation

- 5.4.1 Battelle will rely on the chemical manufacturer's MSDS for hazard determinations and evaluations.
- 5.4.2 When a manufacturer's MSDS is not available, other reference sources will be used as necessary.
- 5.4.3 When Battelle provides a hazardous chemical or material to one of its clients as a product or ships a hazardous chemical or material off site, an MSDS must be provided with the initial shipment of the material (and when new data becomes available) to the client or user. In addition, the label must identify the manufacturer, distributor, importer or responsible party, and must show any hazard warning(s) on the label.
- 5.4.4 The author of the Battelle MSDS shall provide an electronic version of the MSDS and a copy of all supporting documentation used to create the MSDS to the appropriate Safety & Health representative for review and authorization. The representative will then transmit the Battelle generated MSDS to the appropriate person for inclusion into Battelle's internally generated MSDS file.

6.0 LABORATORY OPERATIONS

This section outlines the requirements that apply only to laboratory scale operations. "Laboratory scale operations" means work with substances in which containers used for reactions, transfers, and other handlings of substances are designed to be easily manipulated by one person. This definition generally excludes pilot plant operations.

6.1 Control Measures

Laboratory operations are subject to review by Safety & Health representatives and designees to ensure that the design of the work and of the equipment can prevent incidents that could expose workers to hazardous chemicals or conditions (e.g., pressure build-up, temperature excursions, etc.).

6.1.1 Engineering Controls

6.1.1.1 Hazardous chemicals, especially those that are volatile or are in gaseous state, generally must be used in a chemical fume hood.

6.1.1.2 Fume hoods must be maintained in proper working order. This is to be achieved in accordance with specific measures outlined in the SBMS "Using Local Exhaust Ventilation and Laboratory Hoods" (<http://wwwi2.battelle.org/sbms/PA/28/Procedur.html>).

¹Some chemical specific standards require earlier reporting.

Personal Protective Equipment (PPE)

PPE, such as safety glasses with side shields, goggles, face shield, gloves, and apron are required whenever there is a risk of direct chemical contact, especially for those chemicals where skin and eye contact are prohibited. A Personal Protective Equipment Hazard Assessment Certification is to be completed by the line manager in conjunction with the Safety & Health representative. Refer to the procedure available on SBMS “Personal Protective Clothing and Equipment (PPE)” (<http://wwi2.battelle.org/sbms/PA/34/Procedur.html>).

6.1.2 Respiratory Protection

Respirator use will be required whenever a hazardous chemical is used and cannot be exhausted (through chemical fume hoods or other ventilation) and if use conditions will expose the worker to potentially hazardous concentrations of chemicals. The use, selection, medical evaluations, and fit testing are coordinated by the Safety & Health representative and the Health Services Department. Refer to the procedure available on SBMS “Respiratory Protection” (<http://wwi2.battelle.org/sbms/PA/169/Procedur.html>).

6.2 Highly Hazardous Materials

- 6.2.1 The use of compounds that are highly hazardous, such as select carcinogens, reproductive toxins, and acutely toxic substances, requires the prior review by the Safety & Health representative.
- 6.2.2 These substances must be handled according to specific operating procedures, which may include designated areas, decontamination procedures, specific waste handling procedures, and PPE.
- 6.2.3 Recommended handling procedures for specific categories of chemicals are included in Appendix B. Contact the Safety & Health representative for assistance in categorizing the chemicals in use.

6.3 Medical Consultation

Medical consultation and surveillance through Health Services (614-424-6337) is available to all laboratory employees, especially if:

- 6.3.1 A staff member develops signs or symptoms believed to be associated with exposure to the hazardous chemical(s).
- 6.3.2 Air monitoring data indicate that exposures are above recommended levels (e.g., PEL, Action Level).
- 6.3.3 An incident such as a leak, spill, or explosion occurs that results in a potential exposure or overexposure.

7.0 NON-LABORATORY OPERATIONS

NOTE: See Appendix A for "Compliance Checklist"

This section outlines the requirements that apply to non-laboratory areas. Non-laboratory areas include field operations, pilot plants, machine shops, construction shops, and print shops that use, handle, or store hazardous chemicals. This does not apply to offices and other areas that do not use, handle, or store hazardous chemicals.

7.1 Non-Laboratory Area General Requirements

- 7.1.1 List the hazardous chemicals present in the work area. Each group or department is responsible for keeping a current list of hazardous chemicals used in non-laboratory areas. Also refer to SBMS "Chemical Inventory" (<http://wwwi2.battelle.org/sbms/PA/43/Procedur.html>).
- 7.1.2 The list must be checked against the available MSDSs on file. If any MSDSs are missing, contact the chemical supplier or the Safety & Health representative.
- 7.1.3 All such work areas in Battelle must designate a staff member and alternate to be responsible for preparing and maintaining the list of chemicals.

7.2 Hazardous Non-Routine Tasks

- 7.2.1 Periodically, staff members are required to do hazardous non-routine tasks. Prior to working on such projects, supervisors are required to ensure that each staff member is given information and/or training as required in Battelle safety and health programs and as required by his/her supervisor or designee about any hazardous chemicals or processes to which they may be exposed while carrying out the non-routine task including:
 - 7.2.1.1 Information on the hazards of the chemicals to which they may be exposed.
 - 7.2.1.2 Protective measures such as ventilation, respiratory protection, the presence of another staff member, written operating procedures and emergency procedures that can be taken to prevent or reduce exposures.

7.2.2 Examples of hazardous non-routine tasks that might be performed by staff members include:

Task	Potential Hazards/Hazardous Chemicals
Confined Space Entry ¹	Oxygen deficiency; exposure to toxic materials; fire and explosion.
Work on New or Experimental Equipment ²	Stored energy: Electrical, mechanical, pneumatic.
Chemicals in Unlabeled Pipes (Line-Breaking Operations) ²	Hazardous chemicals and gases carried in the pipe.

7.3 Outside Contractor Personnel

- 7.3.1 The Safety & Health representative for Facilities will be the primary contact for contractors performing facilities related work contracted through Battelle Facilities Support Operations.
- 7.3.2 Operations and research staff and the supervisors of the areas where contractors work, share responsibility with the Safety & Health representative for Facilities to ensure that hazardous chemicals, potential hazards, and area safety precautions are identified and communicated to contractors.
- 7.3.3 Each Safety & Health representative is responsible for providing their respective contractors with the following:
- 7.3.3.1 Hazardous material information for the area.
 - 7.3.3.2 Precautions the contractor's personnel should take to lessen the possibility of exposure (e.g., the use of appropriate protective measures).
- 7.3.4 Contractors must adhere to the safety and health provisions specified in the Battelle contract.
- 7.3.5 If a contractor is found to be in violation of any safety regulation, the Safety & Health representative should be notified immediately.

¹See SBMS "Confined Spaces" (<http://wwwi2.battelle.org/sbms/PA/12/Procedur.html>).

²See SBMS "Control of Hazardous Energy" (<http://wwwi2.battelle.org/sbms/PA/31/Procedur.html>).

8.0 TRAINING

8.1 General HAZCOM and Lab Standard Training

Training required by the Lab Standard for general topics is performed for all laboratory staff and other appropriate staff as part of the new staff orientation process. This training includes but is not limited to:

- 8.1.1 Comparison and contrast of the provisions of both standards, including when each may apply
- 8.1.2 Labeling requirements in laboratory situations versus non-laboratory situations
- 8.1.3 The location and availability of Material Safety Data Sheets (MSDSs)
- 8.1.4 Methods and observations to detect the release of hazardous chemicals in the workplace
- 8.1.5 Physical hazards and health hazards of commonly encountered chemicals in the workplace including signs and symptoms associated with chemical overexposures
- 8.1.6 Measures that may be taken to minimize and/or eliminate exposures to hazardous chemicals, such as the development of appropriate work practices, the use of personal protective equipment, and review of emergency procedures.

8.2 Specific HAZCOM and Lab Standard Training Requirements

- 8.2.1 Refer to section 7.0, Non-Laboratory Operations, for situations requiring specific training under the Hazard Communication standard.
- 8.2.2 Details of individual laboratory operations vary by laboratory, activity, and project. Therefore specific work practices and chemical hazard information are to be transmitted to the staff by his/her supervisor with assistance from the Safety & Health representative, as necessary, prior to the start of work in which the employee may be exposed to chemical hazards.

9.0 PROGRAM REVIEW

In order to comply with the requirements of 29 CFR 1910.1450, Occupational exposures to Hazardous Chemicals in Laboratories, the effectiveness of the Battelle Chemical Safety Information Program (Battelle equivalent to the chemical hygiene plan) must be reviewed and evaluated at least annually and updated as necessary (reference 29 CFR 1910.1450(e)(4)).

10.0 ASSOCIATED PROCEDURES

- SBMS “Chemical Safety” (<http://wwwi2.battelle.org/sbms/PA/10/Procedur.html>).
- SBMS “Chemical Inventory” (<http://wwwi2.battelle.org/sbms/PA/43/Procedur.html>).
- SBMS “Confined Spaces” (<http://wwwi2.battelle.org/sbms/PA/12/Procedur.html>).
- SBMS “Control of Hazardous Energy” (<http://wwwi2.battelle.org/sbms/PA/31/Procedur.html>).

- SBMS “Hazardous Waste Management”
(<http://wwi2.battelle.org/sbms/PA/82/Procedur.html>).
- SBMS “Personal Protective Clothing and Equipment (PPE)”
(<http://wwi2.battelle.org/sbms/PA/34/Procedur.html>).
- SBMS “Using Local Exhaust Ventilation and Laboratory Hoods”
(<http://wwi2.battelle.org/sbms/PA/28/Procedur.html>).
- SBMS “Purchasing Card” (<http://wwi2.battelle.org/sbms/PA/152/Procedur.html>).
- SBMS “Respiratory Protection”
(<http://wwi2.battelle.org/sbms/PA/169/Procedur.html>).

Appendix A: Compliance Checklist

Chemical Safety Information Program Compliance Checklist	
	Prepare a list of chemicals used in the work area. Laboratories should list the commonly used chemicals and before any new projects begin, add to the list as needed. Non-laboratory areas must list all chemicals or chemical products.
	Compare the chemical inventory list (non-laboratory areas only) against a list of the MSDSs in the work area to determine if any MSDSs are missing. If MSDSs are missing, immediately notify your supervisor, Safety & Health representative, or the chemical supplier to obtain a copy.
	Once the hazards of the chemicals are identified, specific safe work practices must be written.
	Staff must be trained and informed about the specific chemical hazards and written work practices before chemicals are handled and before any new chemicals or hazards are introduced into the work area.
	<p>ESH&Q New Staff Orientation classes noted below are presented via the Battelle University. New Staff are notified electronically to inform them of the need to complete the Orientation. For more information, contact the training coordinator at 614-424-7349.</p> <ul style="list-style-type: none"> • Introduction to Environment, Safety, Health, and Quality (BCO-0013) • Hazard Communication (BCO-0014) • Personal Protective Equipment (BCO-0017) • Lab Waste Handling (HWO-105)
	Written procedures must detail how the product line will maintain a hazardous chemical inventory list, MSDSs, written work practices, and required staff training.

Appendix B: RECOMMENDED HANDLING PROCEDURES FOR HIGHLY HAZARDOUS CHEMICALS

1. Provisions for additional employee protection for work with the following categories of substances shall be made:
 - Select Carcinogens
 - Reproductive Toxins
 - Acutely Toxic Substances
 - Reproductive Hazards.

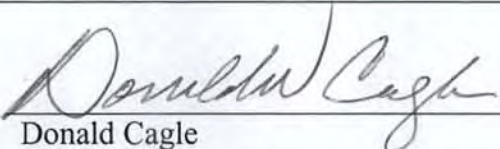
Handling precautions for other types of "highly hazardous" chemicals, such as Chemical Surety Materials, Chemical Warfare Agents, material of high toxicity, explosives, biohazard materials, and radioactive materials, are contained in specific operating procedures at Battelle. For more information on these materials, contact the respective Safety & Health representative.

2. Use small quantities. Do not buy, store, transfer, or use amounts greater than necessary for the (research) work.
3. Keep the containers closed to the extent possible to prevent or minimize the release of chemicals through vaporization, spillage, etc.
4. Open and transfer hazardous chemicals and conduct research work inside ventilated areas (chemical fume hoods, glove boxes, etc.) whenever possible.
5. Post signs in the area where the work is being conducted (e.g., "Authorized Personnel Only").
6. Implement procedures for the highly hazardous waste disposal.
7. In many instances, protective clothing, from impervious gloves up to and including aprons and respirators, may be required especially if work is being conducted outside of the chemical fume hood. See the Safety & Health representative for evaluation of the work process for the appropriate personal protective equipment.

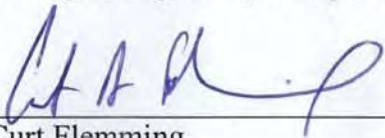
Battelle Science & Technology International

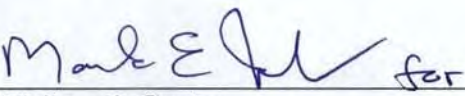
Safety and Industrial Hygiene Program Plan

Title:	Safety and Health Management Program
Number:	SIH-PP-100
Revision:	0

Originator:  11/1/04
Date
Donald Cagle
Manager, Safety, Health, & Emergency Response

Reviewed By:  11/4/04
Date
Mark Jackson
Manager, Regulatory Compliance

Reviewed By:  11/5/04
Date
Curt Flemming
Manager, Quality Management Systems & Training

Approved By:  for 11/4/04
Date
N. Joseph Gantos
Vice President, BSTI ESH&Q Systems Management

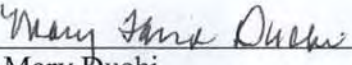
Concurrence:  11/8/04
Date
Mary Duchi
Vice President, Operations & Systems Services

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REVISION HISTORY

Rev. No.	Effective Date	Description of Revision
0	11/15/04	Replaces BCO-PP-001; formation of a Safety Steering Committee

1.0 PURPOSE

Battelle is committed to establishing and maintaining an accident-, injury- and occupational illness-free environment. Battelle corporate policy 1.6, Environmental, Safety and Health Program, states “It is Battelle policy to comply with the letter and spirit of all environmental, safety and health (ES&H) laws and regulations.” ALL staff must plan and conduct their work in a responsible manner to create and maintain a safe and healthy environment in Battelle Science & Technology International (BSTI) facilities and projects. The purpose of this program is to describe the operational framework and guidelines to address safety and health issues within BSTI.

2.0 SCOPE AND APPLICABILITY

This program is applicable to all BSTI staff and operations, including those involved in office, laboratory, pilot plant and field work originating from King Avenue, West Jefferson and regional locations. The plan identifies related administrative and operating procedures, designates responsibilities and accountabilities, and describes work practices necessary to protect staff, facilities, and the public.

3.0 PROGRAM REQUIREMENTS

This program is written to describe how BSTI intends to comply with applicable regulatory and/or voluntary standard requirements.

- Occupational Safety and Health Administration (OSHA), General Industry and Construction Standards and references contained therein
- Ohio Basic Building Code/Ohio Fire Code
- National Fire Protection Association (NFPA) applicable standards
- Battelle Operating Guide, Section 1300 Environment, Safety and Health
- Battelle Corporate Policy 1.6, Environmental, Safety, and Health Program
- Battelle Safe Work Practices Handbook

4.0 PROGRAM OBJECTIVES

The objectives of this program are to:

- Describe the overall management of Safety and Health (S&H) for BSTI.
- Define the key elements and processes of S&H employed by BSTI.
- Define key roles and responsibilities for implementing S&H.
- Provide the framework by which BSTI will comply with Battelle’s Corporate Policy on ES&H.

5.0 PROGRAM DESCRIPTION

The safety and health program provides a framework for hazard identification and evaluation, procedure development and documentation of safe work practices.

5.1 Hazard Identification and Evaluation

- 5.1.1 All proposed new projects within BSTI are cleared through the Integrated Risk Assessment Process.
 - 5.1.1.1 As a part of this process, project staff are asked to complete an Environment, Safety, Health and Quality (ESH&Q) Risk Assessment Questionnaire to identify any elements of the proposed project with safety considerations.
 - 5.1.1.2 The completed proposal scope and questionnaire are reviewed by appropriate member(s) of the BSTI Environment, Safety, Health and Quality Systems Management (ESH&Q SM) staff. Questions and concerns are brought directly to the attention of the project staff.
 - 5.1.1.3 To assist project staff in preparing the ESH&Q section of the Integrated Risk Assessment questionnaire during the proposal process, guidance is provided in Appendix A.
- 5.1.2 Upon project award or initiation, project staff assigned to the project are responsible for implementing appropriate safety controls and procedures. The assigned S&H representative works closely with project staff to ensure implementation of all safety requirements (sections 5.2 and 5.3).
- 5.1.3 Some projects require specialized knowledge and review to identify potential hazards. To address this, BSTI has several subject matter expert committee(s) formed to provide expertise and establish safety requirements in certain areas. See the section on Safety Review Committees (section 5.4) and Appendix B.

5.2 Program Development and Implementation

- 5.2.1 Safety and Health procedures within the Safety and Industrial Hygiene Manual are the primary documentation of S&H requirements.
- 5.2.2 BSTI ESH&Q SM will provide S&H subject matter expertise and support and will provide programs and program documentation at the BSTI level.
- 5.2.3 Each BSTI organization code will have a designated S&H Representative from within BSTI ESH&Q SM. The S&H Representatives will partner with site staff to identify safety and health concerns for each site and assist in program implementation. The Battelle intranet identifies the S&H Representatives.

5.3 Documentation of Safe Work Practices

- 5.3.1 Written safe work practices, to identify safe work processes and procedures in the performance of projects, will be used to document and communicate instructions and information to staff. These may be in the form of Standard Operating Procedures, Safety Plans/Test Plans, Fact Sheets or similar documents. The tasks or duties identified in the safe work practices will assist in

determining the training and qualification requirements. Appendix A provides a project planning and project operations phase list of items that should be considered to help determine if written safe work practices are needed for the project.

- 5.3.2 Project implementation may require documentation specific to the project or working group in addition to documents referenced in 5.2.2. Project staff and the S&H Representative will work together to ensure proper requirements and procedures are documented.

5.4 Committee Review and Approval

- 5.4.1 BSTI will establish safety committees to facilitate safety program implementation. There will be committees at the BSTI level as well as committees embedded within product lines.
- 5.4.2 BSTI will establish a Safety Steering Committee, overseen by the Vice President, ESH&Q SM, to establish and review goals and expectations for the BSTI safety program. The Safety Steering Committee will also serve as a review committee for significant hazards not covered by other subject matter expert review committees.
- 5.4.3 The Safety Steering Committee will be made up of representatives from Safety and Health, Facilities, Health Services, Emergency Management, Research Management, Security, Human Resources and appropriate subject matter experts, as necessary.
- 5.4.4 As a guideline, projects require review by the Safety Steering Committee when:
- A substantial potential exists for escape of, or contact with, toxic gases, vapors, particulates, or liquids resulting in an exposure or environmental release in violation of applicable regulations, established guidelines or rules of good practice.
 - A potential exists for substantial exposure to, or contact with, gases, vapors, particulates or liquids whose toxic hazards have not been investigated or shown to be acceptable through human experience.
 - Work involves unusually large quantities of a hazardous material, or when staff is inexperienced in handling hazardous materials of the proposed type or quantity.
 - A potential exists for use or formation of explosive substances, or when explosive mixtures outside standard equipment and facilities designed for such purposes are used.
 - A potential exists—or is likely to be perceived—for members of the public to be exposed to a hazard (other than routine traffic hazards) arising from a Battelle operation.
 - Operations of a type that requires review, as indicated above, occur in a facility that is newly constructed or substantially altered.

- A potential exists for operations involving hazards associated with the following when conducted in areas not specifically or previously approved:
 - High structures
 - Confined spaces, e.g., sewers, mines, tanks, and pits
 - Diving requiring decompression
 - Unusual electrical hazards
 - Working on, over, in, or near bodies of water
 - Unusual aviation procedures
 - Aggressive hostile environments, e.g., jungles and war zones
 - Heat or cold exceeding work stress criteria
 - High stored-energy systems.
- 5.4.5 At the BSTI level, appropriate subject matter expert committees will be established to address specific project safety concerns. Each of the subject matter expert committees will have a defined purpose and operational scope. A brief description of the current subject matter expert committees is provided in Appendix B.
- 5.4.6 Operational Safety Committees will be established within product lines. The current organizational structure will be used to establish where safety committees are appropriate. The assigned S&H Representative will assist line management in establishing the committee and serve as a subject matter expert to the committee.
- 5.4.7 The Operational Safety Committees are expected to:
- 5.4.7.1 Meet at least quarterly
 - 5.4.7.2 Be comprised of a representative cross-section of staff in the product line or group for which the committee is established
 - 5.4.7.3 Focus on supporting the safety needs of the operational area or product line for which it was established to:
 - Increase safety awareness and knowledge
 - Identify opportunities for improvement
 - Recommend improvement ideas to leadership team
 - Share success stories
 - Seek answers on safety matters
 - Promote and recognize safe behaviors
 - Set the example of safe performance
 - Actively communicate safety.

6.0 ROLES AND RESPONSIBILITIES

All BSTI staff are expected to contribute to establishing and maintaining a safe and healthy working environment. Written procedures that identify program requirements include specific responsibilities. The following roles and responsibilities have been defined for implementing this program:

6.1 Executive Vice President BSTI

- 6.1.1 Provide active leadership for effective implementation
- 6.1.2 Assume responsibility for the safe, overall operation of BSTI
- 6.1.3 Provide a safe and healthy working environment for BSTI staff
- 6.1.4 Provide resources necessary to ensure continuous improvement

6.2 General Managers/Division Leaders

- 6.2.1 Ensure program implementation and compliance within the division
- 6.2.2 Take ownership of the safety program within their division

6.3 Vice President, BSTI Operations & Systems Services

- 6.3.1 Provide S&H support to the Executive Vice President BSTI
- 6.3.2 Oversee the Environment, Safety, Health and Quality Systems Management for BSTI
- 6.3.3 Ensure Battelle staff are provided a healthy and safe environment

6.4 Vice President, ESH&Q Systems Management

- 6.4.1 Ensure implementation of Battelle and BSTI policy.
- 6.4.2 Provide S&H oversight, support and assessment to facilitate effective operations, and identify regulatory compliance requirements to enable management to meet their responsibilities
- 6.4.3 Ensure development and management of ESH&Q plans and applicable programs
- 6.4.4 Establish and oversee operation of the Safety Steering Committee and establish Committee operating procedures

6.5 Line and Support Management

- 6.5.1 Implement safety and health programs within their respective organizations.
- 6.5.2 Ensure staff engage S&H resources when the level of expertise required is beyond their knowledge
- 6.5.3 Ensure staff in their area of responsibility receive necessary training

6.6 Safety, Health and Emergency Response

- 6.6.1 Reports directly to the Vice President, ESH&Q SM to provide subject matter expertise in the development, implementation and oversight of S&H plans and programs

- 6.6.2 Serve as a direct resource to BSTI management and staff to provide high quality technical support for implementing Safety, Health and Emergency Response programs
- 6.6.3 Conduct audits and inspections to help communicate with and educate project staff on S&H to ensure a safe work environment
- 6.6.4 Assist project teams in ensuring and pre-planning for safe conduct of projects

6.7 Staff

- 6.7.1 Work safely at all times and maintain safe work conditions in accordance with safety procedures
- 6.7.2 Make suggestions for safety improvement

7.0 INTERFACES WITH OTHER PROGRAMS

The S&H Management Program interfaces with the following programs and or functions within BSTI to ensure comprehensive implementation of S&H requirements. Each of these interfaces helps to ensure BSTI's ability to conduct and deliver quality products and services that meet or exceed compliance with applicable regulations. These programs are designed not to overlap but to provide complete coverage of applicable regulatory requirements.

- Environmental Protection – ensure safe removal of hazardous waste from laboratories and identification of significant environmental impacts resulting from projects or operations.
- BSTI Quality Management Systems and Training – provide document control, records management, and safety training.
- BSTI Regulatory Compliance Management – ensure timely identification of new or changing regulatory compliance to facilitate integration into existing programs and procedures.
- Radiation Safety – provide review and oversight of projects and operations using radioactive materials.
- Medical/Health Services – provide medical response to injuries and illnesses occurring on site and establish health screening criteria for job eligibility.
- Shipping and Receiving – ensure proper shipment of hazardous materials and identification of hazardous materials, upon receipt.
- Facilities – review design and construction of facilities and interface on facilities maintenance.
- Purchasing – establish and implement procurement procedures for hazardous materials and equipment.
- Proposals/Contracts – ensure significant S&H hazards are identified during the proposal stage to ensure resources are included in the project before award.
- Human Resources – thoroughly identify job requirements to select qualified and capable candidates and identify jobs requiring health screening prior to employment.

- Legal – review BSTI procedures, when appropriate, to ensure compliance and provide interpretation of regulatory or other requirements.

This plan is a high level document under which more detailed Safety and Health General (GP), Specific (SP) and Equipment Procedures (EP) define specific program requirements. In addition, Work Instructions (WI), Forms (FM) and Training Material (TM) may be developed to support the program and procedures.

8.0 METRICS FOR EVALUATING PROGRAM EFFECTIVENESS

Metrics will be used as indicators of program effectiveness. A limited number of high-level metrics will be defined and presented to senior leadership as periodic indicators of performance. Metrics will be defined in procedures and work instructions. Information collected from these metrics will be used to develop and roll up to the high-level metrics. These will include both leading and lagging indicators. Leading indicators include items such as employee safety training hours and safety committee participation by management. Lagging indicators include such items as OSHA injury and illness data, regulatory citations or violations.

9.0 TRAINING

- 9.1 All new BSTI employees will receive a new employee safety orientation.
- 9.2 Once a new employee reports to his/her specific area, the responsible manager or supervisor is responsible for providing an orientation to the work area which will include basic safety items.
- 9.3 Additional safety training requirements may be identified in BSTI program plans created by the S&H organization.
- 9.4 Safety training requirements implemented to satisfy client requirements will be documented in project or product line procedures and documents.

10.0 PROGRAM ASSESSMENTS/AUDITS

- 10.1 Assessments and audits required for regulatory compliance will be specified in procedures and work instructions.
- 10.2 BSTI S&H Representatives will conduct facility walk-throughs of all active laboratory and non-laboratory (except offices) working spaces at least twice a year.
- 10.3 Areas undergoing facilities construction/renovation/demolition will be evaluated to determine appropriate safety requirements. The BSTI Risk Assessment Form for Renovation/Construction Work (see Section 12.6) focuses on safety review of facilities activities.
- 10.4 Office locations will be audited on an as-needed or as-requested basis. Selected office locations will be audited annually.

11.0 PROGRAM REVIEW

This program shall be reviewed every 2 years at a minimum.

12.0 ASSOCIATED PROCEDURES AND FORMS

The following documents are associated with this program:

- BCO-PP-003, ESH&Q Training Program
- HRS-MN-001, Human Subjects Research
- RS-MN-001, Radiation Safety Manual
- EN-PP-003, Environmental Management Plan
- SIH-MN-001, Safety and Industrial Hygiene Manual Documents
- SIH-FM-133, BSTI Risk Assessment Form for Renovation/Construction Work

APPENDIX A: S&H GUIDANCE for PROPOSAL WRITERS and PROJECT MANAGERS

Use of this checklist is not mandatory. Reviewing checklist contents prior to completing the ESH&Q Integrated Risk Assessment questionnaire during the proposal process may help in completing the questionnaire. In addition, the checklist may also be consulted prior to preparing project plans to help ensure all safety elements are addressed.

I. Costing/Proposal Stage

A. Does the project or task involve unusual hazards, such as:

- Hazardous chemicals (toxic, carcinogenic, pyrophoric, corrosive,...)
- Reactive or explosive chemicals
- High pressures, e.g., pressure vessels operating above 5 psig
- High temperatures, e.g., above 600 F
- High electrical voltage/amperage, e.g., above 240 v/60 amps
- Other high stored energy operations, e.g., flywheels, springs, suspended weights, hydraulics
- Hazardous structural tests
- High structures (including roof/elevated work, ladders, and scaffolding)
- Confined spaces
- Lasers (all classes)
- Other non-ionizing radiations, e.g., EMF, microwaves, radar,...
- Watercraft
- Diving operations not at King Avenue
- Aircraft
- Biological, pathogenic or DNA/RNA work
- Ionizing radiation, e.g., radioisotopes, sealed/unsealed sources, radio-equipment
- Probable exposure of the public to above hazards
- Providing a product or system with operating instructions and precautions to clients
- Providing ES&H or regulatory recommendations to clients
- Firearms, ammunition or weapons
- Operating powered industrial vehicles
- Powder actuated tools
- Trenching/excavating
- Working with animals

- B. Do any of the above (checked) items trigger a special review by one of the Columbus Safety Review Committees (see Appendix B)? If so, contact the committee representative.
 - C. Do any of the above (checked) items require an increase in time for reviews, training of staff, etc.; additional equipment for protective devices or controls; or facilities for explosion proof wiring, ventilation, or large/special space that would result in an increase of money or funding?
 - D. Do any of the above (checked) hazards result in unusual disposal or storage costs, especially at the end of the project? Especially difficult items for disposal are PCBs, dioxins, mercury, asbestos, cyanides, radioactive sources, and radioactive wastes mixed with hazardous chemicals.
 - E. Submit ESH&Q Questionnaire when completing the Integrated Risk Assessment Process (proposal), if applicable.
- II. Pre-project/Pre-operation Stage – Use the following questions to help identify what could go wrong and may pose a safety hazard to operations once they are under way.
- A. Is equipment (e.g., glassware, vessels, piping, machinery, etc.) designed and sized properly?
 - B. Does the project involve the use of machinery, such as forklifts, cranes, lathes, diving equipment, etc? If so, are appropriate controls (i.e., procedures, training, etc.) in place?
 - C. Are other project hazards (e.g., chemicals, chemical products, electrical hazards, mechanical hazards, use of radioactive materials, etc.) involved?
 - D. Do documented safe work practices already exist for the hazards identified or do they need to be developed (Documentation of Safe Work Practices, Section 5.3.)? Have documented safe work practices been reviewed by the S&H Representative?
 - E. Is appropriate emergency equipment (e.g., fire extinguishers, safety showers, electrical cut-offs, ventilation, spill clean-up kits, etc.) in place and serviceable based on the identified hazards and equipment use available and in good working order?
 - F. Do identified hazards, or safe work practices, indicate the need for any of the following?
 - Properly trained and qualified personnel to use any equipment or machinery.
 - Properly informing staff of safe work practices, including emergency response.
 - Use of proper personal protective clothing and equipment.
 - Steps and procedures to minimize wastes and disposal costs.
- III. Project/Operational Stage
- A. Are periodic inspections necessary to ensure safe facilities (e.g., conducting monthly S&H inspections of the area(s), including checks of the fire extinguishers, drench hoses, eye wash, deluge showers, spill kits, etc.)?
 - B. Are safe work practices and procedures audited to ensure they are being followed?
 - C. Are practices modified when inadequate or as operations dictate?

- D. Are wastes disposed of regularly to minimize build-up of hazardous chemicals and material wastes?
- E. Is recurring training necessary for long projects?

APPENDIX B: BSTI SUBJECT MATTER EXPERT SAFETY REVIEW COMMITTEES

Biological Safety Committee

Reviews and approves all research activities and specific practices for handling biological materials, including organisms at the biosafety level 3 (BSL-3) and Select Agents defined by 42 CFR 73.

Human Subjects Committee

Reviews all research activities in which humans are to be used as subjects for experimental procedures or treatment, and includes questionnaires that are to be used to sample opinions, test reactions, or collect other data from humans.

Institutional Biosafety Committee

Reviews all research activities and specific practices for constructing and handling recombinant DNA molecules. The committee will also review work with organisms and viruses containing recombinant DNA molecules.

Laser Safety Committee

- 12.1.1 Provides general oversight for the Laser Safety Program, including reviewing accident investigations, recommending corrective actions, reviewing procedure modifications, approving installations and wording on warning signs or labels specific to laser systems.

Pressure Vessel and Systems Safety Committee

Reviews pressure vessels and systems when research or project-related units are designed to contain liquids or gases with the following pressure and volume parameters:

- Liquid-containing units (e.g., hydraulic) operating at 1000 psig (pounds per square inch gauge) with no regard to volume.
- Gas-containing units (e.g., autoclaves) that operate at 5 psig minimum, AND meet the pressure-volume factor (P-VF) of 5 psig-cuft or greater. The P-VF is calculated by multiplying psig by cubic feet.

For example, the following pressures and volumes meet or exceed the P-VF of 5 psig-cuft: 5 psig @ 1 cubic foot(ft³); 10 psig @ 0.5 ft³; 40 psig @ 0.125 ft³; 2000 psig @ 0.0025 ft³ (or 4.32 cubic inches). Units operating below 5 psig, of any size, are not considered pressure vessels or systems by the Committee.

Radiological Safety Committee

The Radiation Safety Manual (RSM) includes a detailed list of projects and situations that require review by the Radiological Safety Committee. Any projects or operations using radiological material should consult the RSM to determine if review is needed.

Risk Management Committee

Reviews all contractual or operational risks considered above normal. Reviews are performed during the procurement and proposal stage prior to making a contractual commitment through the Risk Assessment process.

Battelle Science & Technology International Safety and Health/Emergency Response Specific Procedure

Title: Fire/Hot Work Permit Procedure
Number: SIH-SP-015
Revision: 0

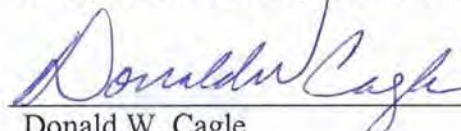
Originator:


Vera E. Jovanovic

Safety Advisor, Safety and Health/Emergency Response

12/9/04
Date

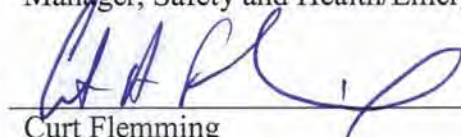
Approved By:


Donald W. Cagle

Manager, Safety and Health/Emergency Response

12/9/04
Date

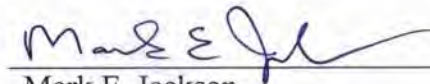
Reviewed By:


Curt Flemming

Manager, Quality Management Systems and Training

12/10/04
Date

Approved By:


Mark E. Jackson

Manager, Regulatory Compliance

12/10/04
Date

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REVISION HISTORY

Rev. No.	Effective Date	Description of Revision
0	12/20/04	Replaces SIH-PP-15

1.0 PURPOSE

This procedure establishes the process for obtaining, using, and revoking SIH-FM-112, Fire/Hot Work Permits. Compliance with this procedure will help to prevent fires, protect personnel, and ensure proper use of ignition sources outside areas designated for fire/hot work.

2.0 SCOPE AND APPLICABILITY

This procedure applies to all Battelle staff and contractors throughout Battelle Science and Technology International (BSTI), including regional offices and field operations. The Fire/Hot Work Permit shall be required in areas not normally used or approved for such activities. Operations requiring permits include, but are not limited to, the following:

- Cutting, grinding, and welding outside of a designated fire/hot work area
- Soldering when using a torch outside of a designated fire/hot work area
- Roofing involving hot applications using tar pots or other flame applications
- Using open fires outside of a designated fire/hot work area.

This procedure does not apply to establishing permanent fire/hot work areas. Permanently established fire/hot work areas must be reviewed and approved by management and a BSTI Safety and Health Representative to ensure that the necessary safeguards have been installed (e.g., adequate ventilation, noncombustible construction, proper gas distribution systems).

3.0 PREREQUISITES

The following prerequisites must be completed by staff members prior to using this procedure:

- All staff following this procedure must be appropriately trained in the Fire/Hot Work Permit Program.
- The Fire Watch must have current (annual) training on fire extinguisher use (HS-140, “Fire Extinguisher Training”).

4.0 DEFINITIONS

The following definitions are document-specific:

- **Designated Fire/Hot Work Area**—A location that has been designed, built and maintained free of flammable and combustible materials to accommodate the use of flame- or heat-producing equipment that has the potential to produce a fire.
- **Fire/Hot Work**—Use of flame-, spark-, or heat-producing equipment that has the potential to produce a fire.
- **Fire/Hot Work Permit**—A form authorizing the use of fire, spark-producing equipment, torches, powder-actuated equipment, arc welding, grinding, or other ignition sources.
- **Fire/Hot Work Watch Log**—A form, SIH-FM-131, used as an extension of the Fire/Hot Work Permit authorizing the Fire Watch to maintain his/her post.
- **Fire Watch**—The person who is in charge of ensuring that fires are spotted as soon as they occur and continues to watch for fires for at least 30 minutes after the fire/hot work ends.

- **Qualified Person**—Any individual qualified to issue a Fire/Hot Work Permit based on formal training in this procedure, current fire extinguisher training (HS-140), knowledge of fire protection requirements, and familiarity with the work involving a Fire/Hot Work Permit.

5.0 REGULATORY/VOLUNTARY STANDARD REFERENCES

This procedure complies with the following regulatory and/or voluntary standard requirements.

- National Fire Protection Association 51B, “Standard for Fire Prevention During Welding, Cutting, and Other Fire/Hot Work”
- 29 Code of Federal Regulations Occupational Safety and Health Administration, 1910.252(a), “Fire Prevention and Protection”
- Ohio Administrative Code, Fire Code 1301:7-7-22, “Welding or Cutting, Calcium Carbide and Acetylene Generators.”

6.0 PROCEDURE

6.1 Obtaining a Fire/Hot Work Permit

Note: Fire/hot work operations involving other hazards may require a specific hazard analysis and a Fire/Hot Work Permit prior to commencing work activities. Use alternative methods instead of fire/hot work where feasible.

- 6.1.1 The qualified person issuing a Fire/Hot Work Permit will inspect the area using the following as a guide:
 - 6.1.1.1 The condition of cutting and welding equipment must be checked.
 - 6.1.1.2 When welding in view of others, welding screens must be erected and so situated to prevent flashes from entering the eyes of passersby or others working in the area.
 - 6.1.1.3 When working within 35 feet of where pipes, beams, or other materials perforate walls, floors, or ceilings, a Fire Watch person shall be stationed at each side of the perforation.
 - 6.1.1.4 Floors must be swept clean of combustibles.
 - 6.1.1.5 Combustible floors must be wet down and covered with damp sand or fire-resistive sheets.
 - 6.1.1.6 The area must be cleared of flammable liquids and other combustibles (minimum of 35 feet from fire/hot work activities). If this cannot be done, all combustible/flammable materials must be protected with fire-resistive tarpaulins or metal shields.
 - 6.1.1.7 Any potentially explosive atmospheres in the area must be eliminated.
 - 6.1.1.8 All wall and floor openings must be covered, and combustibles must be moved away from the other side of walls or ceilings where fire/hot work will be performed.

- 6.1.1.9 Fire-resistive tarpaulins must be suspended beneath work (as appropriate).
- 6.1.1.10 Electrical Services must disable audible and visual fire detection systems in the immediate Fire/Hot Work Permit area (as appropriate).
- 6.1.1.11 Staff and contractors must understand their roles and responsibilities under the permit system.
- 6.1.1.12 The staff member or contractor requesting the permit shall correct any findings from this inspection.
- 6.1.2 The staff member or contractor shall provide all appropriate information on SIH-FM-112.
- 6.1.3 The qualified person issuing the SIH-FM-112 shall determine the adequate number of Fire Watches to complete the task. A minimum of one is required. Where wall or floor openings are within 35 feet and are exposed to sparks, flame, fire, or extreme radiant heat, a Fire Watch shall be stationed at both sides of the wall, floor, or roof opening to keep close watch on any combustible materials that lie adjacent to or on the opposite side of metal partitions, walls, ceilings, or roofs and are likely to be ignited by conduction or radiant heat.
- 6.1.4 If this is a request for a Fire/Hot Work Permit that was previously revoked, the qualified person issuing the permit shall verify that all violations have been resolved to the satisfaction of the original issuer of the permit.
- 6.1.5 The qualified person shall issue SIH-FM-131 to the Fire Watch when the Fire/Hot Work Permit is issued. SIH-FM-131 is used if the fire/hot work is determined to be a continuation of the same activity, and the activity is intermittent throughout a period of time. This allows the same Fire/Hot Work Permit to be used rather than completing a new one at the commencement of the same hot work activity.

6.2 Performing Work Using a Fire/Hot Work Permit

- 6.2.1 If the work involving the Fire/Hot Work Permit involves work on enclosed equipment, the Fire Watch will complete the following steps prior to initiating work.
 - 6.2.1.1 Clean all combustibles off enclosed equipment.
 - 6.2.1.2 Confirm that containers have been purged of flammable liquids and flammable vapors.
 - 6.2.1.3 Use ventilation when welding in any confined space (see “Confined Space Entry Program,” SIH-PP-08).

- 6.2.2 The approved Fire/Hot Work Permit shall be posted in the area where the work is to be performed.
- 6.2.3 The Fire Watch shall begin his/her duties when the fire/hot work begins and end at least 30 minutes after the termination of the fire/hot work.
- 6.2.4 The Fire Watch shall ensure that all combustible materials within 35 feet of the hot work have been removed. In instances where a combustible material cannot be removed, the Fire Watch shall ensure that it is covered or shielded with a fire-resistant material.
- 6.2.5 If unsafe conditions develop, the Fire Watch shall stop hot work operations.
- 6.2.6 If conditions or the environment change during the time frame of the Fire/Hot Work Permit, the permit should reflect those changes, or a new permit should be issued.

6.3 Revoking a Fire/Hot Work Permit

- 6.3.1 The Fire/Hot Work Permit shall be revoked by the qualified person who issued the permit, a BSTI Safety and Health/Emergency Response Representative, Project Manager, or anyone familiar with the requirements of this procedure, immediately whenever there is any deviation from the requirements identified on the Fire/Hot Work Permit.
- 6.3.2 The individual responsible for revoking the permit shall notify the issuer.
- 6.3.3 The staff member using the Fire/Hot Work Permit shall correct the violations and submit it to the issuer for a new permit before continuing work.

7.0 RECORDS

Name of Record	Record Media	Location	Retention Period
Fire/Hot Work Permit, SIH-FM-112	Hardcopy	Within user group	1 year
Fire/Hot Work Watch Log, SIH-FM-131	Hardcopy	Within user group	1 year
Confined Space Entry Program, SIH-PP-08	Hardcopy	Within user group	1 year
BSTI Risk Assessment Form, SIH-FM-133	Hardcopy	BSTI Safety and Health/Emergency Response	1 year
Attendance Records for internal course HS-140, Fire Extinguisher Training	Hardcopy	Environment, Safety, Health, and Quality	1 year

8.0 RELATED DOCUMENTS

The following documents are referenced by this procedure:

- SIH-FM-112, Fire/Hot Work Permit
- SIH-FM-131, Fire/Hot Work Watch Log
- SIH-PP-08, “Confined Space Entry Program”
- SIH-FM-133, BSTI Risk Assessment Form Renovation/Construction Work


Battelle Science & Technology International Safety And Industrial Hygiene Program

Title: Hearing Conservation Program

Number: SIH-GP-003

Revision: 2

Originator:

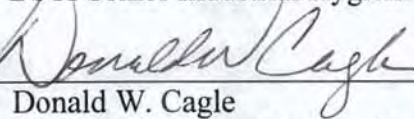

Gary B. Carlin

BSTI Senior Industrial Hygienist

6-22-04

Date

Approved By:

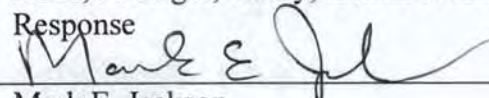


Donald W. Cagle
BSTI, Manager, Safety, Health & Emergency
Response

6/22/04

Date

Approved By:



Mark E. Jackson
Manager, Regulatory Compliance

6/24/04

Date

Approved By:



N. Joseph Gantos
Vice President, BSTI Environment, Safety,
Health & Quality

6/30/04

Date

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REVISION HISTORY

Rev. No.	Effective Date	Description of Revision
0	05/01/96	Initial Release
1	01/02/01	Scheduled Review
2	07/27/04	Review due to department Re-Organization

1.0 PURPOSE

The purpose of this program is to provide guidance to supervisors, Health Services, and Safety and Health Representatives to ensure appropriate protection and conservation of employees' hearing according to OSHA regulations and BSTI requirements.

2.0 SCOPE AND APPLICABILITY

This program applies to all Battelle Science & Technology International (BSTI) staff, including off-sites and field operations.

3.0 PREREQUISITES

Working in an area with noise levels greater than 85 dbA, completion of hearing conservation training and baseline audiometric examination.

4.0 DEFINITIONS

Attenuate To reduce in strength or force. In sound, to reduce intensity as expressed in decibels.

Audiometric Testing The science of measurement of hearing ability.

BSTI Battelle Science and Technology International

Decibel (dB) A non-dimensional unit used to express sound levels. The decibel is a logarithmic expression of the ratio of a measured quantity to a reference quantity. In audiometry, a level of zero decibels represents roughly the weakest sound that can be heard by a person with good hearing.

dB(A) A weighted network filter employed in making sound pressure measurements, indicated by a suffix added to the unit symbol of dbA.

dB(C) A sound level reading in decibels made on the C-weighted network of a sound level meter.

Hearing Conservation The prevention or minimizing of noise-induced hearing loss through the use of hearing protection devices and the control of noise through engineering methods or administrative procedures.

HCP Hearing Conservation Program

Hearing Loss Hearing loss is reduced auditory sensitivity at specific frequencies. This reduced sensitivity may be the result of normal aging, disease, injury to the hearing organs, or exposure to excessive noise over long periods of time. Types of hearing loss are as follows:

- **Conductive** - A hearing loss originating in the conductive mechanism of the ear.

	<ul style="list-style-type: none">• Sensorineural - A hearing loss originating in the cochlea or the fibers of the auditory nerve.
Impact Noise	The noise resulting from the collision of two masses.
Impulse Noise	Impulse noises are usually considered to be singular noise pulses, each less than 1 second in duration, or repetitive noise pulses occurring at greater than 1 second intervals. Also defined as a change of sound pressure of 40 dB or more within 0.5 second.
Noise Induced Hearing Loss	The progressive inner ear hearing loss which results from exposure to noise over a long period of time as contrasted to acoustic trauma or physical injury to the ear.
Permanent Threshold Shift (PTS)	A permanent decrease of the acuity of the ear at a specified frequency as compared to a previously established reference level. The amount of permanent threshold shift is customarily expressed in decibels.
Standard Threshold Shift (STS)	A shift of 10 dB or more at 2000, 3000, and 4000 Hz in either ear relative to the baseline audiogram,

5.0 REGULATORY/VOLUNTARY STANDARD REFERENCES

- U.S. Department of Labor, Occupational Safety and Health Administrations (OSHA), Occupational Noise Exposure Standard, 29 CFR 1910.95.

6.0 RESPONSIBILITIES

6.1. Manager/Supervisor

- 6.1.1 Notify the assigned Safety and Health Representative of the addition of new equipment, changes in process, or controls which may affect the HCP and participate in evaluations or implementation of HCP requirements.
- 6.1.2 Ensure that all affected staff are properly trained in and qualified to implement the requirements of this program.
- 6.1.3 Ensure that all personnel are aware of the locations where hearing protection is required and that buildings, areas, or specific equipment are posted with adequate notification signs (working with Safety and Health Representative).
- 6.1.4 Ensure that all affected BSTI staff are included in the BSTI *Hearing Conservation Program*, in that audiometric testing is done, noise is evaluated, and proper hearing protection is provided and worn.

6.2. Safety, Health and Emergency Response Representatives

- 6.2.1 Ensure that noise monitoring is conducted according to this program and the OSHA Standard, 29 CFR 1910.95.
- 6.2.2 Ensure that the supervisor and employees are notified, in writing, of their noise monitoring results within 15 work days of the result determination.

- 6.2.3 Determine if there are feasible engineering and/or administrative controls which may be implemented to reduce noise exposure levels in high noise areas to below 85 dbA.
- 6.2.4 Ensure that hearing protection is adequate to attenuate the noise for the affected employee.
- 6.2.5 Coordinate and assist any off-sites and field operations to set up, implement, and maintain the facility *Hearing Conservation Program (HCP)*.
- 6.2.6 Periodically evaluate program implementation.
- 6.2.7 Ensure that all records are maintained, including exposure monitoring, training records (initial and refresher), and employee notifications.
- 6.2.8 Post the area or location where hearing protection is required.

6.3. Health Services

- 6.3.1 Maintain BSTI capabilities for audiometric testing and complete initial baseline and annual audiograms, as necessary.
- 6.3.2 Communicate with examining physicians concerning prognosis and future treatment of affected employees.
- 6.3.3 Work with off-sites and field operations to identify contract clinics or audiometric testing facilities available to service these locations, and assist in clinic or facility selection when requested.
- 6.3.4 Notify the appropriate Safety and Health Representative and the employee's supervisor of any known or suspected occupational hearing loss as soon as possible so that an accident/incident investigation can be initiated.
- 6.3.5 Ensure that all occupational exposures with permanent threshold shifts of 10 dBA or greater averaged over 2000, 3000, and 4000 Hz are recorded in the *OSHA 300 Log* of recordable illnesses (See SIH-GP-20).

6.4. Employees

- 6.4.1 Cooperate with management and/or the Safety and Health Representative in identifying or evaluating high noise areas or HCP requirements.
- 6.4.2 Use hearing protection in designated or posted areas.

7.0 Procedure

7.1. Implementation of the Hearing Conservation Program (HCP)

- 7.1.1 Employee noise exposure shall be assessed in accordance with the Occupational Safety and Health Administration (OSHA) Noise Standard 29 CFR 1910.95 without regard to any attenuation provided by the use of personal protective equipment (PPE).
- 7.1.2 The requirements described within this HCP shall be implemented whenever employee noise exposures equal or exceed an 8-hour Time Weighted Average (TWA) of 85 dBA (decibels measured on an A-weighted scale) OR whenever exposure to impulse or impact noise exceeds 140 dB peak sound pressure level.

7.2. Monitoring

- 7.2.1 When information indicates that any employee's exposure may equal or exceed an 8-hour TWA of 85 dBA, the Safety and Health Representative (or designee) shall monitor (using an appropriately calibrated instrument) the exposure according to this program and OSHA requirements.
- 7.2.2 Samples shall be taken which are representative of all job categories potentially exposed to noise greater than an 8-hour TWA of 85 dBA in order to identify staff for inclusion in the HCP and to enable the proper selection of hearing protections.
- 7.2.3 Whenever there is a process change or there is reason to suspect that noise exposure levels have increased, additional noise monitoring shall be conducted by the Safety and Health Representative.
- 7.2.4 The Safety and Health Representative shall ensure a copy of any employee monitoring results is forwarded to Health Services for inclusion in the employee's medical file.

7.3. Employee Notification

- 7.3.1 The Safety and Health Representative or their designate shall be responsible to notify each employee and their supervisor of any exposure at or above an 8-hour TWA of 85 dBA, in writing, within 15 work days after receiving the personal noise monitoring results.

7.4. Audiometric Testing

- 7.4.1 BSTI Health Services or other BSTI Health Services approved audiometry service shall conduct audiometric testing.
- 7.4.2 Baseline audiograms should be performed prior to exposure, but shall be performed within 6 months of an employee's exposure at or above the action level of an 8-hour TWA of 85 dBA.
- 7.4.3 At least annually after obtaining the baseline audiogram, each affected employee shall receive a new audiogram.
- 7.4.4 All employees who have experienced a standard threshold shift (STS) shall be retested within 30 days, and the results of this test shall be used as the annual audiogram.
- 7.4.5 BSTI Health Services shall notify each employee who has had a standard threshold shift (STS) due to an occupational exposure in writing within 21 days of this determination. A copy of this notification shall be sent to the employee's supervisor and the Safety and Health Representative.
- 7.4.6 All confirmed permanent threshold shifts shall be recorded in the *OSHA 300 Log* of recordable illnesses.
- 7.4.7 The Safety and Health Representative should assess each job where an STS has occurred and recommend to supervision methods of preventing future STS.
- 7.4.8 An employee experiencing an STS shall be referred for a clinical audiological evaluation or an otological examination by Health Services, as appropriate, if additional testing is necessary or if a medical pathology of the ear is suspected to be caused by the wearing of

hearing protection. In addition, these employees shall be refit and retrained in the use of hearing protection.

7.5. Engineering and Administrative Controls

- 7.5.1 First consideration shall be given by managers to feasible engineering and/or administrative controls during design or modification of workstations. Safety and Health Representatives should review any such controls.
- 7.5.2 All employees exposed to a TWA of 85 dBA or greater shall wear hearing protection until feasible engineering and/or administrative controls are implemented.

7.6. Hearing Protection

- 7.6.1 Employees whose TWA exposures equals or exceeds 85 dBA shall be fitted with hearing protection, trained in its use and care, and required to use it (by the Safety and Health Department). Hearing protection shall be provided at no cost to the employee.
- 7.6.2 Employees shall be given the opportunity to select their hearing protection from a variety (at least two types) of suitable hearing protection.
- 7.6.3 To avoid confusion, areas of buildings or entire buildings may be designated as locations where hearing protection is required, even if high noise exists only in specific locations within a building (this should be an administrative decision made on a case-by-case basis with the appropriate department or facilities manager and the Safety and Health Representative).
- 7.6.4 Supervisors shall ensure that hearing protection is worn by an employee based on exposure limits in Table 1.
- 7.6.5 Hearing protection must attenuate employee exposure at least to an 8-hour TWA of 85 dBA or less.
- 7.6.6 The adequacy of hearing protector attenuation shall be reevaluated by the Safety and Health Representative whenever employees' noise exposure increases.

7.6.7 If the issued hearing protection does not provide adequate attenuation the employee shall be provided with more effective hearing protection which offers greater attenuation.

Table 1. Permissible Noise Exposure*

Duration Per Day, Hours	Sound Level dBA, Slow Response
8	85
6	87
4	90
3	92
2	95
1-1/2	97
1	100
1/2	105
1/4 or less	110

* As previously stated, BSTI requires the use of an 8-hour TWA of 85 dBA (vs. OSHA 90 dBA).

7.7. Training Program

7.7.1 An initial training program shall be implemented (by the BSTI training department) where exposure is equal to or greater than an 8-hour TWA of 85 dBA and affected employees shall be informed of the following:

- The effects of noise on hearing.
- The purpose of hearing protection, advantages and disadvantages, attenuation of various types, and instructions on selection, fitting, use, and care of all hearing protection provided to them.
- The purpose of audiometric testing and an explanation of the test procedures.
- The contents of *OSHA Standard 29 CFR 1910.95*.

7.7.2 Information provided in the program shall be updated to be consistent with changes in protective equipment, work processes or regulatory changes.

7.7.3 A refresher training program shall be repeated annually for each employee included in the hearing conservation program.

8.0 RECORDS

8.1. Access to Information, Training Materials, and Records

- 8.1.1 All records required by this program shall be provided upon request to employees, former employees, and representatives designated by the individual employee.
- 8.1.2 The BSTI ESH&Q SM Training Department will retain copies of all completed testing materials and attendance records. Training materials utilized in the initial or refresher training programs will be readily available to affected employees and their supervisors.
- 8.1.4 All employee audiometric test records shall be maintained by Health Services.

8.2. Record Retention

- 8.2.1 The records shall be retained for at least the following periods:

Name of Record	Record Media	Location	Minimum Retention Period
Noise Exposure Measurement Records	Paper	Safety and Health Department	2 years
Audiometric test records	Paper	Health Services	Retained for duration of affected employee's employment
Training Records and Sign-in sheets	Paper	BSTI ESH&Q SM Training Department	Retained for duration of employee's employment
Employee noise monitoring notifications	Paper	ESH&Q Central Files/Health Services	Retained for duration of affected employee's employment

9.0 RELATED DOCUMENTS

- BSTI, Safe Work Practices Handbook (latest edition).
- SIH-GP-20, Accident/Incident Reporting and Investigation Program
- BSTI Operating Guide (specifically the following): Tab 1300, Environment, Safety, and Health (1340-2.2) and Tab 1600, Health Services (1610-1).

Battelle Science & Technology International

Safety and Industrial Hygiene General Procedure

Title:	Fall Protection General Procedure
Number:	SIH-GP-006
Revision:	0

Originator: Stephanie H. McKinnon 9 Aug 04
Stephanie H. McKinnon Date
Safety and Health Representative

Reviewed By: Curt A. Flemming Aug. 9, 2004
Curt A. Flemming Date
Manager, Quality Management Systems &
Training

Approved By: Mark E. Jackson 8/9/04
Mark E. Jackson Date
Manager, Regulatory Compliance

Approved By: Donald W. Cagle 8/9/04
Donald W. Cagle Date
Manager, Safety, Health & Emergency
Response

Approved By: N. Joseph Gantos 8/10/04
N. Joseph Gantos Date
Vice President, Environment, Safety, Health
& Quality

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REVISION HISTORY

Rev. No.	Effective Date	Description of Revision
0	08/11/04	Initial Release. Replaces SIH-PP-06.

1.0 PURPOSE

The purpose of this program is to provide guidance to supervisors and Safety and Health Representatives to ensure appropriate fall protection measures for employees according to OSHA regulations and industry work practices.

2.0 SCOPE AND APPLICABILITY

This program applies to all Battelle Science and Technology International Operations (BSTI) activities, including regional offices and field operations. This program addresses fall protection measures for construction, general industry/routine maintenance, and project activities.

3.0 PREREQUISITES

The following prerequisites must be completed by staff members prior to using this procedure:

- 3.1 The Safety and Health Representative, manager/supervisor, or designee shall provide training to all employees exposed to fall hazards. Training shall include the following areas:
 - 3.1.1 The nature of fall hazards in the work area.
 - 3.1.2 The correct procedures for erecting, maintaining, disassembling, and inspecting the fall protection systems used.
 - 3.1.3 The use and operation of guardrail systems, personal fall arrest systems, safety net systems, warning line systems, safety monitoring systems, controlled access zones, and other protection.
 - 3.1.4 The role of each employee in the safety monitoring system.
 - 3.1.5 The limitations on the use of mechanical equipment during the performance of roofing work on low-sloped roofs.
 - 3.1.6 The role of employees in fall protection plans.
 - 3.1.7 The OSHA Fall Protection Standard 1926.500, 1926.501, 1926.502, 1926.503.
- 3.2 A written certification record of the training shall be issued.
- 3.3 Retraining shall be conducted if changes in the workplace render previous training obsolete or changes in the fall protection systems or equipment render previous training obsolete.

4.0 DEFINITIONS

See Appendix A for a complete listing of definitions specific to this document.

5.0 REGULATORY/VOLUNTARY STANDARD REFERENCES

This procedure complies with the following regulatory and/or voluntary standard requirements:

- 5.1 U.S. Department of Labor, Occupational Safety and Health Administration (OSHA), Fall Protection Standard, 29 CFR 1926.500, 1926.501, 1926.502, 1926.503
- 5.2 OSHA 29 CFR 1910 Subpart D, Walking/Working Surfaces
- 5.3 OSHA 29 CFR 1910 Subpart F, Powered Platforms, Manlifts, and Vehicle-Mounted Work Platforms
- 5.4 OSHA 29 CFR 1926 Subpart L, Scaffolds

5.5 OSHA 29 CFR 1926 Subpart N, Cranes, Derricks, Hoists, Elevators, and Conveyors

5.6 OSHA 29 CFR 1926 Subpart P, Excavations

5.7 OSHA 29 CFR 1926 Subpart R, Steel Erection

5.8 OSHA 29 CFR 1926 Subpart S, Underground Construction, Caissons, Cofferdams, and Compressed Air

5.9 OSHA 29 CFR 1926 Subpart X, Stairways and Ladders

6.0 PROCEDURE

Line Management, in conjunction with their assigned Safety and Health Representative, shall identify during the work planning process potential fall hazards. They may document identified hazards on a BSTI Risk Assessment Form. If fall hazards are identified, Line Management and the Safety and Health Representative will determine feasible fall protection measures (such as those described below), implement these measures, make personnel aware of areas where these measures are required, and periodically inspect these work areas to verify compliance.

6.1 Construction Activities

NOTE: Fall protection is not required when making an inspection, investigation, or assessment of workplace conditions prior to the actual start of construction work or after construction work has been completed.

In all construction activities, employees on a walking/working surface with an unprotected side or edge which is six (6) feet or more above a lower level shall be protected from falling by the use of guardrail systems, safety net systems, or personal fall arrest systems. Additional requirements for specific activities requiring fall protection are outlined below.

NOTE: Battelle and OSHA assume that it is feasible to implement the fall protection systems listed below. In lieu of implementing the recommended systems, Battelle and/or the contractor will prepare and implement a Fall Protection Plan in accordance with 29 CFR 1926.502(k). The Safety and Health Representative shall review such plans to determine if the OSHA requirements are being met.

6.1.1 Leading Edge Work

Each employee who is constructing a leading edge six (6) feet or more above lower levels shall be protected by guardrail systems, safety net systems, or personal fall arrest systems.

6.1.2 Hoist Areas

6.1.2.1 Each employee in a hoist area shall be protected from falling six (6) feet or more to lower levels by guardrail systems or personal fall arrest systems.

6.1.2.2 If the guardrail system is removed or portions thereof are removed to facilitate the hoisting operation, and an employee must lean through the access opening or out over the edge, that employee shall be protected by using a personal fall arrest system.

6.1.3 Holes

- 6.1.3.1 Each employee on walking/working surfaces shall be protected from falling through holes (including skylights and roof penetrations) more than six (6) feet above lower levels by personal fall arrest systems, covers, or guardrails erected around such holes.
- 6.1.3.2 Each employee shall be protected from tripping into or stepping into or through holes by covers.
- 6.1.3.3 Each employee on a walking/working surface shall be protected from objects falling through holes from above.

6.1.4 Formwork and Reinforcing Steel

Each employee on the face of formwork or reinforcing steel shall be protected from falling six (6) feet or more to lower levels by personal fall arrest systems, safety net systems, or positioning device systems.

6.1.5 Ramps, Runways, and other Walkways

Each employee on ramps, runways, or walkways shall be protected from falling six (6) feet or more to lower levels by guardrail systems.

6.1.6 Excavations

- 6.1.6.1 Each employee at the edge of an excavation, pit, well, or shaft six (6) feet or more in depth shall be protected from falling by guardrail systems, fences, or barricades.
- 6.1.6.2 Excavations less than six (6) feet deep shall be demarcated with barrier tape and appropriate warning signs.

6.1.7 Dangerous Equipment

- 6.1.7.1 Each employee less than six (6) feet above dangerous equipment shall be protected from falling into or onto equipment by guardrail equipment or by equipment guards.
- 6.1.7.2 Each employee six (6) feet or more above dangerous equipment shall be protected from fall hazards by guardrail systems, personal fall arrest systems, or safety net systems.

6.1.8 Overhand Bricklaying and Related Work

- 6.1.8.1 Each employee performing overhand brick laying and related work six (6) feet or more above lower levels shall be protected from falling by guardrail systems, safety net systems, personal fall arrest systems or shall work in a controlled access zone (CAZ). Only employees performing the work may enter the CAZ.
- 6.1.8.2 Each employee reaching more than 10 inches below the level of the walking/working surface on which they are working shall be protected

from falling by a guardrail system, safety net system, or fall arrest system.

NOTE: Bricklaying operations performed on scaffolds are regulated by OSHA 29 CFR 1926, Subpart L, Scaffolds.

6.1.9 Roofing Work on Low-Slope Roofs

Employees engaged in roofing activities on low-slope roofs with unprotected sides and edges six (6) feet or more above lower levels shall be protected from falling by guardrail systems, safety net systems, personal fall arrest systems, or a combination of warning line system and guardrail system, warning line system and safety net system, or warning line system and personal fall arrest system, or warning line system and safety monitoring system.

6.1.10 Roofing Work on Steep Roofs

Each employee on a steep roof with unprotected sides or edges six (6) feet or more above lower levels shall be protected from falling by guardrail systems with toeboards, safety net systems, or personal fall arrest systems.

6.1.11 Precast Concrete Erection

Each employee engaged in the erection of precast concrete members and related operations who is six (6) feet or more above a lower level shall be protected from falling by guardrail systems, safety net systems, or personal fall arrest systems.

6.1.12 Wall Openings

Each employee working on, at, above, or near wall openings where the outside bottom edge is six (6) feet or more above lower levels and the inside bottom edge of the wall opening is less than 39 inches above the walking/working surface, shall be protected from falling by the use of guardrail systems, a safety net system, or a personal fall arrest system.

6.1.13 Protection from Falling Objects

When an employee is exposed to falling objects, Battelle will require that each employee wear a hard hat and will implement one of the following measures:

- 6.1.13.1.1 Erect toeboards, screens, or guardrail systems to prevent objects from falling from higher levels, or
- 6.1.13.1.2 Erect a canopy structure and keep potential fall objects far enough from the edge of the higher level, or
- 6.1.13.1.3 Barricade the area to which objects could fall and prohibit employees from entering the area.

6.2 General Industry/Routine Maintenance Activities

The following specific activities or situations require fall protection. These requirements are based on industrial specific standards.

6.2.1 Floor Openings

- 6.2.1.1 Stairway floor openings shall be guarded by a standard railing.
- 6.2.1.2 Ladderway floor openings or platforms shall be guarded by a standard railing and toeboard on all exposed sides.
- 6.2.1.3 Hatchway and chute floor openings shall be guarded by either a hinged floor cover of standard strength and construction with standard railing or a removable railing with toeboard on not more than two sides and fixed standard railings with toeboards on all other exposed sides.
- 6.2.1.4 Skylight floor openings and holes shall be guarded by a standard skylight screen or a fixed standard railing on all exposed sides.
- 6.2.1.5 Pit and trap door floor openings, infrequently used, shall be guarded by a cover of standard strength and construction. While the cover is not in place, the pit or trap door openings shall be constantly attended by someone or shall be protected on all sides by removable standard railings.
- 6.2.1.6 Manhole floor openings shall be guarded by a standard manhole cover. While the cover is not in place, the manhole shall be constantly attended by someone or shall be protected by removable standard railings.
- 6.2.1.7 Temporary floor openings shall have standard railing or be constantly attended by someone.
- 6.2.1.8 Floor holes which persons can accidentally walk into shall be guarded by standard railing with toeboards on all exposed sides or shall be covered. While the cover is not in place, the hole shall be constantly attended by someone.
- 6.2.1.9 Floor holes which persons cannot accidentally walk into (because of fixed machinery or equipment) shall be protected by a cover that leaves no openings more than one (1) inch wide. The cover shall be held securely in place to prevent tools or materials from falling through.

6.2.2 Wall Openings and Holes

- 6.2.2.1 Wall openings from which there is a drop of more than four (4) feet shall be guarded by a rail, roller, picket fence, half door, or equivalent barrier. Removable toeboards shall be used when there is exposure below to falling material.
- 6.2.2.2 Chute wall openings where there is a drop of more than four (4) feet shall be guarded by a rail, roller, picket fence, half door, or equivalent barrier.
- 6.2.2.3 Window wall openings at a stairway landing, floor, platforms, or balcony from which there is a drop of more than four (4) feet, and where the bottom of the opening is less than three (3) feet above the platform or landing, shall be guarded by standard slats, standard grill work, or standard railing. If the window opening is below the landing or platform, a standard toeboard shall be provided.

- 6.2.2.4 Temporary wall openings shall have adequate guards, but these need not to be standard construction.
- 6.2.2.5 Where there is a hazard of materials falling through a wall hole, standard toeboards or an enclosing screen shall be installed.

6.2.3 Protection of Open Sided Floors, Platforms and Runways

- 6.2.3.1 Open sided floors, platforms, or runways four (4) feet or more above adjacent floor or ground level shall be guarded by a standard railing on all open sides except when there is an entrance to a ramp, stairway, or fixed ladder. Toeboards are required whenever beneath the open sides persons can pass, there is moving machinery, or there is equipment that could create a hazard.
- 6.2.3.2 Regardless of height, open sided floors, walkways, platforms, or runways above or adjacent to dangerous equipment, pickling or galvanizing tanks, degreasing units, and similar hazards shall be guarded with standard railing and toeboards.

6.2.4 Fixed Industrial Stairs

Standard railings shall be installed on the open sides of all exposed stairways and stair platforms.

6.2.5 Fixed Ladders

Ladder safety devices (life belts, friction brakes, sliding attachments) are required on tower, water tanks, and chimney ladders that are over 20 feet, unless cage protection is provided.

6.2.6 Scaffolds

- 6.2.6.1 Guardrails, mid-rails, and toeboards shall be installed on all open sides of scaffolds which are 10 feet or greater in height.
- 6.2.6.2 Full body harnesses and lifelines are required for suspension scaffolds and boatswains chairs.
- 6.2.6.3 Scaffolding shall have fall protection incorporated into the construction of the scaffolding system. Fall protection shall include standard railings and/or a body harness and lanyard.
 - 6.2.6.3.1 Standard railings consist of a top rail (36 to 42 inches), mid-rail (21 inches), and toeboard (if more than 10 feet or more above the base).
 - 6.2.6.3.2 Where suitable railings are not feasible, a body harness and lanyard may be provided for fall protection. As a minimum, the worker using a body harness and lanyard must be provided with a location(s) to tie off that will sustain a load of 5000 pounds.

6.2.6.3.3 Lanyards, Dee-rings, snaphooks, and horizontal or vertical lifelines shall have a minimum breaking strength of 5000 pounds.

6.2.7 Aerial Lifts

Full body harnesses and lanyards are required when using aerial lifts

7.0 RECORDS

The following records are generated in the course of following this procedure:

Name of Record	Record Media	Location	Retention Period
Training Records (employees)	hardcopy or electronic	ESH&Q master training files	Retained for the duration of their employment.
Training Records (contractors)	hardcopy or electronic	Contractor project file in Facilities job package	Retained in project file for as long as the project file is maintained.
BSTI Risk Assessment	hardcopy or electronic	Facilities Safety and Health Representative	one year
Fall Protection Plans (if the recommendations in this procedure are not feasible)	hardcopy or electronic	Facilities Safety and Health Representative	One year

8.0 RELATED DOCUMENTS

Click on the name of the following documents referenced by this procedure to view their contents:

- 8.1 BSTI Risk Assessment Form (ESH-109)
- 8.2 BCO, Safe Work Practices Handbook (Latest Edition)
- 8.3 BCO Operating Guide, Sections 1340-5.5, Cranes and Hoists and 1340-5.6, Forklifts/Manlifts

APPENDIX A: Definitions

Cage - A cage is a guard that may be referred to as a cage or basket guard which is an enclosure that is fastened to the side rails of the fixed ladder or to the structure to encircle the climbing space of the ladder for the safety of the person who must climb the ladder.

Controlled Access Zone (CAZ) - An area in which overhand bricklaying other related work may take place without the use of guardrail systems, personal fall arrest systems, or safety net systems, and access to the zone is controlled.

Dangerous Equipment - Equipment (such as pickling or galvanizing tanks, degreasing units, machinery, electrical equipment, and other units) which, as a result of form or function, may be hazardous to employees who fall onto or into such equipment.

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

Fixed Ladder - A fixed ladder is a ladder permanently attached to a structure, building, or equipment.

Floor Hole - An opening measuring less than 12 inches but more than 1 inch in its least dimension in any floor, platform, pavement, or yard through which persons may fall, such as a hatchway, stair or ladder opening, pit, or large manhole. Floor openings occupied by elevators, dumb waiters, conveyors, machinery, or containers are excluded from this subpart.

Floor Opening - An opening measuring 12 inches or more in its least dimension, in any floor, platform, pavement, or yard through which persons may fall, such as a hatchway, stair or ladder opening, pit, or large manhole. Floor openings occupied by elevators, dumb waiters, conveyors, machinery, or containers are excluded from this subpart.

Guardrail System - A barrier erected to prevent employees from falling to lower levels. Guardrails shall be at least two (2) by four (4) inches and shall be between 36 and 42 inches high, with a midrail, and toeboards (greater than 10 feet high). Guardrail systems shall be capable of withstanding, without failure, a force of at least 200 pounds applied within two (2) inches of the top edge, in any outward or downward direction, at any point along the top edge.

Handrail - A single bar or pipe supported on brackets from a wall or partition, as on a stairway or ramp, to furnish persons with a handhold in case of tripping.

Hole - Means a gap or void two (2) inches (5.1 cm) or more in its least dimension in a floor, roof, or other walking/working surface.

Infeasible - Means that it is impossible to perform the construction work using a conventional fall protection system (i.e., guardrail system, safety net system, or personal fall arrest system) or that it is technologically impossible to use any one of these systems to provide fall protection.

Ladder Safety Device - A ladder safety device is any device, other than a cage or well, designed to eliminate or reduce the possibility of accidental falls and which may incorporate such features as life belts, friction brakes, and sliding attachments.

Leading Edge - Means the edge of a floor, roof, or formwork for a floor or other walking/working surface (such as the deck) which changes location as additional floor, roof, decking, or

formwork sections are placed, formed, or constructed. A leading edge is considered to be an “unprotected side and edge” during periods when it is not actively and continuously under construction.

Low-Slope Roof - Means a roof having a slope less than or equal to 4 in 12 (vertical to horizontal).

Lower Levels - Means those areas or surfaces to which an employee can fall. Such areas or surfaces include, but are not limited to, ground levels, floors, platforms, ramps, runways, excavations, pits, tanks, material, water, equipment, structures, or portions thereof.

Mechanical Equipment - Means all motor- or human-propelled wheeled equipment used for roofing work, except wheelbarrows and mopcars.

Mid-rail - A rail approximately midway between the guardrail and platform, used when required, and secured to the uprights erected along the exposed sides and ends of platforms.

Overhand Bricklaying and Related Work - Means the process of laying bricks and masonry units such that the surface of the wall to be jointed is on the opposite side of the wall from the mason, not requiring the mason to lean over the wall to complete the work. Related work includes mason tending and electrical installation incorporated into the brick wall during the overhand bricklaying process.

Personal Fall Arrest System - Means a system used to arrest an employee in a fall from a working level. It consists of an anchorage, connectors, a body belt or body harness and may include a lanyard, deceleration device, lifeline, or suitable combinations of these. As of January 1, 1998, the use of a body belt for fall arrest is prohibited.

Platform - A working space for persons, elevated above the surrounding floor or ground, such as a balcony or platform for the operation of machinery and equipment.

Roof - Means the exterior surface on the top of the building. This does not include floors or formwork which, because a building has not been completed, temporarily become the top surface of a building.

Roofing Work - Means the hoisting, storage, application, and removal of roofing materials and equipment, including related insulation, sheet metal, and vapor barrier work, but not including the construction of the roof deck.

Runway - A passageway for persons, elevated above the surrounding floor or ground level, such as a footwalk along shafting or a walkway between buildings.

Safety-Monitoring System - Means a safety system in which a competent person is responsible for recognizing and warning employees of fall hazards.

Scaffold - Any temporary elevated platform and its supporting structure used for supporting workmen or materials or both.

Standard Railing - A vertical barrier erected along exposed edges of a floor opening, wall opening, ramp, platform, or runway to prevent falls of persons.

Steep Roof - Means a roof having a slope greater than 4 in 12 (vertical to horizontal).

Toeboard - A vertical barrier at floor level erected along exposed edges of a floor opening, wall opening, platform, runway, or ramp to prevent falls of materials. They must be four (4)

inches high and no gap between the surface is allowed if personnel can enter the work area below.

Two-point Suspension Scaffold (Swinging Scaffold) - A scaffold, the platform of which is supported by hangers (stirrups) at two points, suspended from overhead supports so as to permit the raising or lowering of the platform to the desired working position by tackle or hoisting machines.

Unprotected Sides and Edges - Means any side or edge (except at entrances to points of access) of a walking/working surface, e.g., floor, roof, ramp, or runway where there is no wall or guardrail system at least 39 inches (1.0 m) high.

Walking/Working Surface - Means any surface, whether horizontal or vertical on which an employee walks or works, including, but not limited to, floors, roofs, ramps, bridges, runways, formwork and concrete reinforcing steel but not including ladders, vehicles, or trailers, on which employees must be located in order to perform their job duties.

Wall Hole - An opening less than 30 inches but more than 1 inch high, of unrestricted width, in any wall or partition, such as a ventilation hole or drainage scupper.

Wall Opening - An opening at least 30 inches high and 18 inches wide, in any wall or partition, through which persons may fall, such as a yard-arm doorway or chute opening.

Warning Line System - Means a barrier erected on a roof to warn employees that they are approaching an unprotected roof side or edge, and which designates an area in which roofing work may take place without the use of guardrail, body belt, or safety net systems to protect employees in the area.

Work Area - Means that portion of a walking/working surface where job duties are being performed.

ATTACHMENT 5

OCCUPATIONAL SAFETY AND HEALTH ADMINISTRATION 300A FORMS

OSHA's Form 300A (Rev. 01/2004)

Summary of Work-Related Injuries and Illnesses

Year 2008



U.S. Department of Labor
Occupational Safety and Health Administration
Form approved OMB no. 1218-0176

All establishments covered by Part 1904 must complete this Summary page, even if no injuries or illnesses occurred during the year. Remember to review the Log to verify that the entries are complete

Using the Log, count the individual entries you made for each category. Then write the totals below, making sure you've added the entries from every page of the log. If you had no cases write "0."

Employees former employees, and their representatives have the right to review the OSHA Form 300 in its entirety. They also have limited access to the OSHA Form 301 or its equivalent. See 29 CFR 1904.35, in OSHA's Recordkeeping rule, for further details on the access provisions for these forms.

Number of Cases

Total number of deaths	Total number of cases with days away from work	Total number of cases with job transfer or restriction	Total number of other recordable cases
0	8	6	23
(G)	(H)	(I)	(J)

Number of Days

Total number of days away from work	Total number of days of job transfer or restriction
180	216
(K)	(L)

Injury and Illness Types

Total number of... (M)	
(1) Injury	33
(2) Skin Disorder	1
(3) Respiratory Condition	0
(4) Poisoning	0
(5) Hearing Loss	2
(6) All Other Illnesses	1

Post this Summary page from February 1 to April 30 of the year following the year covered by the form

Public reporting burden for this collection of information is estimated to average 50 minutes per response, including time to review the instruction, search and gather the data needed, and complete and review the collection of information. Persons are not required to respond to the collection of information unless it displays a currently valid OMB control number. If you have any comments about these estimates or any aspects of this data collection, contact: US Department of Labor, OSHA Office of Statistics, Room N-3644, 200 Constitution Ave. NW Washington, DC 20210. Do not send the completed forms to this office.

Establishment information

Your establishment name Battelle Columbus Laboratories
 Street 505 King Avenue
 City Columbus State Ohio Zip 43016
 Industry description (e.g., Manufacture of motor truck trailers)
Research Institute
 Standard Industrial Classification (SIC), if known (e.g., SIC 3715)
 OR North American Industrial Classification (NAICS), if known (e.g., 336212)
5 4 1 7

Employment information

Annual average number of employees 2278
 Total hours worked by all employees last year 4,556,000

Sign here

Knowingly falsifying this document may result in a fine.

I certify that I have examined this document and that to the best of my knowledge the entries are true, accurate, and complete.

Company executive

President & CEO
 Title

614-424-6562
 Phone

2/2/09
 Date



Summary of Work-Related Injuries and Illnesses

All establishments covered by Part 1904 must complete this Summary page, even if no injuries or illnesses occurred during the year. Remember to review the Log to verify that the entries are complete

Using the Log, count the individual entries you made for each category. Then write the totals below, making sure you've added the entries from every page of the log. If you had no cases write "0."

Employees former employees, and their representatives have the right to review the OSHA Form 300 in its entirety. They also have limited access to the OSHA Form 301 or its equivalent. See 29 CFR 1904.35, in OSHA's Recordkeeping rule, for further details on the access provisions for these forms.

Number of cases

Total number of deaths	Total number of cases with days away from work	Total number of cases with job transfer or restriction	Total number of other recordable cases
0	2	3	13
(G)	(H)	(I)	(J)

Days away from work

Total number of days away from work	Total number of days of job transfer or restriction
65	64
(K)	(L)

Number of injuries and illnesses by category

Total number of... (M)	
(1) Injury	17
(2) Skin Disorder	0
(3) Respiratory Condition	0
(4) Poisoning	0
(5) Hearing Loss	0
(6) All Other Illnesses	1

Post this Summary page from February 1 to April 30 of the year following the year covered by the form

Public reporting burden for this collection of information is estimated to average 50 minutes per response, including time to review the instruction, search and gather the data needed, and complete and review the collection of information. Persons are not required to respond to the collection of information unless it displays a currently valid OMB control number. If you have any comments about these estimates or any aspects of this data collection, contact: US Department of Labor, OSHA Office of Statistics, Room N-3644, 200 Constitution Ave. NW, Washington, DC 20210. Do not send the completed forms to this office.

Establishment information

Your establishment name Battelle Columbus Labs

Street 505 King Avenue

City Columbus State Ohio Zip 43201

Industry description (e.g., Manufacture of motor truck trailers)
Research and Development

Standard Industrial Classification (SIC), if known (e.g., SIC 3715)

OR North American Industrial Classification (NAICS), if known (e.g., 336212)
5 4 1 7 0

Employment information

Annual average number of employees 2329

Total hours worked by all employees last year 4,658,000

Sign here

Knowingly falsifying this document may result in a fine.

I certify that I have examined this document and that to the best of my knowledge the entries are true, accurate, and complete.

Carl F. Kelt
Company executive

President & CEO
Title

614-424-6562
Phone

Jan 26, 2008
Date

OSHA's Form 300A

Summary of Work-Related Injuries and Illnesses

Year 2006



U.S. Department of Labor
Occupational Safety and Health Administration

Form approved OMB no. 1218-0176

All establishments covered by Part 1904 must complete this Summary page, even if no injuries or illnesses occurred during the year. Remember to review the Log to verify that the entries are complete

Using the Log, count the individual entries you made for each category. Then write the totals below, making sure you've added the entries from every page of the log. If you had no cases write "0."

Employees former employees, and their representatives have the right to review the OSHA Form 300 in its entirety. They also have limited access to the OSHA Form 301 or its equivalent. See 29 CFR 1904.35, in OSHA's Recordkeeping rule, for further details on the access provisions for these forms.

Number of Cases

Total number of deaths	Total number of cases with days away from work	Total number of cases with job transfer or restriction	Total number of other recordable cases
<u>0</u>	<u>6</u>	<u>3</u>	<u>13</u>
(G)	(H)	(I)	(J)

Number of Days

Total number of days of job transfer or restriction	Total number of days away from work
<u>119</u>	<u>28</u>
(K)	(L)

Injury and Illness Types

Total number of... (M)	(1) Injury	(2) Skin Disorder	(3) Respiratory Condition	(4) Poisoning	(5) All other illnesses
	<u>19</u>	<u>1</u>	<u>0</u>	<u>0</u>	<u>2</u>

Post this Summary page from February 1 to April 30 of the year following the year covered by the form

Public reporting burden for this collection of information is estimated to average 50 minutes per response, including time to review the instruction, search and gather the data needed, and complete and review the collection of information. Persons are not required to respond to the collection of information unless it displays a currently valid OMB control number. If you have any comments about these estimates or any aspects of this data collection, contact: US Department of Labor, OSHA Office of Statistics, Room N-3644, 200 Constitution Ave. NW, Washington, DC 20210. Do not send the completed forms to this office.

Establishment information

Your establishment name Battelle Columbus Laboratories

Street 505 King Avenue

City Columbus State OH Zip 43016

Industry description (e.g., Manufacture of motor truck trailers)
Scientific Research and Development Services

Standard Industrial Classification (SIC), if known (e.g., SIC 3715)

OR North American Industrial Classification (NAICS), if known (e.g., 336212)
5 4 1 7

Employment information

Annual average number of employees 2285

Total hours worked by all employees last year 4,570,000

Sign here

Knowingly falsifying this document may result in a fine.

I certify that I have examined this document and that to the best of my knowledge the entries are true, accurate, and complete.

Carl H. Kubit
Company executive

President + CEO
Title

614-424-6562
Phone

1/20/2007
Date

ATTACHMENT 6
MATERIAL SAFETY DATA SHEETS



MATERIAL SAFETY DATA SHEET

1. CHEMICAL PRODUCT AND COMPANY IDENTIFICATION

**MDL INFORMATION
SYSTEMS, INC.**

1281 Murfreesboro Road, Suite
300

Nashville, TN 37217-2423

1-615-366-2000

**EMERGENCY TELEPHONE
NUMBER**

1-800-424-9300 (NORTH
AMERICA)

1-703-527-3887
(INTERNATIONAL)

SUBSTANCE: PORTLAND CEMENT

TRADE NAMES/SYNONYMS:

HYDRAULIC CEMENT; CEMENT; CEMENT (PORTLAND); SILICATE, PORTLAND CEMENT;
PORTLAND CEMENT SILICATE; OHS19160; RTECS VV8770000

CHEMICAL FAMILY: silicates

CREATION DATE: May 08 1986

REVISION DATE: Jun 15 2006

2. COMPOSITION, INFORMATION ON INGREDIENTS

COMPONENT: PORTLAND CEMENT

CAS NUMBER: 65997-15-1

EC NUMBER (EINECS): 266-043-4

PERCENTAGE: 100.0

COMPONENT: QUARTZ

CAS NUMBER: 14808-60-7

EC NUMBER (EINECS): 238-878-4

PERCENTAGE: <0.1

3. HAZARDS IDENTIFICATION

NFPA RATINGS (SCALE 0-4): HEALTH=2 FIRE=0 REACTIVITY=0

EMERGENCY OVERVIEW:

COLOR: white or gray

PHYSICAL FORM: powder

ODOR: odorless

MAJOR HEALTH HAZARDS: skin irritation, eye irritation

POTENTIAL HEALTH EFFECTS:

INHALATION:

SHORT TERM EXPOSURE: irritation

LONG TERM EXPOSURE: irritation, difficulty breathing, lung damage

SKIN CONTACT:

SHORT TERM EXPOSURE: irritation (possibly severe)

LONG TERM EXPOSURE: irritation

EYE CONTACT:

SHORT TERM EXPOSURE: irritation, visual disturbances, eye damage

LONG TERM EXPOSURE: irritation

INGESTION:

SHORT TERM EXPOSURE: no information on significant adverse effects

LONG TERM EXPOSURE: irritation

CARCINOGEN STATUS:

OSHA: No

NTP: No

IARC: No

4. FIRST AID MEASURES

INHALATION: If adverse effects occur, remove to uncontaminated area. Give artificial respiration if not breathing. Get immediate medical attention.

SKIN CONTACT: Wash skin with soap and water for at least 15 minutes while removing contaminated clothing and shoes. Get medical attention, if needed. Thoroughly clean and dry contaminated clothing and shoes before reuse.

EYE CONTACT: Flush eyes with plenty of water for at least 15 minutes. Then get immediate medical attention.

INGESTION: If a large amount is swallowed, get medical attention.

5. FIRE FIGHTING MEASURES

FIRE AND EXPLOSION HAZARDS: Negligible fire hazard.

EXTINGUISHING MEDIA: Use extinguishing agents appropriate for surrounding fire.

FIRE FIGHTING: Move container from fire area if it can be done without risk. Avoid inhalation of material or combustion by-products. Stay upwind and keep out of low areas.

6. ACCIDENTAL RELEASE MEASURES

WATER RELEASE:

Subject to California Safe Drinking Water and Toxic Enforcement Act of 1986 (Proposition 65). Keep out of water supplies and sewers.

OCCUPATIONAL RELEASE:

Large spills: Collect spilled material in appropriate container for disposal. Avoid generating dust. Clean up residue with a high-efficiency particulate filter vacuum.

7. HANDLING AND STORAGE

STORAGE: Store and handle in accordance with all current regulations and standards. Keep dry. Store in a well-ventilated area. Store with bases. See original container for storage recommendations. Keep separated from incompatible substances.

HANDLING: Use methods to minimize dust.

8. EXPOSURE CONTROLS, PERSONAL PROTECTION

EXPOSURE LIMITS:**PORTLAND CEMENT:**

5 mg/m³ OSHA TWA (respirable dust fraction)

10 mg/m³ OSHA TWA (total dust) (vacated by 58 FR 35338, June 30, 1993)

15 mg/m³ OSHA TWA (total dust)

50 mppcf OSHA TWA (<1% crystalline silica)

10 mg/m³ ACGIH TWA (total particulate) (no asbestos and <1% crystalline silica)

5 mg/m³ NIOSH recommended TWA 10 hour(s) (respirable fraction)

10 mg/m³ NIOSH recommended TWA 10 hour(s) (total particulate)

5 mg/m³ DFG MAK (inhalable fraction)

10 mg/m³ UK WEL TWA (total inhalable dust)

4 mg/m³ UK WEL TWA (respirable dust)

MEASUREMENT METHOD: NIOSH IV # 0500; OSHA # ID207

VENTILATION: Provide local exhaust ventilation system. Ensure compliance with applicable exposure limits.

EYE PROTECTION: Wear splash resistant safety goggles with a faceshield. Provide an emergency eye wash fountain and quick drench shower in the immediate work area.

CLOTHING: Wear appropriate chemical resistant clothing.

GLOVES: Wear appropriate chemical resistant gloves.

PROTECTIVE MATERIAL TYPES: rubber

RESPIRATOR: The following respirators and maximum use concentrations are drawn from NIOSH and/or OSHA.

50 mg/m³

Any dust respirator.

100 mg/m³

Any dust respirator except single-use and quarter-mask respirators.

Any supplied-air respirator.

250 mg/m³

Any supplied-air respirator operated in a continuous-flow mode.

Any powered, air-purifying respirator with a dust filter.

500 mg/m³

Any air-purifying respirator with a full facepiece and a high-efficiency particulate filter.

Any supplied-air respirator with a tight-fitting facepiece that is operated in a continuous-flow mode.

Any powered, air-purifying respirator with a tight-fitting facepiece and a high-efficiency particulate filter.

Any self-contained breathing apparatus with a full facepiece.

Any supplied-air respirator with a full facepiece.

5000 mg/m³

Any supplied-air respirator operated in a pressure-demand or other positive-pressure mode.

Escape -

Any air-purifying respirator with a full facepiece and a high-efficiency particulate filter.

Any appropriate escape-type, self-contained breathing apparatus.

For Unknown Concentrations or Immediately Dangerous to Life or Health -

Any supplied-air respirator with full facepiece and operated in a pressure-demand or other positive-pressure mode in combination with a separate escape supply.

Any self-contained breathing apparatus with a full facepiece.

9. PHYSICAL AND CHEMICAL PROPERTIES

PHYSICAL STATE: solid

COLOR: white or gray

PHYSICAL FORM: powder

ODOR: odorless

BOILING POINT: Not applicable

MELTING POINT: Not available

VAPOR PRESSURE: 0 mmHg @ 20 C

VAPOR DENSITY: Not applicable

SPECIFIC GRAVITY (water=1): 3.15

WATER SOLUBILITY: 0.1-1.0%

PH: 12 (wet cement)

VOLATILITY: 0 % by volume

ODOR THRESHOLD: Not available

EVAPORATION RATE: Not applicable

COEFFICIENT OF WATER/OIL DISTRIBUTION: Not available

10. STABILITY AND REACTIVITY

REACTIVITY: Stable at normal temperatures and pressure.

CONDITIONS TO AVOID: Avoid generating dust.

INCOMPATIBILITIES: No data available.

HAZARDOUS DECOMPOSITION:

Thermal decomposition products: miscellaneous decomposition products

POLYMERIZATION: Will not polymerize.

11. TOXICOLOGICAL INFORMATION

PORTLAND CEMENT:**LOCAL EFFECTS:**

Irritant: skin, eye

MEDICAL CONDITIONS AGGRAVATED BY EXPOSURE: respiratory disorders

HEALTH EFFECTS:**INHALATION:****ACUTE EXPOSURE:**

PORTLAND CEMENT: May cause irritation to the mucous membranes. Excessive exposures may result in caking in the nose.

CHRONIC EXPOSURE:

PORTLAND CEMENT: Prolonged or repeated exposure to portland cement may cause cough accompanied by phlegm. Epidemiological studies indicate that heavy or prolonged exposure to finished portland cement does not cause pneumoconiosis. Long term exposure to raw or mixed cement dusts may cause cough, expectoration, dyspnea, wheezing, pharyngitis, chronic bronchitis, emphysema, cement pneumoconiosis, and silicosis.

SKIN CONTACT:**ACUTE EXPOSURE:**

PORTLAND CEMENT: Dry portland cement may cause irritation and dermatitis. Direct contact with wet cement, combined with prolonged contact time, and pressure on areas by kneeling or by occlusion may cause ulcerations and possibly burns. Sensitivity to constituents of cement may induce allergic skin reactions.

CHRONIC EXPOSURE:

PORTLAND CEMENT: Chronically exposed workers may exhibit cement dermatitis which assumes many forms: Skin dryness, fissures, dystrophy of nails, and eczematous rashes.

EYE CONTACT:**ACUTE EXPOSURE:**

PORTLAND CEMENT: May cause irritation. Wet cement may cause a burning sensation, corneal edema indicated by seeing halos around lights, and injury to the conjunctiva.

CHRONIC EXPOSURE:

PORTLAND CEMENT: Repeated or prolonged exposure may cause conjunctivitis and blepharitis.

INGESTION:**ACUTE EXPOSURE:**

PORTLAND CEMENT: No data available.

CHRONIC EXPOSURE:

PORTLAND CEMENT: A high incidence of gastroduodenal ulcers have been reported in cement workers. Gastric ulcers have been induced in animals fed cement dust.

12. ECOLOGICAL INFORMATION

Not available

13. DISPOSAL CONSIDERATIONS

Dispose in accordance with all applicable regulations.

14. TRANSPORT INFORMATION

U.S. DEPARTMENT OF TRANSPORTATION: No classification assigned.

CANADIAN TRANSPORTATION OF DANGEROUS GOODS: No classification assigned.

LAND TRANSPORT ADR: No classification assigned.

LAND TRANSPORT RID: No classification assigned.

AIR TRANSPORT IATA: No classification assigned.

AIR TRANSPORT ICAO: No classification assigned.

MARITIME TRANSPORT IMDG: No classification assigned.

15. REGULATORY INFORMATION

U.S. REGULATIONS:

CERCLA SECTIONS 102a/103 HAZARDOUS SUBSTANCES (40 CFR 302.4): Not regulated.

SARA TITLE III SECTION 302 EXTREMELY HAZARDOUS SUBSTANCES (40 CFR 355.30):
Not regulated.

SARA TITLE III SECTION 304 EXTREMELY HAZARDOUS SUBSTANCES (40 CFR 355.40):
Not regulated.

SARA TITLE III SARA SECTIONS 311/312 HAZARDOUS CATEGORIES (40 CFR 370.21):

ACUTE: Yes

CHRONIC: No

FIRE: No

REACTIVE: No

SUDDEN RELEASE: No

SARA TITLE III SECTION 313 (40 CFR 372.65): Not regulated.

OSHA PROCESS SAFETY (29CFR1910.119): Not regulated.

STATE REGULATIONS:

California Proposition 65:

Known to the state of California to cause the following:

Silica, crystalline (airborne particles of respirable size)

Cancer (Oct 01, 1988)

CANADIAN REGULATIONS:

WHMIS CLASSIFICATION: Not determined.

EUROPEAN REGULATIONS:

EC CLASSIFICATION (CALCULATED): Not determined.

NATIONAL INVENTORY STATUS:

U.S. INVENTORY (TSCA): Listed on inventory.

TSCA 12(b) EXPORT NOTIFICATION: Not listed.

16. OTHER INFORMATION

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MATERIAL SAFETY DATA SHEET

1. CHEMICAL PRODUCT AND COMPANY IDENTIFICATION

**MDL INFORMATION
SYSTEMS, INC.**

1281 Murfreesboro Road, Suite
300

Nashville, TN 37217-2423

1-615-366-2000

**EMERGENCY TELEPHONE
NUMBER**

1-800-424-9300 (NORTH
AMERICA)

1-703-527-3887
(INTERNATIONAL)

SUBSTANCE: FULLER'S EARTH

TRADE NAMES/SYNONYMS:

BENTONITE; WILKINITE; FLORIDIN; KAOLINITE; OHS10145

CHEMICAL FAMILY: mineral

CREATION DATE: Jan 15 1985

REVISION DATE: Mar 17 2005

2. COMPOSITION, INFORMATION ON INGREDIENTS

COMPONENT: FULLER'S EARTH

CAS NUMBER: 8031-18-3

EC NUMBER: Not assigned.

PERCENTAGE: 100

3. HAZARDS IDENTIFICATION

NFPA RATINGS (SCALE 0-4): HEALTH=1 FIRE=0 REACTIVITY=0

EMERGENCY OVERVIEW:

COLOR: white, black

PHYSICAL FORM: solid

MAJOR HEALTH HAZARDS: No significant target effects reported.

POTENTIAL HEALTH EFFECTS:

INHALATION:

SHORT TERM EXPOSURE: irritation

LONG TERM EXPOSURE: lung damage

SKIN CONTACT:

SHORT TERM EXPOSURE: irritation

LONG TERM EXPOSURE: irritation

EYE CONTACT:

SHORT TERM EXPOSURE: irritation

LONG TERM EXPOSURE: no information is available

INGESTION:

SHORT TERM EXPOSURE: constipation

LONG TERM EXPOSURE: no information is available

CARCINOGEN STATUS:

OSHA: No

NTP: No

IARC: No

4. FIRST AID MEASURES

INHALATION: If adverse effects occur, remove to uncontaminated area. Give artificial respiration if not breathing. If breathing is difficult, oxygen should be administered by qualified personnel. Get immediate medical attention.

SKIN CONTACT: Wash skin with soap and water for at least 15 minutes while removing contaminated clothing and shoes. Get medical attention, if needed. Thoroughly clean and dry contaminated clothing and shoes before reuse.

EYE CONTACT: Flush eyes with plenty of water for at least 15 minutes. Then get immediate medical attention.

INGESTION: If a large amount is swallowed, get medical attention.

NOTE TO PHYSICIAN: For inhalation, consider oxygen.

5. FIRE FIGHTING MEASURES

FIRE AND EXPLOSION HAZARDS: Negligible fire hazard.

EXTINGUISHING MEDIA: Use extinguishing agents appropriate for surrounding fire.

FIRE FIGHTING: Move container from fire area if it can be done without risk. Avoid inhalation of material or combustion by-products. Stay upwind and keep out of low areas.

FLASH POINT: not flammable

6. ACCIDENTAL RELEASE MEASURES

OCCUPATIONAL RELEASE:

Large spills: Collect spilled material in appropriate container for disposal. Avoid generating dust. Clean up residue with a high-efficiency particulate filter vacuum.

7. HANDLING AND STORAGE

STORAGE: Store and handle in accordance with all current regulations and standards.

8. EXPOSURE CONTROLS, PERSONAL PROTECTION

EXPOSURE LIMITS:**FULLER'S EARTH:**

No occupational exposure limits established.

VENTILATION: Provide local exhaust ventilation system. Ensure compliance with applicable exposure limits.

EYE PROTECTION: Wear splash resistant safety goggles with a faceshield. Provide an emergency eye wash fountain and quick drench shower in the immediate work area.

CLOTHING: Protective clothing is not required.

GLOVES: Wear appropriate chemical resistant gloves.

RESPIRATOR: Under conditions of frequent use or heavy exposure, respiratory protection may be needed. Respiratory protection is ranked in order from minimum to maximum. Consider warning properties before use.

Any dust, mist, and fume respirator.

Any air-purifying respirator with a high-efficiency particulate filter.

Any powered, air-purifying respirator with a dust, mist, and fume filter.

Any powered, air-purifying respirator with a high-efficiency particulate filter.

For Unknown Concentrations or Immediately Dangerous to Life or Health -

Any supplied-air respirator with full facepiece and operated in a pressure-demand or other positive-pressure mode in combination with a separate escape supply.

Any self-contained breathing apparatus with a full facepiece.

9. PHYSICAL AND CHEMICAL PROPERTIES

PHYSICAL STATE: solid

COLOR: white, black

ODOR: Not available

MOLECULAR FORMULA: (Al₁₂O₁₂Si₄H₂)_x.Mg

BOILING POINT: Not applicable

MELTING POINT: Not available

VAPOR PRESSURE: Not applicable

VAPOR DENSITY: Not applicable

SPECIFIC GRAVITY: Not available

WATER SOLUBILITY: Not available
PH: Not applicable
VOLATILITY: Not applicable
ODOR THRESHOLD: Not available
EVAPORATION RATE: Not applicable
COEFFICIENT OF WATER/OIL DISTRIBUTION: Not available

10. STABILITY AND REACTIVITY

REACTIVITY: Stable at normal temperatures and pressure.

CONDITIONS TO AVOID: Avoid generating dust.

INCOMPATIBILITIES: acids

FULLER'S EARTH:
HYDROFLUORIC ACID: May generate heat.

POLYMERIZATION: Will not polymerize.

11. TOXICOLOGICAL INFORMATION

HEALTH EFFECTS:

INHALATION:

ACUTE EXPOSURE:

FULLER'S EARTH: May be irritating to respiratory tract and mucous membranes.

CHRONIC EXPOSURE:

FULLER'S EARTH: Prolonged inhalation of dust may cause permanent pulmonary tissue changes.

SKIN CONTACT:

ACUTE EXPOSURE:

FULLER'S EARTH: May cause irritation.

CHRONIC EXPOSURE:

FULLER'S EARTH: May cause dermatitis.

EYE CONTACT:

ACUTE EXPOSURE:

FULLER'S EARTH: May cause irritation.

CHRONIC EXPOSURE:

FULLER'S EARTH: No data available.

INGESTION:

ACUTE EXPOSURE:

FULLER'S EARTH: May cause intestinal obstruction if ingested in large quantities.

CHRONIC EXPOSURE:

FULLER'S EARTH: No data available.

12. ECOLOGICAL INFORMATION

Not available

13. DISPOSAL CONSIDERATIONS

Dispose in accordance with all applicable regulations.

14. TRANSPORT INFORMATION

U.S. DEPARTMENT OF TRANSPORTATION: No classification assigned.

CANADIAN TRANSPORTATION OF DANGEROUS GOODS: No classification assigned.

LAND TRANSPORT ADR: No classification assigned.

LAND TRANSPORT RID: No classification assigned.

AIR TRANSPORT IATA: No classification assigned.

AIR TRANSPORT ICAO: No classification assigned.

MARITIME TRANSPORT IMDG: No classification assigned.

15. REGULATORY INFORMATION

U.S. REGULATIONS:

CERCLA SECTIONS 102a/103 HAZARDOUS SUBSTANCES (40 CFR 302.4): Not regulated.

SARA TITLE III SECTION 302 EXTREMELY HAZARDOUS SUBSTANCES (40 CFR 355.30):
Not regulated.

SARA TITLE III SECTION 304 EXTREMELY HAZARDOUS SUBSTANCES (40 CFR 355.40):
Not regulated.

SARA TITLE III SARA SECTIONS 311/312 HAZARDOUS CATEGORIES (40 CFR 370.21):

ACUTE: No

CHRONIC: No

FIRE: No

REACTIVE: No

SUDDEN RELEASE: No

SARA TITLE III SECTION 313 (40 CFR 372.65): Not regulated.

OSHA PROCESS SAFETY (29CFR1910.119): Not regulated.

STATE REGULATIONS:

California Proposition 65: Not regulated.

CANADIAN REGULATIONS:

WHMIS CLASSIFICATION: Not determined.

EUROPEAN REGULATIONS:

EC CLASSIFICATION (CALCULATED): Not determined.

NATIONAL INVENTORY STATUS:

U.S. INVENTORY (TSCA): Listed on inventory.

TSCA 12(b) EXPORT NOTIFICATION: Not listed.

16. OTHER INFORMATION

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MATERIAL SAFETY DATA SHEET

1. CHEMICAL PRODUCT AND COMPANY IDENTIFICATION

**MDL INFORMATION
SYSTEMS, INC.**

1281 Murfreesboro Road, Suite
300

Nashville, TN 37217-2423

1-615-366-2000

**EMERGENCY TELEPHONE
NUMBER**

1-800-424-9300 (NORTH
AMERICA)

1-703-527-3887
(INTERNATIONAL)

SUBSTANCE: GASOLINE, AUTOMOTIVE, UNLEADED

TRADE NAMES/SYNONYMS:

UNLEADED GASOLINE; PREMIUM UNLEADED GASOLINE; PETROL; MOTOR SPIRITS;
BENZIN; GASOLINE; "A" GRADE GASOLINE; "N" GRADE GASOLINE; UN 1203; OHS10340;
RTECS LX3373000

CHEMICAL FAMILY: petroleum hydrocarbons

CREATION DATE: Apr 23 1985

REVISION DATE: Mar 15 2007

2. COMPOSITION, INFORMATION ON INGREDIENTS

COMPONENT: GASOLINE, AUTOMOTIVE, UNLEADED

CAS NUMBER: 8006-61-9

EC NUMBER (EINECS): 232-349-1

PERCENTAGE: 100

COMPONENT: BENZENE

CAS NUMBER: 71-43-2

EC NUMBER (EINECS): 200-753-7

PERCENTAGE: <1

3. HAZARDS IDENTIFICATION

NFPA RATINGS (SCALE 0-4): HEALTH=2 FIRE=3 REACTIVITY=0

EMERGENCY OVERVIEW:

COLOR: colorless to amber

PHYSICAL FORM: volatile liquid

ODOR: distinct odor

MAJOR HEALTH HAZARDS: respiratory tract irritation, skin irritation, eye irritation, aspiration hazard, central nervous system depression, cancer hazard (in humans)

PHYSICAL HAZARDS: Extremely flammable liquid and vapor. Vapor may cause flash fire.

POTENTIAL HEALTH EFFECTS:

INHALATION:

SHORT TERM EXPOSURE: irritation, ringing in the ears, nausea, vomiting, chest pain, difficulty breathing, irregular heartbeat, headache, drowsiness, dizziness, disorientation, difficulty speaking, mood swings, loss of coordination, blurred vision, dilated pupils or pin-point pupils, lung congestion, kidney damage, liver damage, effects on the brain, convulsions, unconsciousness, coma

LONG TERM EXPOSURE: changes in body temperature, changes in blood pressure, nausea, loss of appetite, difficulty breathing, irregular heartbeat, headache, drowsiness, dizziness, sleep disturbances, mood swings, loss of coordination, hearing loss, visual disturbances, menstrual disorders, blood disorders, kidney damage, liver damage, reproductive effects, brain damage, cancer

SKIN CONTACT:

SHORT TERM EXPOSURE: irritation, blisters, changes in blood pressure, stomach pain, blood disorders, heart damage, kidney damage, liver damage, effects on the brain

LONG TERM EXPOSURE: irritation, blisters, skin disorders, tingling sensation

EYE CONTACT:

SHORT TERM EXPOSURE: irritation, visual disturbances

LONG TERM EXPOSURE: irritation, eye damage

INGESTION:

SHORT TERM EXPOSURE: changes in body temperature, nausea, vomiting, diarrhea, chest pain, difficulty breathing, irregular heartbeat, headache, drowsiness, dizziness, disorientation, mood swings, tremors, loss of coordination, blurred vision, bluish skin color, lung congestion, lung damage, internal bleeding, paralysis, convulsions, unconsciousness, coma, aspiration hazard

LONG TERM EXPOSURE: reproductive effects, cancer

CARCINOGEN STATUS:

OSHA: Yes

NTP: Yes

IARC: Yes

4. FIRST AID MEASURES

INHALATION: If adverse effects occur, remove to uncontaminated area. Give artificial respiration if not breathing. If breathing is difficult, oxygen should be administered by qualified personnel. Get immediate medical attention.

SKIN CONTACT: Wash skin with soap and water for at least 15 minutes while removing contaminated clothing and shoes. Get medical attention, if needed. Thoroughly clean and dry contaminated clothing and shoes before reuse.

EYE CONTACT: Flush eyes with plenty of water for at least 15 minutes. Then get immediate medical attention.

INGESTION: Aspiration hazard. DO NOT induce vomiting. If vomiting occurs, keep head lower than hips to help prevent aspiration. Get immediate medical attention. Give artificial respiration if not

breathing.

NOTE TO PHYSICIAN: For inhalation, consider oxygen.

5. FIRE FIGHTING MEASURES

FIRE AND EXPLOSION HAZARDS: Severe fire hazard. The vapor is heavier than air. Vapors or gases may ignite at distant ignition sources and flash back. Vapor/air mixtures are explosive.

EXTINGUISHING MEDIA: regular dry chemical, carbon dioxide, water, regular foam

Large fires: Use regular foam or flood with fine water spray.

FIRE FIGHTING: Move container from fire area if it can be done without risk. Cool containers with water spray until well after the fire is out. Stay away from the ends of tanks. For fires in cargo or storage area: Cool containers with water from unmanned hose holder or monitor nozzles until well after fire is out. If this is impossible then take the following precautions: Keep unnecessary people away, isolate hazard area and deny entry. Let the fire burn. Withdraw immediately in case of rising sound from venting safety device or any discoloration of tanks due to fire. For tank, rail car or tank truck: Evacuation radius: 800 meters (1/2 mile). Water may be ineffective.

FLASH POINT: -45 F (-43 C) (CC)

LOWER FLAMMABLE LIMIT: 1.2%

UPPER FLAMMABLE LIMIT: 7.6%

AUTOIGNITION: 536-853 F (280-456 C)

FLAMMABILITY CLASS (OSHA): IB

6. ACCIDENTAL RELEASE MEASURES

WATER RELEASE:

Subject to California Safe Drinking Water and Toxic Enforcement Act of 1986 (Proposition 65). Keep out of water supplies and sewers.

OCCUPATIONAL RELEASE:

Avoid heat, flames, sparks and other sources of ignition. Stop leak if possible without personal risk. Reduce vapors with water spray. Small spills: Absorb with sand or other non-combustible material. Collect spilled material in appropriate container for disposal. Large spills: Dike for later disposal. Remove sources of ignition. Keep unnecessary people away, isolate hazard area and deny entry. Notify Local Emergency Planning Committee and State Emergency Response Commission for release greater than or equal to RQ (U.S. SARA Section 304). If release occurs in the U.S. and is reportable under CERCLA Section 103, notify the National Response Center at (800)424-8802 (USA) or (202)426-2675 (USA).

7. HANDLING AND STORAGE

STORAGE: Store and handle in accordance with all current regulations and standards. Subject to storage regulations: U.S. OSHA 29 CFR 1910.106. Grounding and bonding required. See original container for storage recommendations. Keep separated from incompatible substances.

8. EXPOSURE CONTROLS, PERSONAL PROTECTION

EXPOSURE LIMITS:

GASOLINE, AUTOMOTIVE, UNLEADED:

GASOLINE (BULK HANDLING):

300 ppm (900 mg/m³) OSHA TWA (vacated by 58 FR 35338, June 30, 1993)
500 ppm (1500 mg/m³) OSHA STEL (vacated by 58 FR 35338, June 30, 1993)
300 ppm ACGIH TWA
500 ppm ACGIH STEL
NIOSH recommended TWA (lowest feasible concentration)

MEASUREMENT METHOD: OSHA PV2028

BENZENE:

1 ppm OSHA TWA
5 ppm OSHA STEL 15 minute(s)
0.5 ppm OSHA action level
10 ppm OSHA TWA (applies to industry exempt from benzene standard 1910.1028)
25 ppm OSHA ceiling (applies to industry exempt from benzene standard 1910.1028)
50 ppm OSHA peak 10 minute(s) (applies to industry exempt from benzene standard 1910.1028)
0.5 ppm ACGIH TWA (skin)
2.5 ppm ACGIH STEL (skin)
0.1 ppm NIOSH recommended TWA 10 hour(s)
1 ppm NIOSH recommended STEL
DFG MAK (cutaneous absorption danger)
3.25 mg/m³ (1 ml/m³) AGS TRK (effective 1 Jan 2005 no longer valid per amendment)
3.25 mg/m³ (1 ppm) EC OEL TWA (skin) (BOELV)
1 ppm UK WEL TWA (skin)

MEASUREMENT METHOD: NIOSH IV # 1500, 1501, 3700, 3800; OSHA 12, 1005

VENTILATION: Ventilation equipment should be explosion-resistant if explosive concentrations of material are present. Provide local exhaust or process enclosure ventilation system. Ensure compliance with applicable exposure limits.

EYE PROTECTION: Wear splash resistant safety goggles with a faceshield. Provide an emergency eye wash fountain and quick drench shower in the immediate work area.

CLOTHING: Remove any chemical soaked clothing immediately. Wear appropriate chemical resistant clothing.

GLOVES: Wear appropriate chemical resistant gloves.

RESPIRATOR: Under conditions of frequent use or heavy exposure, respiratory protection may be needed. Respiratory protection is ranked in order from minimum to maximum. Consider warning properties before use.

Any chemical cartridge respirator with organic vapor cartridge(s).

Any chemical cartridge respirator with a full facepiece and organic vapor cartridge(s).

Any air-purifying respirator with a full facepiece and an organic vapor canister.

For Unknown Concentrations or Immediately Dangerous to Life or Health -

Any supplied-air respirator with full facepiece and operated in a pressure-demand or other positive-pressure mode in combination with a separate escape supply.
Any self-contained breathing apparatus with a full facepiece.

9. PHYSICAL AND CHEMICAL PROPERTIES

PHYSICAL STATE: liquid

APPEARANCE: clear

COLOR: colorless to amber

PHYSICAL FORM: volatile liquid

ODOR: distinct odor

BOILING POINT: 100-399 F (38-204 C)

FREEZING POINT: Not available

VAPOR PRESSURE: Not available

VAPOR DENSITY (air=1): 3.0-4.0

SPECIFIC GRAVITY (water=1): 0.7-0.8

WATER SOLUBILITY: insoluble

PH: Not available

VOLATILITY: Not available

ODOR THRESHOLD: 0.25 ppm

EVAPORATION RATE: Not available

COEFFICIENT OF WATER/OIL DISTRIBUTION: Not available

SOLVENT SOLUBILITY:

Soluble: absolute alcohol, ether, chloroform, benzene

10. STABILITY AND REACTIVITY

REACTIVITY: Stable at normal temperatures and pressure.

CONDITIONS TO AVOID: Avoid heat, flames, sparks and other sources of ignition. Containers may rupture or explode if exposed to heat. Keep out of water supplies and sewers.

INCOMPATIBILITIES: oxidizing materials

GASOLINE, AUTOMOTIVE, UNLEADED:

OXIDIZERS (STRONG): Fire and explosion hazard.

HAZARDOUS DECOMPOSITION:

Thermal decomposition products: oxides of carbon

POLYMERIZATION: Will not polymerize.

11. TOXICOLOGICAL INFORMATION

GASOLINE, AUTOMOTIVE, UNLEADED:

IRRITATION DATA: 500 ul/24 hour(s) skin-rabbit mild

TOXICITY DATA: 13.6 gm/kg oral-rat LD50; 13600 mg/kg oral-rat LD50; >5 ml/kg skin-rabbit LD; 5

ml/kg/2 week(s) intermittent oral-rat TDLo; 10 gm/kg/4 week(s) intermittent oral-rat TDLo; 4 mg/m³/8 hour(s)-60 day(s) intermittent inhalation-rat TCLo; 2000 mg/m³/8 week(s) intermittent inhalation-rat TCLo

CARCINOGEN STATUS: IARC: Human Inadequate Evidence, Animal Limited Evidence, Group 2B; ACGIH: A3 -Animal Carcinogen

In studies with mice and rats by inhalation, an increased incidence of hepatocellular adenomas and carcinomas was produced in female but not male mice; an increased incidence of adenomas and carcinomas of the kidney was produced in male but not female rats.

LOCAL EFFECTS:

Irritant: inhalation, skin, eye

ACUTE TOXICITY LEVEL:

Slightly Toxic: ingestion

TARGET ORGANS: central nervous system

TUMORIGENIC DATA: 1501 ppm inhalation-rat TCLo/78 week(s) continuous; 2056 ppm inhalation-mouse TCLo/6 hour(s)-78 week(s) intermittent; 2056 ppm inhalation-rat TC/6 hour(s)-78 week(s) intermittent

ADDITIONAL DATA: Alcohol may enhance the toxic effects. Stimulants such as epinephrine may induce ventricular fibrillation.

Toxicity and irritation data derived from unspecified and unleaded gasoline.

BENZENE:

IRRITATION DATA: 15 mg/24 hour(s) open skin-rabbit mild; 20 mg/24 hour(s) skin-rabbit moderate; 88 mg eyes-rabbit moderate; 2 mg/24 hour(s) eyes-rabbit severe; 60 ul/8 hour(s) open skin-rat mild

TOXICITY DATA: 2 pph/5 minute(s) inhalation-human LCLo; 50 mg/kg oral-man LDLo; 150 ppm/1 year(s) intermittent inhalation-man TCLo; 100 ppm inhalation-human TCLo; 65 mg/m³/5 year(s) inhalation-human LCLo; 194 mg/kg unreported-man LDLo; 930 mg/kg oral-rat LD50; 10000 ppm/7 hour(s) inhalation-rat LC50; 1100 ug/kg intraperitoneal-rat LD50; 4700 mg/kg oral-mouse LD50; 9980 ppm inhalation-mouse LC50; 48 mg/kg skin-mouse LD50; 340 mg/kg intraperitoneal-mouse LD50; 2 gm/kg oral-dog LDLo; 146000 mg/m³ inhalation-dog LCLo; 170000 mg/m³ inhalation-cat LCLo; 45000 ppm/30 minute(s) inhalation-rabbit LCLo; >9400 ul/kg skin-rabbit LD50; 88 mg/kg intravenous-rabbit LDLo; >9400 ul/kg skin-guinea pig LD50; 527 mg/kg intraperitoneal-guinea pig LDLo; 1400 mg/kg subcutaneous-frog LDLo; 5700 mg/kg oral-mammal LD50; 20000 ppm/5 minute(s) inhalation-mammal LCLo; 1500 mg/kg intraperitoneal-mammal LDLo; 5 mg/kg subcutaneous-rat LDLo; 880 mg/kg/12 hour(s) oral-mouse TDLo; 4000 ppm inhalation-rat TCLo; 10000 ppm inhalation-rat LCLo; 35000 ppm/22 minute(s) inhalation-rabbit LCLo; 0.1 ml/kg intramuscular-rabbit LDLo; 1 ml/kg oral-rat LD50; 1800 mg/kg oral-rat LD50; 15 ml/kg/2 hour(s) inhalation-mouse LC10; 16.7 gm/m³/2 hour(s) inhalation-rat TCLo; 50 mg/m³/2 hour(s) inhalation-human TCLo; 75 mg/m³/2 hour(s) inhalation-human TCLo; 2 pph/2 minute(s) inhalation-human LCLo; 5 mg/m³/5 hour(s) inhalation-human LCLo; 0.7 ml/kg oral-human LDLo; 2000 ppm/30 minute(s) inhalation-mouse TCLo; 3013 ppm/30 minute(s) inhalation-mouse TCLo; 1 ppm/6 hour(s) inhalation-rat TCLo; 920 ul/kg/1 hour(s) skin-rat TDLo; 0.92 ml/kg skin-rat TDLo; 6400 mg/kg oral-rat LD50; 1280 mg/kg oral-rat TDLo; 320 mg/kg oral-rat TDLo; 6600 mg/kg/27 week(s) intermittent oral-rat TDLo; 23 mg/m³/4 hour(s)-8 day(s) intermittent inhalation-rat TCLo; 300 ppm/6 hour(s)-13 week(s) intermittent inhalation-rat TCLo; 300 ppm/6 hour(s)-99 week(s) intermittent inhalation-rat TCLo; 17 gm/kg/17 week(s) intermittent oral-rat TDLo; 1000 ppm/7 hour(s)-28 week(s) intermittent inhalation-rat TCLo; 500 ppm/6 hour(s)-3 week(s) intermittent inhalation-rat TCLo; 12 gm/kg/6 week(s) intermittent subcutaneous-rat TDLo; 18 mg/kg/21 day(s) intermittent subcutaneous-rat TDLo; 2197 mg/kg/5 day(s) intermittent subcutaneous-rat TDLo; 13536 mg/kg/12 week(s) intermittent subcutaneous-rat TDLo; 5 ml/kg/10 day(s) intermittent intraperitoneal-rat TDLo; 4250 mg/kg/17 week(s) intermittent oral-mouse TDLo; 300 ppm/6 hour(s)-13 week(s) intermittent inhalation-mouse TCLo; 25 ppm/6 hour(s)-5 day(s) intermittent inhalation-mouse TCLo; 10 ppm/6 hour(s)-10 week(s) intermittent inhalation-mouse TCLo; 10 ppm/6 hour(s)-26 week(s) intermittent inhalation-mouse TCLo; 211 ppm/6

hour(s)-7 day(s) intermittent oral-mouse TCLo; 300 ppm/6 hour(s)-16 week(s) intermittent inhalation-mouse TCLo; 48 ppm/6 hour(s)-14 day(s) intermittent inhalation-mouse TCLo; 2197 mg/kg/5 day(s) intermittent subcutaneous-mouse TDLo; 100 ppm/6 hour(s)-72 week(s) intermittent inhalation-mouse TCLo; 500 mg/m³/3 hour(s)-13 week(s) intermittent inhalation-rabbit TCLo; 100 ppm/6 hour(s)-3 week(s) intermittent inhalation-pig TCLo; 929.6 mg/kg/4 week(s) continuous oral-mouse TDLo; 232.4 mg/kg/7 day(s) continuous oral-mouse TDLo; 4000 mg/kg/5 day(s) intermittent subcutaneous-mouse TDLo; 7.5 ml/kg/12 week(s) intermittent subcutaneous-rat TDLo; 100 ppm/6 hour(s)-2 week(s) intermittent inhalation-mouse TCLo; 1172 mg/m³/2 week(s) intermittent inhalation-rat TCLo; 100 ppm/2 week(s) intermittent inhalation-mouse TCLo; 159.9 ug/kg/3 day(s) intermittent intraperitoneal-rat TDLo; 24.97 ug/kg/2 day(s) intermittent intraperitoneal-rat TDLo; 50 ppm/6 hour(s)-14 day(s) intermittent inhalation-mouse TCLo; 100 ppm/6 hour(s)-14 day(s) intermittent inhalation-mouse TCLo; 300 ppm/26 week(s) intermittent inhalation-mouse TCLo; 960 ul/kg/4 day(s) intermittent skin-rat TDLo; 10 ppm/2 week(s) intermittent inhalation-mouse TCLo; 0.96 ml/kg/4 day(s) intermittent skin-rat TDLo; 10 ppm/2 week(s) intermittent inhalation-rat TCLo; 5600 mg/kg/28 day(s) intermittent oral-rat TDLo; 22400 mg/kg/28 day(s) intermittent oral-rat TDLo; 22400 mg/kg/28 day(s) intermittent oral-rat TDLo; 280 mg/kg/28 day(s) intermittent oral-rat TDLo; 280 mg/kg/28 day(s) intermittent oral-rat TDLo; 280 mg/kg/28 day(s) intermittent oral-rat TDLo; 0.585 gm/m³/8 day(s) intermittent inhalation-rat TCLo; 0.023 gm/m³/8 day(s) intermittent inhalation-rat TCLo; 0.585 gm/m³/4 day(s) intermittent inhalation-rat TCLo; 0.023 gm/m³/2 day(s) intermittent inhalation-rat TCLo; 0.023 gm/m³/4 day(s) intermittent inhalation-rat TCLo; 0.585 gm/m³/2 day(s) intermittent inhalation-rat TCLo; 560 gm/m³/4 day(s) continuous multiple-non-mammalian species TDLo

CARCINOGEN STATUS: OSHA: Carcinogen; NTP: Known Human Carcinogen; IARC: Human Sufficient Evidence, Animal Sufficient Evidence, Group 1; ACGIH: A1 -Confirmed Human Carcinogen; EC: Category 1; TRGS 905: K 1

Numerous case reports and series have suggested a relationship between exposure to benzene and the occurrence of various types of leukemia. Several case-control studies have also shown increased odds ratios for exposure to benzene, but mixed exposure patterns and poorly defined exposures render their interpretation difficult. Three independent cohort studies have demonstrated an increased incidence of acute nonlymphocytic leukemia in workers exposed to benzene.

LOCAL EFFECTS:

Irritant: inhalation, skin, eye

ACUTE TOXICITY LEVEL:

Highly Toxic: dermal absorption

Moderately Toxic: ingestion

Slightly Toxic: inhalation

TARGET ORGANS: immune system (blood), central nervous system

MEDICAL CONDITIONS AGGRAVATED BY EXPOSURE: blood system disorders, immune system disorders or allergies

TUMORIGENIC DATA: 200 mg/m³ inhalation-man TCLo/78 week(s) intermittent; 10 ppm inhalation-human TCLo/8 hour(s)-10 year(s) intermittent; 52 gm/kg oral-rat TDLo/52 week(s) intermittent; 1200 ppm inhalation-rat TCLo/6 hour(s)-10 week(s) intermittent; 18250 mg/kg oral-mouse TDLo/2 year(s) continuous; 300 ppm inhalation-mouse TCLo/6 hour(s)-16 week(s) intermittent; 1200 gm/kg skin-mouse TDLo/49 week(s) intermittent; 1200 mg/kg intraperitoneal-mouse TDLo/8 week(s) intermittent; 600 mg/kg subcutaneous-mouse TDLo/17 week(s) intermittent; 670 mg/kg parenteral-mouse TDLo/19 week(s) intermittent; 150 ppm inhalation-human TC/15 minute(s)-8 year(s) intermittent; 52 gm/kg oral-rat TD/1 year(s) intermittent; 10 gm/kg oral-rat TD/52 week(s) intermittent; 600 mg/m³ inhalation-man TC/4 year(s) intermittent; 150 ppm inhalation-man TC/11 year(s) intermittent; 1200 ppm inhalation-mouse TC/6 hour(s)-10 week(s) intermittent; 2400 mg/kg oral-mouse TD/8 week(s) intermittent; 8 ppb inhalation-human TC/4 week(s) intermittent; 10 mg/m³ inhalation-human TC/11 year(s) intermittent; 300 ppm inhalation-mouse TC/6 hour(s)-16 week(s) intermittent; 51500 mg/kg oral-rat TDLo/103 week(s) intermittent; 103000 mg/kg oral-rat TDLo/103 week(s) intermittent; 12875 mg/kg oral-rat TDLo/103

week(s) intermittent; 12875 mg/kg oral-mouse TDLo/103 week(s) intermittent; 51500 mg/kg oral-mouse TDLo/103 week(s) intermittent

MUTAGENIC DATA: mutation in microorganisms - Salmonella typhimurium 10 ppm (-S9); specific locus test - Drosophila melanogaster oral 11250 umol/L; sex chromosome loss and non disjunction - Drosophila melanogaster oral 7500 ppm; sex chromosome loss and non disjunction - Drosophila melanogaster multiple 27000 ppm; mutation in microorganisms - Saccharomyces cerevisiae 549 mg/L (+S9); gene conversion and mitotic recombination - Saccharomyces cerevisiae 275 mg/L; sex chromosome loss and non disjunction - Aspergillus nidulans 35000 ppm; other mutation test systems - grasshopper inhalation 14 pph 16 hour(s); other mutation test systems - non-mammalian species intraperitoneal 75 gm/kg; DNA inhibition - human leukocyte 2200 umol/L; DNA inhibition - human HeLa cell 2200 umol/L; other mutation test systems - human lymphocyte 5 umol/L; cytogenetic analysis - human inhalation 125 ppm 1 year(s); cytogenetic analysis - human leukocyte 1 mmol/L 72 hour(s); cytogenetic analysis - human lymphocyte 1 mg/L; cytogenetic analysis - human unreported 10 ppm 4 week(s); sister chromatid exchange - human lymphocyte 200 umol/L; mutation in mammalian somatic cells - human lymphocyte 1 gm/L; micronucleus test - rat inhalation 1 ppm 6 hour(s); unscheduled DNA synthesis - rat liver 1 mmol/L; DNA inhibition - rat inhalation 400 ppm; other mutation test systems - rat liver 1 mmol/L; other mutation test systems - rat bone marrow 1 mmol/L; other mutation test systems - rat subcutaneous 1 gm/L; other mutation test systems - rat subcutaneous 2200 mg/kg; cytogenetic analysis - rat inhalation 300 mg/m³ 16 week(s)-intermittent; cytogenetic analysis - rat subcutaneous 2400 mg/kg 12 day(s)-intermittent; cytogenetic analysis - rat intraperitoneal 234 mg/kg; cytogenetic analysis - rat oral 39060 ug/kg; sister chromatid exchange - rat inhalation 3 ppm 6 hour(s); sister chromatid exchange - rat leukocyte 1 mmol/L; micronucleus test - mouse embryo 12500 nmol/L; micronucleus test - mouse subcutaneous 440 mg/kg; micronucleus test - mouse oral 40 mg/kg; micronucleus test - mouse intraperitoneal 264 mg/kg 24 hour(s); micronucleus test - mouse inhalation 10 ppm 6 hour(s); mutation in microorganisms - mouse lymphocyte 62500 ug/L (+S9); mutation in microorganisms - mouse embryo 2500 mg/L (+S9); morphological transformation - mouse embryo 1 gm/L; morphological transformation - mouse fibroblast 150 gm/L; DNA damage - mouse lymphocyte 3840 umol/L; DNA adduct - mouse intraperitoneal 2640 mg/kg 3 day(s)-continuous; other mutation test systems - mouse oral 2 gm/kg; other mutation test systems - mouse other cell types 5 mmol/L; DNA inhibition - mouse oral 20 gm/kg; other mutation test systems - mouse lymphocyte 10 mmol/L; DNA inhibition - mouse intraperitoneal 880 mg/kg; DNA inhibition - mouse inhalation 3000 ppm 4 hour(s)-continuous; DNA inhibition - mouse bone marrow 3 mmol/L; sister chromatid exchange - mouse inhalation 10 ppm 6 hour(s); sister chromatid exchange - mouse intraperitoneal 5 gm/kg; cytogenetic analysis - mouse oral 20 mg/kg; cytogenetic analysis - mouse intraperitoneal 264 mg/kg 3 day(s)-continuous; cytogenetic analysis - mouse inhalation 3000 ppm; dominant lethal test - mouse oral 1 mg/kg; dominant lethal test - mouse intraperitoneal 5 mg/kg; mutation in mammalian somatic cells - mouse lymphocyte 12500 ug/L; mutation in mammalian somatic cells - mouse inhalation 40 ppb 6 week(s)-continuous; mutation in mammalian somatic cells - mouse oral 2 gm/kg 5 day(s)-continuous; morphological transformation - hamster embryo 100 ug/L; DNA damage - hamster ovary 17 mmol/L; cytogenetic analysis - hamster lung 550 mg/L; cytogenetic analysis - hamster ovary 600 mg/L; sister chromatid exchange - hamster ovary 750 mg/L; sex chromosome loss and non disjunction - hamster liver 62500 ug/L; sex chromosome loss and non disjunction - hamster embryo 30 umol/L; mutation in mammalian somatic cells - hamster embryo 10 umol/L; DNA damage - rabbit subcutaneous 2344 mg/kg; DNA inhibition - rabbit subcutaneous 2 gm/kg; other mutation test systems - rabbit bone marrow 1 mmol/L; other mutation test systems - cat bone marrow 1 mmol/L; cytogenetic analysis - rabbit subcutaneous 8400 mg/kg; DNA damage - mouse intraperitoneal 2000 mg/kg; DNA damage - mouse oral 2000 mg/kg; micronucleus test - mouse inhalation 15000 ppm 5 week(s); cytogenetic analysis - mouse skin 8.5 gm/kg; morphological transformation - mouse fibroblast 0.01 mg/L (-S9) 21 day(s); cytogenetic analysis - rat subcutaneous 7.5 mL/kg 12 week(s)-intermittent; micronucleus test - rat intraperitoneal 0.03 mL/kg; micronucleus test - rat intratracheal 0.03 mL/kg; micronucleus test - non-mammalian species multiple 10 mg/L 36 hour(s); micronucleus test - non-mammalian species multiple 10 mg/L 90 minute(s); DNA adduct - mouse

intraperitoneal 5000 mg/kg 5 day(s)-intermittent; micronucleus test - mouse inhalation 100 ppm 6 hour(s)-2 week(s)-intermittent; micronucleus test - mouse inhalation 100 ppm 2 week(s)-intermittent; DNA adduct - rat intraperitoneal 0.5 mg/kg 1 day(s); DNA adduct - mouse intraperitoneal 0.5 mg/kg 1 day(s); cytogenetic analysis - human inhalation 0.1 ppm; micronucleus test - human inhalation 21 ng/L 9 year(s)-intermittent; micronucleus test - mouse inhalation 10 ppm 5 day(s)-2 week(s)-intermittent; micronucleus test - mouse inhalation 10 ppm 2 week(s); DNA damage - mouse inhalation 100 ppm 2 week(s); micronucleus test - mouse unreported 10 mg/kg; cytogenetic analysis - mouse intraperitoneal 24 mg/kg

REPRODUCTIVE EFFECTS DATA: 670 mg/m³ inhalation-rat TCLO/24 hour(s) 15 day(s) pre pregnancy/1-22 day(s) pregnant female continuous; 56600 ug/m³ inhalation-rat TCLO/24 hour(s) 1-22 day(s) pregnant female continuous; 50 ppm inhalation-rat TCLO/24 hour(s) 7-14 day(s) pregnant female continuous; 150 ppm inhalation-rat TCLO/24 hour(s) 7-14 day(s) pregnant female continuous; 9 gm/kg oral-mouse TDLo 6-15 day(s) pregnant female continuous; 12 gm/kg oral-mouse TDLo 6-15 day(s) pregnant female continuous; 6500 mg/kg oral-mouse TDLo 8-12 day(s) pregnant female continuous; 16880 mg/kg oral-mouse TDLo 6-15 day(s) pregnant female continuous; 500 ppm inhalation-mouse TCLO/7 hour(s) 6-15 day(s) pregnant female continuous; 500 mg/m³ inhalation-mouse TCLO/12 hour(s) 6-15 day(s) pregnant female continuous; 5 ppm inhalation-mouse TCLO 6-15 day(s) pregnant female continuous; 20 ppm inhalation-mouse TCLO/6 hour(s) 6-15 day(s) pregnant female continuous; 5 mg/kg intraperitoneal-mouse TDLo 1 day(s) male; 219 mg/kg intraperitoneal-mouse TDLo 14 day(s) pregnant female continuous; 1100 mg/kg subcutaneous-mouse TDLo 12 day(s) pregnant female continuous; 7030 mg/kg subcutaneous-mouse TDLo 12-13 day(s) pregnant female continuous; 13200 ug/kg intravenous-mouse TDLo 13-16 day(s) pregnant female continuous; 4 gm/kg parenteral-mouse TDLo 12 day(s) pregnant female continuous; 1 gm/m³ inhalation-rabbit TCLO/24 hour(s) 7-20 day(s) pregnant female continuous; 1 gm/m³ inhalation-rabbit TCLO/24 hour(s) 7-20 day(s) pregnant female continuous; 500 ppm inhalation-rabbit TCLO/7 hour(s) 6-18 day(s) pregnant female continuous; 1600 mg/kg intraperitoneal-mouse TDLo 10-11 day(s) pregnant female continuous

ADDITIONAL DATA: May cross the placenta. Alcohol may enhance the toxic effects. Interactions with drugs may occur. Stimulants such as epinephrine may induce ventricular fibrillation.

HEALTH EFFECTS:

INHALATION:

ACUTE EXPOSURE:

GASOLINE, AUTOMOTIVE, UNLEADED: At 160-270 ppm throat irritation may occur within several hours. At 2000 ppm mild anesthesia may occur within 30 minutes. Other symptoms of central nervous system depression may include headache, nausea, vomiting, dizziness, drowsiness, facial flushing, blurred vision, slurred speech, difficulty swallowing, staggering, confusion and euphoria. At higher levels dyspnea, pulmonary edema and bronchopneumonia may develop. Further depression may occur with weak respiration and pulse, nervousness, twitching, irritability, and ataxia. Severe intoxication may result in delirium, unconsciousness, coma, and convulsions with epileptiform seizures. The pupils may be constricted or, in comatose states, fixed and dilated or unequal; nystagmus may also occur. May also affect the liver, kidneys, spleen, brain, myocardium and pancreas. Death may be due to respiratory or circulatory failure or ventricular fibrillation. Extremely high concentration may cause asphyxiation.

BENZENE: Concentrations of 3000 ppm may cause respiratory tract irritation; more severe exposures may result in pulmonary edema. Systemic effects are mainly on the central nervous system and depend on exposure time and concentration. No effects were noted at 25 ppm for 8 hours; signs of intoxication began at 50-150 ppm within 5 hours; at 500-1500 ppm, within 1 hour; were severe at 7500 ppm, within 30-60 minutes; and 20,000 ppm was fatal within 5-10 minutes. Effects may include nausea, vomiting, headache, dizziness, drowsiness, weakness, sometimes preceded by a brief period of exhilaration or euphoria, irritability, malaise, confusion, ataxia, staggering, weak, rapid pulse, chest pain and tightness with breathlessness, pallor, cyanosis of the lips and fingertips, and tinnitus. In severe exposures there may be

blurred vision, shallow, rapid breathing, delirium, cardiac arrhythmias, unconsciousness, deep anesthesia, paralysis, and coma characterized by motor restlessness, tremors and hyperreflexia, sometimes preceded by convulsions. Recovery depends on the severity of exposure. Polyneuritis may occur and there may be persistent nausea, anorexia, muscular weakness, headache, drowsiness, insomnia, and agitation. Nervous irritability, breathlessness, and unsteady gait may persist for 2-3 weeks; a peculiar skin color and cardiac distress may persist for 4 weeks. Liver and kidney effects may occur, but are usually mild, temporary impairments. Chromosomal damage has been found after exposure to toxic levels. Although generally hematotoxicity is not a significant concern in acute exposure, delayed hematological effects, including anemia and thrombocytopenia, have been reported, as have petechial hemorrhages, spontaneous internal bleeding and secondary infections. In fatal exposures, death may be due to asphyxia, central nervous system depression, cardiac or respiratory failure and circulatory collapse, or occasionally, sudden ventricular fibrillation. It may occur within a few minutes to several hours, or cardiac arrhythmia may occur at anytime within 24 hours. Also, death from central nervous system, respiratory or hemorrhagic complications may occur up to 5 days after exposure. Pathologic findings have included respiratory inflammation with edema and hemorrhage of the lungs, renal congestion, cerebral edema, and extensive petechial hemorrhages in the brain, pleurae, pericardium, urinary tract, mucous membranes, and skin.

CHRONIC EXPOSURE:

GASOLINE, AUTOMOTIVE, UNLEADED: With few exceptions, most of the reported effects of repeated inhalation are from intentional "sniffing" of gasoline rather than workplace exposure. Reported symptoms include headache, nausea, fatigue, anorexia and weight loss, pallor, dizziness, insomnia, memory loss, nervousness, confusion, muscular weakness and cramps, peripheral neuropathy, polyneuritis, and neurasthenia. It is unclear whether some of these symptoms may have been due to gasoline containing lead. Liver and kidney damage are also possible. In a 90 day study, male but not female rats exhibited a severe, dose-related renal toxicity. In another study, an increase in renal adenomas and carcinomas in male rats and an increase in hepatocellular adenomas and carcinomas in female mice were reported.

BENZENE: Longterm exposure may cause symptoms referable to the central nervous, hematopoietic and immune systems. Early effects are vague and varied and may include headache, light-headedness, dizziness, nausea, anorexia, abdominal discomfort, and fatigue. Sore, dry throat, weakness, lethargy, malaise, drowsiness, nervousness, and irritability have also been reported. Later there may be dyspnea, pallor, slightly increased temperature, decreased blood pressure, rapid pulse, palpitations, and visual disturbances. Dizziness when cold water is placed in the ear and hearing impairment have been reported, as have diffuse cerebral atrophy associated with ataxia, tremors and emotional lability. Workers exposed to benzene in combination with other solvents have exhibited polyneuritis. Several case reports, one of them an acute exposure, suggest the possibility that systemic exposure may be associated with retrobulbar or optic neuritis. Occasionally hemorrhages in retina and conjunctiva occur and rarely neuroretinal edema and papilledema have accompanied the retinal hemorrhages. Hematological effects vary widely and may appear after a few weeks or many years of exposure or even many years after exposure has ceased. The degree of exposure below which no blood effects will occur cannot be established with certainty. In the early stages, there may be blood clotting defects due to morphological, functional and quantitative platelet alteration with resultant bleeding from the nose and gums, easy bruising and petechiae; leukopenia with predominant lymphocytopenia or neutropenia; and anemia which may be normochromic or macrocytic and hypochromic. Extramedullary hematopoiesis, splenomegaly, circulating immature marrow cells, and an initial increase in leukocytes, erythrocytes and platelets have also been reported. The bone marrow may be hyper-, hypo- or normoplastic and does not always correlate with the peripheral blood picture. Also, the symptoms do not always parallel the laboratory findings. If treated at this stage, the effects appear reversible, although recovery may be protracted and there may be relapses. Decreased erythrocyte survival, hemolysis, capillary fragility, internal hemorrhages, iron metabolism disturbances, and hyperbilirubinemia have also been reported. Exposure to high levels for longer periods may result in

aplasia and fatty degeneration of the bone marrow with pancytopenia. The most serious cases of aplastic anemia may be fatal due to hemorrhage and infection; death may occur within 3 months of diagnosis. Enormous variability in individual response, including non-dose dependent aplasia, and the finding of eosinophilia suggests that, in some cases, the blood dyscrasia may partially be an allergic reaction. Numerous case reports and series have suggested a relationship between exposure to benzene and the occurrence of various types of leukemia. Several case-control studies have also shown increased odds ratios for exposure to benzene, but mixed exposure patterns and poorly defined exposures render their interpretation difficult. Three independent cohort studies have demonstrated an increased incidence of acute nonlymphocytic leukemia in workers exposed to benzene. Several studies have also suggested a link between occupational exposure and multiple myeloma and lymphoma, both Hodgkin's and nonhodgkin's. Although aplastic anemia is probably the more likely consequence of longterm exposure, it is not uncommon for an individual surviving this, to go through a preleukemic phase into frank leukemia. Conversely, leukemia without precedent aplastic anemia can occur. In one study the range of time from the start of the exposure to the diagnosis of leukemia was 3-24 years. It has been suggested that the chromosomal aberrations which can arise in peripheral blood and bone marrow cells and persist for a long time after exposure ceases, may be associated with the increased incidence of leukemia. The immunosuppressive effect has also been suggested as being associated with the leukemogenesis. Adverse effects on the immunological system have been shown to make rabbits more susceptible to tuberculosis and pneumonia and may explain why the terminal event in some cases of benzene intoxication may be overwhelming infection. Exposed mice exhibited a tendency toward induction of lymphoid neoplasms. Rats exhibited an increased incidence of neoplasms, mainly carcinomas, at various sites. Menstrual disturbances have been reported more frequently in exposed women. Testicular damage has been reported in rats, rabbits and guinea pigs. Some animal studies have demonstrated embryo/fetotoxicity, sometimes at levels as low as 10 ppm and the potential for teratogenic effects such as decreased body weight and skeletal variants, have also been shown. Other studies have not produced any abnormalities or embryoethality.

SKIN CONTACT:

ACUTE EXPOSURE:

GASOLINE, AUTOMOTIVE, UNLEADED: Liquid may cause irritation with erythema and pain. Prolonged or extensive contact may cause blistering and, in extreme cases epidermal necrolysis. A 12 year old boy partially immersed in a pool of gasoline for 1 hour experienced hypotension, abdominal tenderness, disseminated intravascular coagulation, transient hematuria, nonoliguric renal failure and an elevated serum amylase. Autopsy revealed cerebral edema, diffuse bilateral pneumonia, biventricular cardiac enlargement, toxic nephrosis, fatty infiltration of liver and peripancreatic fat necrosis.

BENZENE: Direct contact may cause irritation. Effects may include erythema, a burning sensation, and with prolonged contact, blistering and edema. Under normal conditions, significant signs of systemic toxicity are unlikely from skin contact alone due to the slow rate of absorption. It may however, contribute to the toxicity from inhalation. Application to guinea pigs resulted in increased dermal permeability.

CHRONIC EXPOSURE:

GASOLINE, AUTOMOTIVE, UNLEADED: Repeated or prolonged contact with the liquid may cause irritation, dermatitis and defatting of the skin with drying and cracking or burns and blistering. Some individuals may develop hypersensitivity, probably due to additives.

BENZENE: Repeated or prolonged contact defats the skin and may result in dermatitis with erythema, scaling, dryness, vesiculation, and fissuring, possibly accompanied by paresthesias of the fingers which may persist several weeks after the dermatitis subsides. Peripheral neuritis has also been reported. Secondary infections may occur. Tests on guinea pigs indicate sensitization is possible. Although animal

studies have failed to establish a relationship between skin contact and a carcinogenic effect, most of the studies were inadequate; some papillomas and hematopoietic effects have been reported.

EYE CONTACT:

ACUTE EXPOSURE:

GASOLINE, AUTOMOTIVE, UNLEADED: Concentrations between 270 and 900 ppm may cause a sensation of irritation often before signs such as conjunctival hyperemia are visible. Liquid splashed in the eyes may cause pain, smarting and slight, transient corneal epithelial disturbance. Blepharospasm and conjunctival hyperemia and edema may occur.

BENZENE: May cause irritation. Vapor concentrations of 3000 ppm are very irritating, even on brief exposure. Droplets cause a moderate burning sensation, but only a slight, transient corneal epithelial injury with rapid recovery.

CHRONIC EXPOSURE:

GASOLINE, AUTOMOTIVE, UNLEADED: Repeated or prolonged exposure may cause conjunctivitis and possible gradual, irreversible loss of corneal and conjunctival sensitivity.

BENZENE: Repeated or prolonged exposure may cause conjunctivitis. In one study, 50% of rats exposed to 50 ppm for more than 600 hours developed cataracts.

INGESTION:

ACUTE EXPOSURE:

GASOLINE, AUTOMOTIVE, UNLEADED: Lung damage may occur if aspirated into the lungs and may be fatal. Symptoms may include coughing, difficulty breathing, cyanosis, and pulmonary edema. May cause irritation and burning of the gastrointestinal tract with nausea, vomiting and diarrhea. Absorption may cause initial central nervous stimulation followed by depression. Symptoms may include a mild excitation, restlessness, nervousness, irritability, twitching, weakness, blurred vision, headache, dizziness, drowsiness, incoordination, confusion, delirium, unconsciousness, convulsions and coma. Cardiac arrhythmias may occur. Transient liver damage is possible. Signs of pulmonary involvement may include coughing, dyspnea, substernal pain, sudden development of rapid breathing, cyanosis, tachycardia and fever. Even small amounts may be fatal with death caused by cardiac arrest, asphyxia or respiratory paralysis. Depending on amount aspirated, death may occur rapidly or within 24 hours.

BENZENE: Lung damage may occur if aspirated into the lungs and may be fatal. Symptoms may include coughing, difficulty breathing, cyanosis, and pulmonary edema. May cause local irritation and burning sensation in the mouth, throat and stomach, and hemorrhagic inflammatory lesions of the mucous membranes in contact with the liquid. Signs and symptoms of systemic intoxication may include nausea, vomiting, headache, dizziness, weakness, staggering, chest pain and tightness, shallow, rapid pulse and respiration, breathlessness, pallor followed by flushing, and a fear of impending death. There may be visual disturbances, tremors, convulsions, ventricular irregularities, and paralysis. Excitement, euphoria or delirium may precede weariness, fatigue, sleepiness and followed by stupor and unconsciousness, coma and death from respiratory failure. Those who survive the central nervous system effects may develop bronchitis, pneumonia, pulmonary edema, and intrapulmonary hemorrhage. The usual lethal dose in humans is 10-15 milliliters, but smaller amounts have been reported to cause death. A single exposure may produce long term effects with pancytopenia persisting up to a year.

CHRONIC EXPOSURE:

GASOLINE, AUTOMOTIVE, UNLEADED: No data available.

BENZENE: Daily administration to humans of 2-5 grams in olive oil caused headache, vertigo, bladder



irritability, impotence, gastric disturbances, and evidence of renal congestion. In female rats treated with 132 single daily doses over 187 days, no effects were observed at 1 mg/kg. There was slight leukopenia at 10 mg/kg and both leukopenia and anemia were seen at 50 and 100 mg/kg. Oral administration to rats and mice at various dose levels induced neoplasms at multiple sites in males and females. In a one year gavage study, rats given 50 or 250 mg/kg, 4-5 days/week for 52 weeks did not exhibit acute or subacute toxic effects, but a dose correlated increase of leukemias and mammary carcinomas was observed. There were other tumor types also reported. Reproductive effects have been reported in animals.

12. ECOLOGICAL INFORMATION

Not available

13. DISPOSAL CONSIDERATIONS

Dispose in accordance with all applicable regulations. Subject to disposal regulations: U.S. EPA 40 CFR 262. Hazardous Waste Number(s): D001. Hazardous Waste Number(s): D018. Dispose of in accordance with U.S. EPA 40 CFR 262 for concentrations at or above the Regulatory level. Regulatory level- 0.5 mg/L.

14. TRANSPORT INFORMATION

U.S. DOT 49 CFR 172.101:

PROPER SHIPPING NAME: Gasoline

ID NUMBER: UN1203

HAZARD CLASS OR DIVISION: 3

PACKING GROUP: II

LABELING REQUIREMENTS: 3

CANADIAN TRANSPORTATION OF DANGEROUS GOODS:

SHIPPING NAME: Gasoline

UN NUMBER: UN1203

CLASS: 3

PACKING GROUP/RISK GROUP: II

LAND TRANSPORT ADR:

PROPER SHIPPING NAME: Gasoline

UN NUMBER: UN1203

CLASS: 3

CLASSIFICATION CODE: F1

PACKING GROUP: II

LABELS: 3

LAND TRANSPORT RID:

PROPER SHIPPING NAME: Gasoline

UN NUMBER: UN1203

CLASS: 3

CLASSIFICATION CODE: F1

PACKING GROUP: II
LABELS: 3

AIR TRANSPORT IATA:
PROPER SHIPPING NAME: Gasoline
UN/ID NUMBER: UN1203
CLASS OR DIVISION: 3
HAZARD LABELS: 3
PACKING GROUP: II

AIR TRANSPORT ICAO:
PROPER SHIPPING NAME: Gasoline
UN NUMBER: UN1203
CLASS OR DIVISION: 3
LABELS: 3
UN PACKING GROUP: II

MARITIME TRANSPORT IMDG:
PROPER SHIPPING NAME: Gasoline
UN NUMBER: UN1203
CLASS OR DIVISION: 3
PACKING GROUP: II

15. REGULATORY INFORMATION

U.S. REGULATIONS:

CERCLA SECTIONS 102a/103 HAZARDOUS SUBSTANCES (40 CFR 302.4):
Benzene: 10 LBS RQ

SARA TITLE III SECTION 302 EXTREMELY HAZARDOUS SUBSTANCES (40 CFR 355.30):
Not regulated.

SARA TITLE III SECTION 304 EXTREMELY HAZARDOUS SUBSTANCES (40 CFR 355.40):
Not regulated.

SARA TITLE III SARA SECTIONS 311/312 HAZARDOUS CATEGORIES (40 CFR 370.21):
ACUTE: Yes
CHRONIC: Yes
FIRE: Yes
REACTIVE: No
SUDDEN RELEASE: No

SARA TITLE III SECTION 313 (40 CFR 372.65):
Benzene

OSHA PROCESS SAFETY (29CFR1910.119): Not regulated.

STATE REGULATIONS:

California Proposition 65:
Known to the state of California to cause the following:

Benzene

Cancer (Feb 27, 1987)

Developmental toxicity (Dec 26, 1997)

Male reproductive toxicity (Dec 26, 1997)

CANADIAN REGULATIONS:**WHMIS CLASSIFICATION:** Not determined.**EUROPEAN REGULATIONS:****EC CLASSIFICATION (ASSIGNED):**

Xn	Harmful
	Carcinogen Category 2

EC Classification may be inconsistent with independently-researched data.

DANGER/HAZARD SYMBOL:**T****EC RISK AND SAFETY PHRASES:**

R 45	May cause cancer.
R 65	Harmful: may cause lung damage if swallowed.
S 45	In case of accident or if you feel unwell, seek medical advice immediately (show the label where possible).
S 53	Avoid exposure - obtain special instructions before use.

CONCENTRATION LIMITS:C_{>=}10% T R 45-65

0.1% ≤ C < 10% T R 45

NATIONAL INVENTORY STATUS:**U.S. INVENTORY (TSCA):** Listed on inventory.**TSCA 12(b) EXPORT NOTIFICATION:** Not listed.**16. OTHER INFORMATION**

MSDS SUMMARY OF CHANGES
11. TOXICOLOGICAL INFORMATION

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MATERIAL SAFETY DATA SHEET

1. CHEMICAL PRODUCT AND COMPANY IDENTIFICATION

**MDL INFORMATION
SYSTEMS, INC.**

1281 Murfreesboro Road, Suite
300

Nashville, TN 37217-2423

1-615-366-2000

**EMERGENCY TELEPHONE
NUMBER**

1-800-424-9300 (NORTH
AMERICA)

1-703-527-3887
(INTERNATIONAL)

SUBSTANCE: DIESEL FUEL NO. 2

TRADE NAMES/SYNONYMS:

DIESEL OIL; DIESEL FUEL; DIESEL OIL, MEDIUM; FUELS, DIESEL, NO. 2; DIESEL OIL NO. 2-D; DIESEL FUEL OIL NO. 2-D; DIESEL FUEL NO. 2-D; NO. 2 DIESEL FUEL; DIESEL FUEL #2; REGULAR DIESEL; FUEL OIL #2; OHS07100; RTECS LS9142500

CHEMICAL FAMILY: petroleum hydrocarbons

CREATION DATE: Mar 14 1985

REVISION DATE: Mar 15 2007

2. COMPOSITION, INFORMATION ON INGREDIENTS

COMPONENT: DIESEL FUEL NO. 2

CAS NUMBER: 68476-34-6

EC NUMBER (EINECS): 270-676-1

EC INDEX NUMBER: 649-227-00-2

PERCENTAGE: 100

OTHER CONTAMINANTS:

May contain trace amounts of sulfur, aniline and 2-ethylhexanol.

3. HAZARDS IDENTIFICATION

NFPA RATINGS (SCALE 0-4): HEALTH=2 FIRE=2 REACTIVITY=0

EMERGENCY OVERVIEW:

COLOR: colorless to brown

PHYSICAL FORM: liquid

ODOR: petroleum odor

MAJOR HEALTH HAZARDS: respiratory tract irritation, skin irritation, aspiration hazard, central nervous system depression

PHYSICAL HAZARDS: Flash back hazard. Combustible liquid and vapor.

POTENTIAL HEALTH EFFECTS:

INHALATION:

SHORT TERM EXPOSURE: irritation, cough, nausea, vomiting, difficulty breathing, headache, dizziness, disorientation, hyperactivity, loss of coordination, bluish skin color, lung congestion, unconsciousness, coma

LONG TERM EXPOSURE: irritation

SKIN CONTACT:

SHORT TERM EXPOSURE: irritation, blisters, absorption may occur

LONG TERM EXPOSURE: irritation, kidney damage, liver damage

EYE CONTACT:

SHORT TERM EXPOSURE: irritation

LONG TERM EXPOSURE: no information is available

INGESTION:

SHORT TERM EXPOSURE: nausea, vomiting, diarrhea, stomach pain, difficulty breathing, headache, drowsiness, dizziness, loss of coordination, aspiration hazard

LONG TERM EXPOSURE: no information is available

CARCINOGEN STATUS:

OSHA: No

NTP: No

IARC: No

4. FIRST AID MEASURES

INHALATION: If adverse effects occur, remove to uncontaminated area. Give artificial respiration if not breathing. If breathing is difficult, oxygen should be administered by qualified personnel. Get immediate medical attention.

SKIN CONTACT: Wash skin with soap and water for at least 15 minutes while removing contaminated clothing and shoes. Get medical attention, if needed. Thoroughly clean and dry contaminated clothing and shoes before reuse.

EYE CONTACT: Flush eyes with plenty of water for at least 15 minutes. Then get immediate medical attention.

INGESTION: Aspiration hazard. DO NOT induce vomiting. If vomiting occurs, keep head lower than hips to help prevent aspiration. Get immediate medical attention. Give artificial respiration if not breathing.

5. FIRE FIGHTING MEASURES

FIRE AND EXPLOSION HAZARDS: Moderate fire hazard. The vapor is heavier than air. Vapors or gases may ignite at distant ignition sources and flash back. Vapor/air mixtures are explosive above flash

point.

EXTINGUISHING MEDIA: regular dry chemical, carbon dioxide, water, regular foam

Large fires: Use regular foam or flood with fine water spray.

FIRE FIGHTING: Move container from fire area if it can be done without risk. Dike for later disposal. Do not scatter spilled material with high-pressure water streams. Cool containers with water spray until well after the fire is out. Stay away from the ends of tanks. Withdraw immediately in case of rising sound from venting safety device or any discoloration of tanks due to fire. For tank, rail car or tank truck, evacuation radius: 800 meters (1/2 mile). Do not attempt to extinguish fire unless flow of material can be stopped first. Flood with fine water spray. Do not scatter spilled material with high-pressure water streams. Cool containers with water spray until well after the fire is out. Apply water from a protected location or from a safe distance. Avoid inhalation of material or combustion by-products. Stay upwind and keep out of low areas.

FLASH POINT: >126 F (>52 C)

LOWER FLAMMABLE LIMIT: >0.6%

UPPER FLAMMABLE LIMIT: >6.0%

AUTOIGNITION: >475 F (>246 C)

FLAMMABILITY CLASS (OSHA): II

HAZARDOUS COMBUSTION PRODUCTS:

Thermal decomposition products or combustion: oxides of carbon, oxides of sulfur

6. ACCIDENTAL RELEASE MEASURES

OCCUPATIONAL RELEASE:

Avoid heat, flames, sparks and other sources of ignition. Stop leak if possible without personal risk. Reduce vapors with water spray. Small spills: Absorb with sand or other non-combustible material. Collect spilled material in appropriate container for disposal. Large spills: Dike for later disposal. Remove sources of ignition. Keep unnecessary people away, isolate hazard area and deny entry. Notify Local Emergency Planning Committee and State Emergency Response Commission for release greater than or equal to RQ (U.S. SARA Section 304). If release occurs in the U.S. and is reportable under CERCLA Section 103, notify the National Response Center at (800)424-8802 (USA) or (202)426-2675 (USA).

7. HANDLING AND STORAGE

STORAGE: Store and handle in accordance with all current regulations and standards. Subject to storage regulations: U.S. OSHA 29 CFR 1910.106. Grounding and bonding required. Notify State Emergency Response Commission for storage or use at amounts greater than or equal to the TPQ (U.S. EPA SARA Section 302). SARA Section 303 requires facilities storing a material with a TPQ to participate in local emergency response planning (U.S. EPA 40 CFR 355.30). Keep separated from incompatible substances.

HANDLING: Subject to handling regulations: U.S. OSHA 29 CFR 1910.119.

8. EXPOSURE CONTROLS, PERSONAL PROTECTION

EXPOSURE LIMITS:**DIESEL FUEL NO. 2:****DIESEL FUEL:**

100 mg/m³ ACGIH TWA (vapor and aerosol) (skin)

KEROSENE:

200 mg/m³ ACGIH TWA (restricted to conditions with negligible aerosol exposure) (skin)

100 mg/m³ NIOSH recommended TWA 10 hour(s)

MEASUREMENT METHOD: NIOSH IV # 1550

MINERAL OIL MIST:

5 mg/m³ OSHA TWA

5 mg/m³ ACGIH TWA

10 mg/m³ ACGIH STEL

5 mg/m³ NIOSH recommended TWA 10 hour(s)

10 mg/m³ NIOSH recommended STEL

MEASUREMENT METHOD: NIOSH IV # 5026, 5524

HYDROGEN SULFIDE:

20 ppm OSHA ceiling

50 ppm OSHA peak 10 minute(s) (once if no other measurable exposure occurs)

10 ppm (14 mg/m³) OSHA TWA (vacated by 58 FR 35338, June 30, 1993)

15 ppm (21 mg/m³) OSHA STEL (vacated by 58 FR 35338, June 30, 1993)

10 ppm ACGIH TWA

15 ppm ACGIH STEL

10 ppm (15 mg/m³) NIOSH recommended ceiling 10 minute(s)

7.1 mg/m³ (5 ml/m³) DFG MAK (peak limitation category - I, with excursion factor of 2)

5 ppm (7 mg/m³) UK WEL TWA

10 ppm (14 mg/m³) UK WEL STEL

MEASUREMENT METHOD: NIOSH IV # 6013; OSHA ID141

VENTILATION: Provide local exhaust or process enclosure ventilation system. Ensure compliance with applicable exposure limits.

EYE PROTECTION: Wear splash resistant safety goggles. Provide an emergency eye wash fountain and quick drench shower in the immediate work area.

CLOTHING: Wear appropriate chemical resistant clothing.

GLOVES: Wear appropriate chemical resistant gloves.

RESPIRATOR: Under conditions of frequent use or heavy exposure, respiratory protection may be needed. Respiratory protection is ranked in order from minimum to maximum. Consider warning properties before use.

Any chemical cartridge respirator with organic vapor cartridge(s).

Any chemical cartridge respirator with a full facepiece and organic vapor cartridge(s).

Any air-purifying respirator with a full facepiece and an organic vapor canister.

For Unknown Concentrations or Immediately Dangerous to Life or Health -

Any supplied-air respirator with full facepiece and operated in a pressure-demand or other positive-pressure mode in combination with a separate escape supply.

Any self-contained breathing apparatus with a full facepiece.

9. PHYSICAL AND CHEMICAL PROPERTIES

PHYSICAL STATE: liquid

COLOR: colorless to brown

ODOR: petroleum odor

BOILING POINT: 340-680 F (171-360 C)

FREEZING POINT: 0 F (-18 C)

VAPOR PRESSURE: 1 mmHg @ 20 C

VAPOR DENSITY (air=1): >1

SPECIFIC GRAVITY (water=1): 0.87-0.90

WATER SOLUBILITY: insoluble

PH: Not available

VOLATILITY: Not available

ODOR THRESHOLD: Not available

EVAPORATION RATE: Not available

VISCOSITY: 32.6-40.1 SUS @ 38 C

COEFFICIENT OF WATER/OIL DISTRIBUTION: Not available

10. STABILITY AND REACTIVITY

REACTIVITY: Stable at normal temperatures and pressure.

CONDITIONS TO AVOID: Avoid heat, flames, sparks and other sources of ignition. Containers may rupture or explode if exposed to heat. Keep out of water supplies and sewers. Dangerous gases may accumulate in confined spaces.

INCOMPATIBILITIES: oxidizing materials

DIESEL FUEL:

OXIDIZERS (STRONG): Fire and explosion hazard.

HAZARDOUS DECOMPOSITION:

Thermal decomposition products or combustion: oxides of carbon, oxides of sulfur

POLYMERIZATION: Will not polymerize.

11. TOXICOLOGICAL INFORMATION

DIESEL FUEL NO. 2:

TOXICITY DATA: >5 ml/kg skin-rabbit LD50; 7.5 gm/kg oral-rat LD50; 1.25 ml/kg oral-rat TDLo; 15 ml/kg/14 day(s) intermittent oral-cattle, horse TDLo

CARCINOGEN STATUS: IARC: Human Inadequate Evidence, Group 3 (Light distillate diesel fuels);

ACGIH: A3 -Animal Carcinogen

LOCAL EFFECTS:

Irritant: inhalation, skin

ACUTE TOXICITY LEVEL:

Slightly Toxic: ingestion

TARGET ORGANS: central nervous system

TUMORIGENIC DATA: 312 ml/kg skin-mouse TDLo/78 week(s) intermittent

ADDITIONAL DATA: Animal studies have confirmed an association between the induction of cancer, primarily of the lung, and inhalation exposure to whole diesel exhaust. Limited epidemiologic evidence also suggests an association between occupational exposure to diesel engine emissions and lung cancer (NIOSH, 1988).

HEALTH EFFECTS:

INHALATION:

ACUTE EXPOSURE:

DIESEL FUEL: Vapors or mist may cause respiratory tract irritation. Human exposure has resulted in immediate cough, dyspnea, cyanosis and unconsciousness for one hour. Chest X-rays showed diffuse shadowing, most prominent at the lung bases, which resolved slowly with treatment but was still present at day 37. High levels may also cause central nervous system excitation followed by depression with symptoms possibly including restlessness, confusion, ataxia, headache, dizziness, anorexia, nausea, vomiting, weakness, incoordination, stupor, delirium, and coma.

CHRONIC EXPOSURE:

DIESEL FUEL: Prolonged or repeated exposure may cause irritation. May produce effects to the kidneys.

SKIN CONTACT:

ACUTE EXPOSURE:

DIESEL FUEL: May cause redness, irritation, and pain. A sample of diesel fuel applied to covered rabbit skin caused extreme irritation. Severe erythema and edema were seen, along with blistering and open sores.

CHRONIC EXPOSURE:

DIESEL FUEL: Repeated or prolonged contact may cause defatting and drying of the skin resulting in irritation and dermatitis. Cutaneous hyperkeratosis has been described in engine drivers with occupational exposure to diesel fuel. Two individuals with topical exposure from washing hair or hands with diesel fuel developed acute renal failure; one also had gastrointestinal symptoms. Repeated applications to rabbit skin produced 67% mortality at 8 mL/kg. The primary causes of death were depression and anorexia which were induced by dermal irritation with infection, rather than systemic intoxication. Autopsy revealed effects on the liver and kidneys.

EYE CONTACT:

ACUTE EXPOSURE:

DIESEL FUEL: Liquid or vapor may cause irritation. Tests on rabbit eyes were non-irritating.

CHRONIC EXPOSURE:

DIESEL FUEL: No data available.

INGESTION:

ACUTE EXPOSURE:

DIESEL FUEL: Lung damage may occur if aspirated into the lungs and may be fatal. Symptoms may include coughing, difficulty breathing, cyanosis, and pulmonary edema. May cause nausea, vomiting,

cramping, diarrhea, and possibly symptoms of central nervous system depression. Pneumonitis or respiratory failure may result.

CHRONIC EXPOSURE:

DIESEL FUEL: No data available.

12. ECOLOGICAL INFORMATION

Not available

13. DISPOSAL CONSIDERATIONS

Dispose in accordance with all applicable regulations. Subject to disposal regulations: U.S. EPA 40 CFR 262. Hazardous Waste Number(s): D001.

14. TRANSPORT INFORMATION

INTERNATIONAL U.S. DOT 49 CFR 172.101:

PROPER SHIPPING NAME: Diesel fuel

ID NUMBER: UN1202

HAZARD CLASS OR DIVISION: 3

PACKING GROUP: III

LABELING REQUIREMENTS: 3

CANADIAN TRANSPORTATION OF DANGEROUS GOODS:

SHIPPING NAME: Diesel fuel

UN NUMBER: UN1202

CLASS: 3

PACKING GROUP/RISK GROUP: III

LAND TRANSPORT ADR:

PROPER SHIPPING NAME: Diesel fuel

UN NUMBER: UN1202

CLASS: 3

CLASSIFICATION CODE: F1

PACKING GROUP: III

LABELS: 3

LAND TRANSPORT RID:

PROPER SHIPPING NAME: Diesel fuel

UN NUMBER: UN1202

CLASS: 3

CLASSIFICATION CODE: F1

PACKING GROUP: III

LABELS: 3

AIR TRANSPORT IATA:

PROPER SHIPPING NAME: Diesel fuel
UN/ID NUMBER: UN1202
CLASS OR DIVISION: 3
HAZARD LABELS: 3
PACKING GROUP: III

AIR TRANSPORT ICAO:
PROPER SHIPPING NAME: Diesel fuel
UN NUMBER: UN1202
CLASS OR DIVISION: 3
LABELS: 3
UN PACKING GROUP: III

MARITIME TRANSPORT IMDG:
PROPER SHIPPING NAME: Diesel fuel
UN NUMBER: UN1202
CLASS OR DIVISION: 3
PACKING GROUP: III

15. REGULATORY INFORMATION

U.S. REGULATIONS:

CERCLA SECTIONS 102a/103 HAZARDOUS SUBSTANCES (40 CFR 302.4):

HYDROGEN SULFIDE: 100 LBS RQ

SARA TITLE III SECTION 302 EXTREMELY HAZARDOUS SUBSTANCES (40 CFR 355.30):

HYDROGEN SULFIDE: 500 LBS TPQ

SARA TITLE III SECTION 304 EXTREMELY HAZARDOUS SUBSTANCES (40 CFR 355.40):

HYDROGEN SULFIDE: 100 LBS RQ

SARA TITLE III SARA SECTIONS 311/312 HAZARDOUS CATEGORIES (40 CFR 370.21):

ACUTE: Yes

CHRONIC: Yes

FIRE: Yes

REACTIVE: No

SUDDEN RELEASE: No

SARA TITLE III SECTION 313 (40 CFR 372.65):

HYDROGEN SULFIDE: Administrative stay issued Aug. 22, 1994

OSHA PROCESS SAFETY (29CFR1910.119):

HYDROGEN SULFIDE: 1500 LBS TQ

STATE REGULATIONS:

California Proposition 65: Not regulated.

CANADIAN REGULATIONS:

WHMIS CLASSIFICATION: Not determined.

EUROPEAN REGULATIONS:

EC CLASSIFICATION (ASSIGNED):

	Carcinogen Category 3
--	-----------------------

EC Classification may be inconsistent with independently-researched data.

DANGER/HAZARD SYMBOL:



Xn

EC RISK AND SAFETY PHRASES:

R 40	Limited evidence of a carcinogenic effect.
S 2	Keep out of the reach of children.
S 36/37	Wear suitable protective clothing and gloves.

NATIONAL INVENTORY STATUS:

U.S. INVENTORY (TSCA): Listed on inventory.

TSCA 12(b) EXPORT NOTIFICATION: Not listed.

16. OTHER INFORMATION

MSDS SUMMARY OF CHANGES

8. EXPOSURE CONTROLS, PERSONAL PROTECTION

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JOHNSON SCREENS

A Weatherford Company

Material Safety Data Sheet

SECTION 1 - CHEMICAL PRODUCT AND COMPANY INFORMATION

Product Name: NW-400

Part Number:

Chemical Family: Non-Ionic Surface Active Agent

Manufacturer's Name: Johnson Screens /A Weatherford Company

Address: P.O. Box 64118 – St. Paul, MN 55164

Product/Technical Information Phone Number: 651-636-3900

Medical/Handling Emergency Phone Number: CHEMTREC 1-800-424-9300

Transportation Emergency Phone Number: CHEMTREC 1-800-424-9300

Issue Date: 12/09/97

Revision Date/Revision Number: 06-06-05 /05

SECTION 2 – COMPOSITION INFORMATION

No constituents of the formulae are listed or considered hazardous under OSHA 29CFR 1910.1200

SECTION 3 - HAZARDS IDENTIFICATION

Appearance & Odor: Slight yellow, clear liquid; sweet odor

Emergency Overview: Based on current data, this product does not meet the regulatory definition of a hazardous substance. However, good industrial hygiene practices should be used in handling it.

Fire & Explosion Hazards: Product will burn under fire conditions. Closed containers may explode (due to the build-up of pressure) when exposed to extreme heat.

Primary Route(s) of Exposure: Skin, eyes, ingestion

Inhalation – Acute Effects: Mists may cause upper respiratory tract irritation

Skin Contact – Acute Effects: Slightly irritating; may cause redness, irritation

Eye Contact – Acute Effects: Slightly irritating; may cause redness, irritation

Ingestion – Acute Effects: Practically non-toxic

SECTION 4 - FIRST AID MEASURES

.....

Inhalation First Aid: Inhalation is not an expected route of exposure. If respiratory irritation or distress occurs, remove affected person from area to fresh air and provide oxygen if breathing is difficult. Give artificial respiration ONLY if breathing has stopped and give CPR ONLY if there is no breathing and no pulse. Obtain medical attention.

Skin Contact First Aid: Immediately remove clothing from affected area and wash skin for 15 minutes with flowing water and soap. Clothing should be discarded or washed before reuse. Obtain medical assistance if irritation develops.

Eye Contact First Aid: Immediately irrigate eyes with flowing water continuously for 15 minutes while holding eyes open. Contacts should be removed before or during flushing. Obtain medical attention immediately.

Ingestion First Aid: If victim is alert and not convulsing, rinse mouth with water and give plenty of water to drink. If spontaneous vomiting occurs, have affected person lean forward with head down to avoid breathing in of vomitus. Rinse mouth again and give more water to drink. Obtain medical attention.

Medical Conditions Aggravated: Skin contact may aggravate existing skin disease

Note to Physician: All treatments should be based on observed signs and symptoms of distress in the patient. Consideration should be given to the possibility that overexposure to materials other than this product may have occurred. Treat symptomatically. No specific antidote available.

SECTION 5 - FIRE FIGHTING MEASURES

.....

Flash Point/Method: >93° C. (200° F.) / Closed cup

Auto Ignition Temperature: Not known

Upper/Lower Explosion Limits: >93° C. (200° F.)

Extinguishing Media: Recommended (small fires): dry chemical, carbon dioxide; Recommended (large fires): alcohol foam, universal foam, water spray; Not recommended: water jet (frothing possible).

Fire Fighting Procedures: Firefighters should wear NIOSH/MSHA approved self-contained breathing apparatus and full protective clothing.

Fire & Explosion Hazards: Product will burn under fire conditions. Closed containers may explode (due to the build-up of pressure) when exposed to extreme heat.

Hazardous Products of Decomposition and/or Combustion: Oxides of nitrogen, oxides of sulfur, oxides of carbon (under fire conditions)

NFPA Ratings:

HEALTH	FLAMMABILITY	REACTIVITY	OTHER
1	1	0	

SECTION 6 – ACCIDENTAL RELEASE MEASURES

Wear appropriate protective gear for the situation. Absorb with an inert absorbent. Sweep up and place in an appropriate closed container. Clean up residual material by washing area with water. Collect washings for disposal. Do not flush to drain.

All disposal methods must be in compliance with all Federal, State, Local, and Provincial laws and regulations. Regulations may vary in different locations. Waste characterizations and compliance with applicable laws are the responsibility of the waste generator.

SECTION 7 – HANDLING AND STORAGE

Handling: Avoid breathing vapors and mists. Avoid direct or prolonged contact with skin and eyes. In cold weather, this product may stratify and freeze. This does not damage the product. If freezing occurs, thaw and remix before using. Frozen material may be thawed in a warm room. Avoid localized overheating. Vent drums while heating. Mix thoroughly to assure homogeneity.

Storage: Store in tightly closed containers. Store in an area that is dry, well ventilated, away from incompatible materials, and away from ignition sources. Store at 4° to 49° C. (37° to 120° F.)

General Comments:

SECTION 8 – PERSONAL PROTECTION/EXPOSURE CONTROL

Respiratory Protection: When respirators are required, select NIOSH/MSHA approved equipment based on actual or potential airborne concentrations and in accordance with the appropriate regulatory standards and/or industrial recommendations.

Skin Protection: Skin contact should be minimized through use of gloves and suitable long-sleeved clothing. Consideration must be given both to durability as well as permeation resistance.

Eye Protection: Eye and face protection requirements will vary dependent upon work environment conditions and material handling practices. Appropriate ANSI Z87 approved equipment should be selected for the particular use intended for this material. Eye contact should be prevented through use of chemical safety glasses with side shields or splash proof goggles. An emergency eyewash must be readily accessible to the work area.

Ventilation Protection: When engineering controls are indicated by use conditions or a potential for excessive exposure exists, the following traditional exposure control

techniques may be used to effectively minimize employee exposures: general area dilution/exhaust ventilation.

Other Protection: Personal hygiene is an important work practice exposure control measure and the following general measures should be taken when working with or handling this material:

1. Do not store, use, and/or consume foods, beverages, tobacco products, or cosmetics in areas where this material is stored.
2. Wash hands and face carefully before eating, drinking, or using tobacco, applying cosmetics, or using the toilet.
3. Wash exposed skin promptly to remove accidental splashes of contact with this material.

Exposure Limits:

OSHA	ACGIH	NIOSH	SUPPLIER
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SECTION 9 – PHYSICAL AND CHEMICAL PROPERTIES

.....

Appearance & Odor: Slight yellow clear liquid, sweet odor

Vapor Pressure: <5.2 mmHg at 0°C. (32°F)

Vapor Density (Air=1): Unknown

Boiling Point: >100° C. (212° F.) at 760 mmHg

Melting Point: Unknown

Specific Gravity: 1.13 at 25° C (77° F.)

Solubility in Water: Soluble

Volatile Percentage: <51

pH: 7.5 to 9.5 at 100 wt/wt%

Flash Point/method: >93°C. (200°F.) /Closed cup

Auto Ignition Temp: >93°C

Upper/Lower Explosion Limits: Unknown

Other:

SECTION 10 - STABILITY AND REACTIVITY

.....

Stability: Stable under normal handling and storage conditions described in Section 7.

Incompatibilities: Strong oxidizing agents

Polymerization: Will not occur

Decomposition: Oxides of nitrogen, oxides of sulfur, and oxides of carbon

Conditions to Avoid: Heat, open flame, and spark

SECTION 11 - TOXICOLOGICAL INFORMATION

.....

Inhalation – Acute: No test data found for product

Inhalation – Chronic: No test data found for product

Skin Contact – Acute: Slight irritation, rabbit

Skin Contact – Chronic: Slight irritation, rabbit

Eye Contact – Acute: Slight irritation, rabbit

Ingestion – Acute: LD₅₀ – lethal dose 50% of test species, 13800 mg/kg, rats

Ingestion – Chronic: None available

Carcinogenicity/Mutagenicity: This product does not contain any substances that are considered by OSHA, NTP, IARC, or ACGIH to be “probable” or suspected” human carcinogens.

Reproductive Effects: None available

Neurotoxicity: None available

Other Effects:

Target Organs: None

SECTION 12 – ECOLOGICAL INFORMATION

No data found for product.

SECTION 13 – DISPOSAL CONSIDERATIONS

Material that cannot be used or chemically reprocessed and empty containers should be disposed of in accordance with all applicable regulations. Product containers should be thoroughly emptied before disposal. Generators of waste material are required to evaluate all waste for compliance with RCRA and any local disposal procedures and regulations. NOTE: State and local regulations may be more stringent than federal regulations.

EPA Hazardous Waste - NO

SECTION 14 – TRANSPORTATION INFORMATION

DOT Shipping Description: Not regulated as a hazardous material by the U.S. Department of Transportation (DOT) 49CFR 172.101 Hazardous Materials Table.

SECTION 15 – REGULATORY INFORMATION

NSF Certified for use in well cleaning and pipe line cleaning.

SARA/Title III Hazard Classes:

Fire Hazard	- No
Reactive Hazard	- No
Release of Pressure	- No
Acute Health Hazard	- No
Chronic Health Hazard	- No

TSCA Inventory Status: All functional components of this product are listed on the TSCA Inventory

All components are listed under DSL (Canada)

California Proposition 65: This product does not contain any chemicals currently on the California list of known carcinogens and reproductive toxins.

SECTION 16 – OTHER INFORMATION

.....

Disclaimer: The information contained herein is based on data considered accurate. However, no warranty is expressed or implied regarding the accuracy of this data or the results to be obtained from the user thereof. It is the buyer's responsibility to ensure that its activities comply with federal, state, provincial and local laws.

JOHNSON SCREENS

A Weatherford Company

Material Safety Data Sheet

SECTION 1 - CHEMICAL PRODUCT AND COMPANY INFORMATION

Product Name: NW-310

Part Number: **Chemical Family:** Polymeric acid solution to enhance acid cleaning activity

Manufacturer's Name: Johnson Screens /A Weatherford Company

Address: P.O. Box 64118 – St. Paul, MN 55164

Product/Technical Information Phone Number: 651-636-3900

Medical/Handling Emergency Phone Number: CHEMTREC 1-800-424-9300

Transportation Emergency Phone Number: CHEMTREC 1-800-424-9300

Issue Date: 06-01-97

Revision Date/Revision Number: 06-06-05 /04

SECTION 2 – COMPOSITION INFORMATION

No constituents of the formulae are listed or considered hazardous under OSHA 29CFR 1910.1200

All components are listed under TSCA

SECTION 3 - HAZARDS IDENTIFICATION

Appearance & Odor: Clear yellow liquid

Emergency Overview: Product is a mild acid – handle with caution

Fire & Explosion Hazards: Contact with metals may produce flammable hydrogen gas

Primary Route(s) of Exposure: Skin, eyes, and inhalation

Inhalation – Acute Effects: Irritation or corrosion of mucous membranes with upper and lower respiratory irritation

Skin Contact – Acute Effects: Skin discomfort or rash

Eye Contact – Acute Effects: Irritation, tearing, or blurring of vision

Ingestion – Acute Effects: Diarrhea

SECTION 4 - FIRST AID MEASURES

.....

Inhalation First Aid: Remove affected person from area to fresh air and provide oxygen if breathing is difficult. Give artificial respiration ONLY if breathing has stopped and give CPR ONLY if there is no breathing and no pulse. Obtain medical attention.

Skin Contact First Aid: Immediately remove clothing from affected area and wash skin for 15 minutes with flowing water and soap. Clothing should be discarded or washed before reuse. Obtain medical assistance if irritation develops.

Eye Contact First Aid: Immediately irrigate eyes with flowing water continuously for 15 minutes while holding eyes open. Contacts should be removed before or during flushing. Obtain medical attention immediately.

Ingestion First Aid: If victim is alert and not convulsing, rinse mouth with water and give plenty of water to drink. If spontaneous vomiting occurs, have affected person lean forward with head down to avoid breathing in of vomitus. Rinse mouth again and give more water to drink. Obtain medical attention.

Medical Conditions Aggravated: None known

Note to Physician: Product has some surfactant qualities that may result in a laxative effect in cases of ingestion.

SECTION 5 - FIRE FIGHTING MEASURES

.....

Flash Point/Method: None

Auto Ignition Temperature: N/D

Upper/Lower Explosion Limits: N/A

Extinguishing Media: That which is appropriate for surrounding fire

Fire Fighting Procedures: Wear self-contained breathing apparatus. Carbon monoxide, carbon dioxide, phosphorus oxides (extremely small) may be released in a fire.

Fire & Explosion Hazards: High heat fires could result in excessive carbon monoxide release.

Hazardous Products of Decomposition and/or Combustion: Carbon monoxide, carbon dioxide, and phosphorus oxides.

NFPA Ratings:

HEALTH	FLAMMABILITY	REACTIVITY	OTHER
1	0	1	None

SECTION 6 – ACCIDENTAL RELEASE MEASURES

.....

Neutralize spills with lime or soda ash. Flush spill area with plenty of water. Keep spectators away. Treat as an acid material. Contain spill with inert material (e.g. sand, earth, absorbable material). Transfer diking material to suitable container for recovery or disposal. Material may be diluted and rinsed down a sanitary sewer system to a municipal wastewater plant. If quantities in excess of 500 gallons are rinsed to a sewer, the district should be notified of possible pH upset to the wastewater plant.

All disposal methods must be in compliance with all Federal, State, Local and Provincial laws and regulations. Regulations may vary in different locations. Waste characterizations and compliance with applicable laws are the responsibility solely of the waste generator.

SECTION 7 – HANDLING AND STORAGE

.....

Handling: Minimize skin contact. Wash with soap and water before eating, drinking, smoking, or using toilet facilities.

Storage: Keep in well ventilated area. Keep package tightly closed. Store above 32° F. (0° C.) Product should not be stored with or near strong caustic or oxidizing agents.

General Comments: None

SECTION 8 – PERSONAL PROTECTION / EXPOSURE CONTROL

.....

Respiratory Protection: None required for normal use

Skin Protection: Neoprene gloves or approved chemical protective gloves suitable for use in acid material

Eye Protection: Chemical splash goggles (ANSI Z871) or approved equivalent

Ventilation Protection: Standard plant ventilation should be sufficient

Other Protection: Safety showers, with quick opening valves which stay open, and eye wash fountains, or other means of washing the eyes with a gentle flow of cool to tepid tap water, should be readily available in all areas where this material is handled or stored. Water should be supplied through insulated and heat-traced lines to prevent freeze-ups in cold weather.

Exposure Limits:

OSHA	ACGIH	NIOSH	SUPPLIER
None	None	None	AEL=20mg/m ³ - 8&12 hrs TWA

SECTION 9 – PHYSICAL AND CHEMICAL PROPERTIES

.....

Appearance & Odor: Clear yellow liquid
Vapor Pressure: Vapor is water **Vapor Density:** 1.0 (vapor is water)
Boiling Point: 250° F. **Melting Point:** N/A
Specific Gravity: 1.19 **Solubility in Water:** Complete
Volatile Percentage: 34% **pH:** 2.3
Flash Point/method: Will not flash **Auto Ignition Temperature:** N/D
Upper/Lower Explosion Limits: N/A **Other:**

SECTION 10 - STABILITY AND REACTIVITY

.....

Stability: Stable
Incompatibilities: Metals, oxidizing agents such as nitric acid, cyanide, sulfides
Polymerization: No
Decomposition: Carbon monoxide, carbon dioxide, phosphorus oxides (extremely small)
Conditions to Avoid: Contact with strong oxidizing chemicals such as calcium hypochlorite

SECTION 11 - TOXICOLOGICAL INFORMATION

.....

Inhalation – Acute: 4 hrs. LC₅₀ (rats) – 14 mg/L
Inhalation – Chronic: Not established
Skin Contact – Acute: Dermal LD₅₀ Rabbits > 3000 mg/kg
Skin Contact – Chronic: Skin irritation Rabbits (Draize Score 1.6 /8)
Eye Contact – Acute: Minimal Rabbits (Draize score 2.7 / 110)
Ingestion – Acute: Oral LD₅₀ (Rats) > 5000 mg/kg
Ingestion – Chronic: 600 mg/kg (90 day study dogs) produced some kidney function changes *
Carcinogenicity/Mutagenicity: None
Reproductive Effects: None known
Neurotoxicity: None
Other Effects: Some calcium loss in long term feeding studies (Dogs) *
Target Organs: Kidneys, Bones

SECTION 12 – ECOLOGICAL INFORMATION

.....

Biodegradability:
 BOD (5) 1.0% solution 7950 mg O₂/L
 BOD (5) 0.1% solution 725 mg O₂/L
 Total Organic Carbon 2.2%
 Non-bioaccumulating
Fish toxicity: Bluegill (24 – 48 hrs) LC₅₀ = 186 mg/L
Biological safe concentration is 56 mg/L
At 310 mg/L there was 90% mortality in 24 – 48 hrs
At 36 mg/L pH 5.4 there was 100% survival over 48 hrs

SECTION 13 – DISPOSAL CONSIDERATIONS

.....

Comply with Federal, State, and local regulations. If approved, may be neutralized and flushed to wastewater treatment plant. Product is biodegradable, no discharge limitations are required.

Material that cannot be used or chemically reprocessed and empty containers should be disposed of in accordance with all applicable regulations. Product containers should be thoroughly emptied before disposal. Generators of waste material are required to evaluate all waste for compliance with RCRA and any local disposal procedures and regulations. NOTE: State and local regulations may be more stringent than federal regulations.

SECTION 14 – TRANSPORTATION INFORMATION

.....

DOT Shipping Description: Not regulated as a hazardous material by the US Dept. of Transportation (DOT) 49CFR 172.101 Hazardous Materials Table

SECTION 15 – REGULATORY INFORMATION

.....

NSF Certified for use in well cleaning, pipe line cleaning, and filter cleaning.

RCRA Status: Not a hazardous waste under RCRA 40 CFR 261. No reportable quantities.

SARA/TITLE III-CERCLA List: This product does not contain a “CERCLA” listed hazardous substance for emergency release notification under Sec. 304 (40CFR 302).

SARA/TITLE III-Toxic Chemicals List: This product does no contain a toxic chemical for routine annual “Toxic Chemical Release Reporting” under Sec. 313 (40CFR 372).

TSCA Inventory Status: Chemical components listed on TSCA Inventory.

California Proposition 65: This product does not contain any chemicals currently on the California list of known carcinogens and reproductive toxins.

SECTION 16 – OTHER INFORMATION

.....

Disclaimer: The information contained herein is based on data considered accurate. However, no warranty is expressed or implied regarding the accuracy of this data or the results to be obtained from the user thereof. It is the buyer’s responsibility to ensure that its activities comply with federal, state, provincial and local laws.

JOHNSON SCREENS

A Weatherford Company

Material Safety Data Sheet

SECTION 1 - CHEMICAL PRODUCT AND COMPANY INFORMATION

Product Name: NW-220

Part Number: **Chemical Family:** Aqueous solution of polyelectrolytes

Manufacturer's Name: Johnson Screens /A Weatherford Company

Address: P.O. Box 64118 – St. Paul, MN 55164

Product/Technical Information Phone Number: 651-636-3900

Medical/Handling Emergency Phone Number: CHEMTREC 1-800-424-9300

Transportation Emergency Phone Number: CHEMTREC 1-800-424-9300

Issue Date: 12/09/97

Revision Date/Revision Number: 06/06/05 /05

SECTION 2 – COMPOSITION INFORMATION

No constituents of the formulae are listed or considered hazardous under 29CFR 1910.1200

All components are listed under TSCA

SECTION 3 - HAZARDS IDENTIFICATION

Appearance & Odor: Clear amber liquid

Emergency Overview: In general, product is non-hazardous to a persons health

Fire & Explosion Hazards: Should not be stored with oxidizing agents

Primary Route(s) of Exposure: Skin, eyes, and ingestion

Inhalation – Acute Effects: Does not apply

Skin Contact – Acute Effects: Does not usually cause skin irritation

Eye Contact – Acute Effects: May cause eye irritation

Ingestion – Acute Effects: May cause nausea and vomiting

SECTION 4 - FIRST AID MEASURES

.....

Inhalation First Aid: Remove affected person from area to fresh air and provide oxygen if breathing is difficult. Give artificial respiration ONLY if breathing has stopped and give CPR ONLY if there is no breathing and no pulse. Obtain medical attention.

Skin Contact First Aid: Immediately remove clothing from affected area and wash skin for 15 minutes with flowing water and soap. Clothing should be discarded or washed before reuse. Obtain medical assistance if irritation develops.

Eye Contact First Aid: Immediately irrigate eyes with flowing water continuously for 15 minutes while holding eyes open. Contacts should be removed before or during flushing. Obtain medical attention immediately.

Ingestion First Aid: If victim is alert and not convulsing, rinse mouth with water and give plenty of water to drink. If spontaneous vomiting occurs, have affected person lean forward with head down to avoid breathing in of vomitus. Rinse mouth again and give more water to drink. Obtain medical attention.

Medical Conditions Aggravated: None known

Note to Physician: Product is not known to interfere with any organ functions

SECTION 5 - FIRE FIGHTING MEASURES

.....

Flash Point/Method: None

Auto Ignition Temperature: Unknown

Upper/Lower Explosion Limits: None

Extinguishing Media: That which is appropriate for surrounding fire

Fire Fighting Procedures: Wear self-contained breathing apparatus. Carbon monoxide and/or carbon dioxide may be released in a fire.

Fire & Explosion Hazards: None

Hazardous Products of Decomposition and/or Combustion: Carbon monoxide, carbon dioxide

NFPA Ratings:

HEALTH	FLAMMABILITY	REACTIVITY	OTHER
1	0	0	None

SECTION 6 – ACCIDENTAL RELEASE MEASURES

Keep spectators away. Product is a neutral material not considered hazardous. Contain spill with inert material (eg. sand, earth, absorbable material). Transfer diking material to suitable container for recovery or disposal. Material may be diluted and rinsed down a sanitary sewer system to a municipal wastewater plant. No expected overload of plant facility or upset of pH is expected in quantities less than 1,000 gallons.

All disposal methods must be in compliance with all Federal, State, Local, and Provincial laws and regulations. Regulations may vary in different locations. Waste characterizations and compliance with applicable laws are the responsibility solely of the waste generator.

SECTION 7 – HANDLING AND STORAGE

Handling: The product is not considered dangerous and requires no special handling

Storage: Avoid contact with strong acids or alkaline-based products

General Comments: None

SECTION 8 – PERSONAL PROTECTION/EXPOSURE CONTROL

Respiratory Protection: Protection meeting OSHA 1910.134 and ANSI Z88.2 requirements should be followed whenever workplace conditions warrant a respirator's use.

Skin Protection: Wear neoprene gloves or approved chemical protective gloves for use in acid material

Eye Protection: Wear chemical splash goggles (ANSI Z781) or approved equivalent

Ventilation Protection: No special equipment

Other Protection: Safety showers, with quick opening valves which stay open, and eye wash fountains, or other means of washing the eyes with a gentle flow of cool to tepid tap water should be readily available in all areas where this material is handled or stored. Water should be supplied through insulated and heat-traced lines to prevent freeze-ups in cold weather.

Exposure Limits:

OSHA	ACGIH	NIOSH	SUPPLIER
None	None	None	None

SECTION 9 – PHYSICAL AND CHEMICAL PROPERTIES

Appearance & Odor: Clear amber liquid
Vapor Pressure: Vapor is water
Boiling Point: 243°F
Specific Gravity: 1.27
Volatile Percentage: 34%
Flash Point/method: None
Upper/Lower Explosion Limits: None

Vapor Density: 1.0 (Vapor is water)
Melting Point: N/A
Solubility in Water: Complete
pH: 7.0
Auto Ignition Temperature: Unknown
Other:

SECTION 10 - STABILITY AND REACTIVITY

Stability: Stable
Incompatibilities: Oxidizing agents such as nitric acid, cyanide, sulfides

Polymerization: No
Decomposition: Carbon monoxide, carbon dioxide
Conditions to Avoid: Contact with oxidizing agents

SECTION 11 - TOXICOLOGICAL INFORMATION

Inhalation – Acute: N/D
Inhalation – Chronic: N/D
Skin Contact – Acute: Dermal LD₅₀ Rabbits > 3000 mg/kg
Skin Contact – Chronic: Skin irritation rabbits (Draize score 1.6/8)
Eye Contact – Acute: Minimal Rabbits (Draize score 2.7/110)
Ingestion – Acute: Oral LD₅₀ (Rats) 15,000 mg/kg
Ingestion – Chronic: N/D
Carcinogenicity/Mutagenicity: None /Ames Test was negative
Reproductive Effects: None known
Neurotoxicity: None
Other Effects: No observable affects in long term feeding studies
Target Organs: None

SECTION 12 – ECOLOGICAL INFORMATION

Fish toxicity is extremely limited: Bluegill, LC₅₀ 96H: > 5000 ppm. Rainbow Trout LC₅₀ 96H: > 5000 ppm. Invertebrate Toxicity: Daphnia Magna, IC₅₀ 48H: > 2000 ppm and Brown Shrimp, LC₅₀ 96H: > 20,000 ppm.

SECTION 13 – DISPOSAL CONSIDERATIONS

.....

Product is biodegradable, no discharge limitations are required.

Material that cannot be used or chemically reprocessed and empty containers should be disposed of in accordance with all applicable regulations. Product containers should be thoroughly emptied before disposal. Generators of waste material are required to evaluate all waste for compliance with RCRA and any local disposal procedures and regulations. NOTE: State and local regulations may be more stringent than federal regulations.

SECTION 14 – TRANSPORTATION INFORMATION

.....

DOT Shipping Description: Not regulated as a hazardous material by the U.S. Department of Transportation (DOT) 49CFR 172.101 Hazardous Materials Table

SECTION 15 – REGULATORY INFORMATION

.....

NSF certified for use in well development and rehabilitation.

RCRA Status: Not a hazardous waste under RCRA 40CFR 261. No reportable quantities.

SARA/TITLE III – CERCLA List: This product does not contain a “CERCLA” listed hazardous substance for emergency release notification under Sec. 304 (40CFR 302).

SARA/TITLE III – Toxic Chemicals List: This product does not contain a toxic chemical for routine annual (Toxic Chemical Release Reporting” under Sec. 313 (40CFR 372).

TSCA Inventory Status: Chemical components listed on TSCA Inventory.

California Proposition 65: This product does not contain any chemicals currently on the California list of known carcinogens and reproductive toxins.

SECTION 16 – OTHER INFORMATION

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Disclaimer: The information contained herein is based on data considered accurate. However, no warranty is expressed or implied regarding the accuracy of this data or the results to be obtained from the user thereof. It is the buyer’s responsibility to ensure that its activities comply with federal, state, provincial and local laws.

JOHNSON SCREENS

A Weatherford Company

Material Safety Data Sheet

SECTION 1 - CHEMICAL PRODUCT AND COMPANY INFORMATION

Product Name: NW-120

Part Number:

Chemical Family: Inorganic acid

Manufacturer's Name: Johnson Screens / A Weatherford Company

Address: P.O. Box 64118 – St. Paul, MN 55164

Product/Technical Information Phone Number: 651-636-3900

Medical/Handling Emergency Phone Number: CHEMTREC 1-800-424-9300

Transportation Emergency Phone Number: CHEMTREC 1-800-424-9300

Issue Date: 06-06-03

Revision Date/Revision Number: 06-06-05 /01

SECTION 2 – COMPOSITION INFORMATION

	% by Weight	
Phosphoric Acid	65 – 80	Food Grade
Orthophosphoric Acid (CAS # 7664-38-2)		

SECTION 3 - HAZARDS IDENTIFICATION

Appearance & Odor: Colorless to lightly colored liquid; nil odor

Emergency Overview: Overexposure may aggravate disorders of the skin / respiratory system

Fire & Explosion Hazards: None currently known

Primary Route(s) of Exposure: Skin, eyes, digestive tract, respiratory system

Inhalation – Acute Effects: May cause irritation / coughing

Skin Contact – Acute Effects: May cause severe irritation; prolonged or repeated skin contact may cause burns, irreversible damage

Eye Contact – Acute Effects: May cause severe irritation / burns; prolonged or repeated eye contact may cause irreversible damage or blindness

Ingestion – Acute Effects: May cause irritation, burns, pain, nausea, vomiting, shock symptoms (rapid pulse, sweating, collapse)

SECTION 4 - FIRST AID MEASURES

.....

Inhalation First Aid: Remove affected person from area to fresh air and provide oxygen if breathing is difficult. Give artificial respiration ONLY if breathing has stopped and give CPR ONLY if there is no breathing and no pulse. Obtain medical attention.

Skin Contact First Aid: Immediately remove clothing from affected area and wash skin for 15 minutes with flowing water and soap. Clothing should be discarded or washed before reuse. Obtain medical assistance if irritation develops.

Eye Contact First Aid: Immediately irrigate eyes with flowing water continuously for 15 minutes while holding eyes open. Contacts should be removed before or during flushing. Obtain medical attention immediately.

Ingestion First Aid: If victim is alert and not convulsing, rinse mouth with water and give plenty of water to drink. If spontaneous vomiting occurs, have affected person lean forward with head down to avoid breathing in of vomitus. Rinse mouth again and give more water to drink. Obtain medical attention.

Medical Conditions Aggravated: Persons with pre-existing skin disorders or eye problems, or impaired respiratory function may be more susceptible to the effects of the substance.

Note to Physician: May give oxygen if breathing difficulty following exposure. Observe for possible delayed reactions.

SECTION 5 - FIRE FIGHTING MEASURES

.....

Flash Point/Method: N/A

Auto Ignition Temperature:

Upper/Lower Explosion Limits: Not determined

Extinguishing Media: Chemical type foam, CO₂ (Carbon Dioxide), dry chemical, water fog

Fire Fighting Procedures: Not considered a fire hazard

Fire & Explosion Hazards: Is not flammable, however the following can occur during a fire: phosphorus oxides and/or phosphine from thermal decomposition and hydrogen from reactive metals.

Hazardous Products of Decomposition and/or Combustion: Oxides of phosphorus

NFPA Ratings:

HEALTH	FLAMMABILITY	REACTIVITY	OTHER
3	0	0	

0 = Insignificant 1 = Slight 2 = Moderate 3 = High 4 = Extreme

SECTION 6 – ACCIDENTAL RELEASE MEASURES

Small spill: neutralize acid spill with alkali such as soda ash, sodium bicarbonate, limestone or lime. Absorb material with an inert material such as sand, vermiculite, diatomaceous earth or other absorbent material and place in chemical waste container to be disposed at an appropriate waste disposal facility according to current applicable laws and regulations and product characteristics at time of disposal. Adequate ventilation is required for soda ash due to the release of carbon dioxide gas. No smoking in spill area.

Large spill: contain with dikes and transfer the material to appropriate containers for reclamation or disposal. Absorb remaining spill with an inert material such as sand, vermiculite or other absorbent material and place in chemical waste container to be disposed at an appropriate waste disposal facility according to current applicable laws and regulations and product characteristics at time of disposal. Neutralize residue with alkali such as soda ash, sodium bicarbonate, limestone or lime. Adequate ventilation is required for soda ash due to the release of carbon dioxide gas. No smoking in spill area.

Release Notes: If spill could potentially enter any waterway, including intermittent dry creeks, contact the local authorities. If in the U.S., contact the US COAST GUARD NATIONAL RESPONSE CENTER toll free number 800-424-8802. In case of accident or road spill notify: CHEMTREC in USA at 800-424-9300; CANUTEC in Canada at 613-996-6666; CHEMTREC in other countries at (International code)+1-703-527-3887.

Comments: See Section 13 for disposal information and Section 15 for regulatory requirements. Large and small spills may have a broad definition depending on the user's handling system. Therefore, the spill category must be defined at the point of release by technically qualified personnel.

SECTION 7 – HANDLING AND STORAGE

Handling: For industrial use only. Heat is generated upon dilution with water. When diluting, add product slowly to water with agitation. Never add water to the acid as severe splashing and reactivity will result. Always add acid to water. ATTENTION: This container hazardous when emptied. Since emptied container contains product residues (vapor or liquid), all labeled hazard precautions must be observed.

Storage: Keep container closed when not in use. Keep out of reach of children.

General Comments: Wear protective equipment when handling. Use only with adequate ventilation. Wash thoroughly after handling. Do not breathe vapor, mist, or dust. Do not get in eyes, on skin, or clothing. Do not swallow.

SECTION 8 – PERSONAL PROTECTION/EXPOSURE CONTROL

Respiratory Protection: If exposure limits are exceeded, or if exposure may occur, use a NIOSH/MSHA respirator approved for your conditions of exposure. Refer to the most recent NIOSH publications concerning chemical hazards, or consult your safety equipment supplier. Respiratory protection programs must be in compliance with OSHA requirements in 29 CFR 1910.134. For emergencies, a NIOSH/MSHA approved positive pressure breathing apparatus should be readily available.

Skin Protection: Acid proof gloves; clean, body covering clothing; rubber apron; rubber boots

Eye Protection: Chemical goggles or faceshield (ANSI Z87.1 or approved equivalent). Always wear eye protection when working with chemicals. Do not wear contact lenses when working with chemicals.

Ventilation Protection: Adequate ventilation is required to minimize exposure or to maintain exposure levels below OSHA/ACGIH requirements. Mechanical general ventilation is usually adequate. Local mechanical ventilation may be required.

Other Protection: Safety shower, eye wash fountain, and washing facilities should be readily available. In case of emergency or when dusting, misting, or splashing may occur, wear respiratory protection, eye protection, gloves, helmet, boots, and complete protective body covering.

Exposure Limits:

OSHA	ACGIH	NIOSH	SUPPLIER
TWA/TLV (ppm)	TWA/TLV (ppm)		
0.25	0.25		

SECTION 9 – PHYSICAL AND CHEMICAL PROPERTIES

Appearance & Odor: Colorless to lightly colored liquid, no odor

Vapor Pressure: 5.700 @ 68° F.

Vapor Density (Air=1): Not determined

Boiling Point: 275° F.

Melting Point: -17.5° C (75% H₃PO₄)

Specific Gravity: 1.5850 @ 60° F.

Solubility in Water: Complete

Volatile Percentage: Not determined

pH: aqueous approx. 1.000 to 2.000

Flash Point/method: N/A

Auto Ignition Temperature: None

Upper/Lower Explosion Limits: Not determined

Other:

SECTION 10 - STABILITY AND REACTIVITY

Stability: Stable under normal conditions of storage and use

Incompatibilities: Inorganic bases, metals/metal blends; contact with some metals can generate explosive hydrogen gas

Polymerization: Will not occur

Decomposition: Oxides of phosphorus and/or phosphine from thermal decomposition and hydrogen gas from reaction with metals

Conditions to Avoid: High temperature

SECTION 11 - TOXICOLOGICAL INFORMATION

Inhalation – Acute: LC₅₀ (guinea pig, mouse, rat, rabbit): 61-1,689 mg/m³

Inhalation – Chronic:

Skin Contact – Acute: LD₅₀ (rabbit): >1,260 to > 3,160 mg/kg

Skin Contact – Chronic:

Eye Contact – Acute:

Ingestion – Acute: LD₅₀ (rat): 1,530 mg/kg

Ingestion – Chronic:

Carcinogenicity/Mutagenicity: No components present in excess of 0.1% by weight are listed as carcinogens by IARC, NTP, or OSHA

Reproductive Effects: 375 mg/kg bw did not affect offspring growth in rats

Neurotoxicity: None known

Other Effects: In vitro bacterial genetic toxicity negative

Target Organs: Overexposure may cause damage to all body tissues

SECTION 12 – ECOLOGICAL INFORMATION

Ecotoxicity: acute toxicity to fish: 96 hour LC₅₀: 3.0 – 3.5 mg/L

Acute toxicity to Daphnia: survival rate depends on pH

Environmental Fate: phosphoric acid undergoes ionic dissociation in water.

Toxicity: Moderately toxic to aquatic organisms as defined by USEPA

Degradation Products: while acidity of this material is readily reduced in natural waters, the resulting phosphate may persist indefinitely or incorporate into biological systems.

SECTION 13 – DISPOSAL CONSIDERATIONS

Material that cannot be used or chemically reprocessed and empty containers should be disposed of in accordance with all applicable regulations. Product containers should be thoroughly emptied before disposal. Generators of waste material are required to

evaluate all waste for compliance with RCRA and any local disposal procedures and regulations. NOTE: State and local regulations may be more stringent than federal regulations.

SECTION 14 – TRANSPORTATION INFORMATION

DOT Shipping Description:

Proper Shipping Name: Phosphoric Acid
 Hazard Class: 8, UN1805, PG III
 Label Requirements: CORROSIVE
 Reportable Quantity: None

European Transportation: ADR/RID Hazard Classification: 8 ADR/RID Item
 Number: 17°C
 U.S. Custom Harmonization Number: 2809.20.00.30

SECTION 15 – REGULATORY INFORMATION

SARA Hazard Category: This product has been reviewed according to the EPA Hazard Categories promulgated under Section 311 and 312 of the Superfund Amendment and Reauthorization Act of 1986 (SARA Title III) and is considered, under applicable definitions, to meet the following categories:

Fire: No Pressure Generating: No Reactivity: No Acute: Yes Chronic: No

40 CFR Part 355 – Extremely Hazardous Substances: None
 40 CFR Part 370 – Hazardous Chemical Reporting: Applicable

TSCA Inventory Status: Chemical components listed on TSCA Inventory

SARA Title III: This product contains the following substances to the reporting requirements of Title III (EPCRA) of the Superfund Amendments and Reauthorization Act of 1986 and 40 CFR Part 372:

Chemical	CAS No.	% by Wt.	CERCLA RQ (lbs)	SARA (1986) Reporting		
				311	312	313
Phosphoric Acid	7664-38-2	65 – 80	5,000	Yes	Yes	No

CERCLA/Superfund, 40 CFR Parts 117, 302: If this product contains components subject to substances designated as CERCLA Reportable Quantity (RQ) Substances, it will be designated in the above table with the RQ value in pounds. If there is a release of RQ Substance to the environment, notification to the National Response Center, Washington, D.C. (1-800-424-8802) is required.

SECTION 16 – OTHER INFORMATION

Disclaimer: The information contained herein is based on data considered accurate. However, no warranty is expressed or implied regarding the accuracy of this data or the results to be obtained from the user thereof. It is the buyer's responsibility to ensure that its activities comply with federal, state, provincial and local laws.

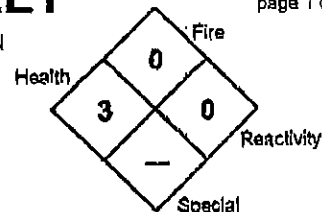
BRENTAG MATERIAL SAFETY DATA SHEET

page 1 of 6

Brenntag MSDS #: **BPI-38297**
 MSDS Revision/Issue Date: **11/28/07**
 Supercodes Revision Date: **New**

NFPA 704 DESIGNATION
HAZARD RATING

4=Extreme
3=High
2=Moderate
1=Slight
0=Insignificant



1. CHEMICAL PRODUCT IDENTIFICATION & COMPANY IDENTIFICATION

PRODUCT IDENTIFIER: Hydrochloric Acid, 20° Be, All Grades (Muriatic Acid)

GENERAL USE: Used in the production of chlorides; pickling and cleaning of metal products; as a catalyst and solvent in organic syntheses; and removing scale from boilers and heat exchange equipment.

PRODUCT DESCRIPTION: An inorganic acid solution. Synonyms include Chlorohydric acid, Hydrochloride, Hydrogen Chloride, Hydrochloric Acid and spirits of salt.

INFORMATION PROVIDED BY: Brenntag Pacific, Inc.
5700 N.W. Front Avenue
Portland, OR 97210

EMERGENCY PHONE NUMBERS:
BRENTAG: 503-899-7055
CHEMTREC: 800-424-9300
CANUTEC: 613-896-8666

For MSDS call: **PHONE: 503-242-0200**

2. COMPOSITION & INFORMATION ON INGREDIENTS

COMPONENT	CAS #	OSHA HAZARD	WT %	ACGIH		OSHA	
				TLV _(TWA)	STEL	PEL _(TWA)	STEL
Hydrochloric Acid	7647-01-0	Corrosive; Lung toxin	31.4 Minimum	None Ceiling: 2 ppm	None	None Ceiling: 5 ppm	None

NDA = No Data Available

N/A = Not Applicable

3. HAZARDS IDENTIFICATION

EMERGENCY OVERVIEW: A clear, colorless liquid having a strong, sharp, acidic odor. The vapors, mists and liquid may cause severe irritation or burns to the eyes, skin and respiratory tract. Inhalation of high vapor or mist concentrations can cause permanent lung damage. The NIOSH I.D.L.H. for Hydrogen Chloride is: 50 ppm.

POTENTIAL HEALTH EFFECTS

INHALATION: Inhalation of vapors or mists can cause severe irritation or burns to the nose, mouth, throat, mucous membranes and lungs. Symptoms of exposure may include sneezing, coughing, choking, chest pain, shortness of breath and impairment of lung function. Inhalation of high vapor or mist concentrations can cause permanent lung damage.

EYE CONTACT: Exposure to the vapors, mists or liquid may cause severe eye irritation or burns. Symptoms of exposure may include tearing, redness, swelling, pain and possible mucous discharge. Direct contact with the liquid can be corrosive to the eye and can cause corneal damage with impairment of vision, unless promptly treated.

SKIN CONTACT: Exposure to the mists or liquid may cause severe skin irritation or burns. Symptoms of exposure may include redness, swelling, discomfort or pain and possible scab formation. Prolonged skin exposure may cause destruction of the dermis with impairment of the skin, at site of contact, to regenerate. No published data indicates this material is absorbed through the skin.

INGESTION: Ingestion can cause severe irritation and/or burns to the entire gastrointestinal tract, including the stomach and intestines, characterized by nausea, vomiting, diarrhea, abdominal pain, bleeding and/or tissue ulceration.

CHRONIC: Repeated inhalation exposure above the ACGIH-TLV or OSHA-PEL may cause chronic bronchitis, impairment of lung function and possible permanent lung damage. Otherwise, the chronic exposure effects are expected to be the same as for acute exposure.

4. FIRST AID MEASURES

- INHALATION:** If inhaled, immediately move to fresh air. If not breathing, give artificial respiration. Do not use mouth-to-mouth method if victim ingested or inhaled the substance; use the Holger Nielsen method (back pressure-arm lift) or proper respiratory device. If breathing is difficult, give oxygen. Call a physician.
- EYE CONTACT:** In case of contact, immediately flush eyes with plenty of clean running water for at least 15 minutes, lifting the upper and lower lids occasionally. Remove contact lenses, if worn. Get medical attention immediately.
- SKIN CONTACT:** In case of contact, immediately flush skin with plenty of clean running water for at least 15 minutes, while removing contaminated clothing and shoes. If burn or irritation occurs, call a physician.
- INGESTION:** If swallowed, DO NOT induce vomiting. Get medical attention immediately. If victim is fully conscious, give plenty of water to drink. Never give anything by mouth to an unconscious person.
- NOTE TO PHYSICIANS:** The hazard associated with this material is its corrosivity to the eyes, skin and mucous membranes. Inhalation exposure above the ACGIH/OSHA Ceiling levels may damage the lungs and, at high concentrations, severe breathing difficulties may occur, which may be delayed in onset and may be due to pulmonary edema (fluid in the lung), laryngeal edema or spasm.
- If ingested, consideration should be given to careful endoscopy as stomach or esophageal burns, perforations or strictures may occur. Careful gastric lavage with an endotracheal tube in place should be considered.
- Treat exposure symptomatically.

5. FIRE FIGHTING MEASURES

- Flashpoint and Method:** Not applicable
- Flammable Limits (in air, % by volume)** Lower: Not applicable Upper: Not applicable
- Autoignition Temperature:** Not applicable
- GENERAL HAZARD:** This material is not combustible but will generate flammable / explosive Hydrogen gas on contact with many metals. The Uniform Fire Code health hazard classification for this material is: Corrosive (Acidic). Dilute solutions of this material may also be corrosive. This material may produce hazardous vapors and hazardous decomposition products.
- FIRE FIGHTING INSTRUCTIONS:** **EXTINGUISHING MEDIA:** Water, foam, CO₂ or dry chemicals.
Use a water spray or fog to cool the containers exposed to the heat of a fire.
- FIRE FIGHTING EQUIPMENT:** Fire fighters should wear full protective equipment, including self-contained breathing apparatus.
- HAZARDOUS COMBUSTION PRODUCTS:** When heated to dryness and decomposition, it emits very toxic Hydrochloric Acid vapors and chloride fumes.

6. ACCIDENTAL RELEASE MEASURES

- LAND SPILL:** Wearing recommended protective equipment and clothing, dike the spill and pick up the bulk of liquid using pumps or a vacuum truck, or absorb the liquid in sand or a commercial absorbent. Place in approved containers for recovery, disposal, or satellite accumulation. Neutralize the acidity, of the remaining liquid, using soda ash, lime, or other agent appropriate for neutralizing acidic liquids. Flush the spill area with water; collect the residues for disposal or sewer, as appropriate.
- Inhalation Hazard: when an inhalation hazard is indicated, use cleaning methods that do not generate dust, aerosols, fumes, vapors or mists. Respiratory equipment is required during the clean-up of the spill.
- WATER SPILL:** Wear recommended protective equipment and clothing if contact with hazardous material can occur. Stop or divert water flow. Dike contaminated water and remove for disposal and/or treatment. As appropriate, notify all downstream users of possible contamination.

7. HANDLING AND STORAGE**STORAGE TEMPERATURE:** Below 38° C. (100° F.)**STORAGE PRESSURE:** Ambient

GENERAL: Store in a cool, dry, well-ventilated area away from incompatible materials and products. Do not store in direct sunlight. Do not get this material in eyes, on skin or on clothing. Wear recommended personal protective equipment when handling this material. Do not breathe vapors, mists or aerosols. Use only with adequate ventilation. Keep the containers tightly closed when not in use. Wash thoroughly after handling.

Do not mix this material with concentrated alkali. Never allow this material or its solutions to contact Aluminum, Magnesium, Zinc or galvanized surfaces as this results in corrosion of the metal and it will generate flammable / explosive Hydrogen gas.

8. EXPOSURE CONTROLS / PERSONAL PROTECTION

CONTROL MEASURES: Use a local or general, mechanical exhaust ventilation system capable of maintaining emissions, in the work area, below the OSHA or ACGIH Ceiling level.

RECOMMENDED PERSONAL PROTECTIVE EQUIPMENT

RESPIRATOR: For exposure above the OSHA or ACGIH Ceiling level, wear a NIOSH approved full facepiece or half mask air-purifying cartridge respirator equipped with an acid gas cartridge or supplied air. For exposure to Hydrogen Chloride above 50 ppm, a full facepiece supplied air respirator or self-contained breathing apparatus operated in the pressure demand and positive pressure mode is recommended by NIOSH.

EYES: Wear chemical goggles (recommended by ANSI Z87.1-1979), unless a full facepiece respirator is worn.

GLOVES: Wear Neoprene, Butyl Rubber, Viton, Viton / Butyl Rubber or Responder gloves.

CLOTHING & EQUIPMENT: Wear a Neoprene or Butyl Rubber apron or full protective clothing when handling this material. An eye wash station and safety shower should be available in the work area.

FOOTWEAR: Wear Neoprene or Butyl Rubber boots.

9. PHYSICAL AND CHEMICAL PROPERTIES

Appearance:	Clear, colorless	Bulk Density (pounds/l):	Not applicable
Physical State:	Liquid	Vapor Pressure:	13 mm Hg @ 20° C. (HCl gas)
Odor:	Strong, sharp, acidic	Vapor Density (air=1):	1.3 (HCl gas)
Odor Threshold:	1 ppm (HCl in air)	Evaporation Rate (n-Butyl Acetate=1):	Approximately 1
Molecular Formula:	HCl (in water)	VOC Content:	Not applicable
Molecular Weight:	36.46 (in water)	% Volatile:	100
Boiling Point:	80 to 85° C. (176 to 185° F.)	Solubility in H₂O:	Complete
Freezing/Melting Point:	-50 to -55° C. (-58 to -67° F.)	Octanol/Water Partition Coefficient:	No data available
Specific Gravity:	Approximately 1.159 @ 20° C.	pH (sat. sol):	Less than 1.0
Density (pounds/gallon):	Approximately 9.67	pH (1% solution):	Less than 1.5

10. STABILITY AND REACTIVITY

GENERAL: This product is stable and hazardous polymerization will not occur.

CONDITIONS TO AVOID: Hot storage.

INCOMPATIBLE MATERIAL: Most metals (especially Aluminum, Magnesium and Zinc), alkali and caustics, organic amines, sulfides, sulfites, cyanides and chlorine releasers.

HAZARDOUS DECOMPOSITION PRODUCTS: When heated to dryness and decomposition, it emits very toxic Hydrochloric Acid vapors and chloride fumes.

SENSITIVITY TO MECHANICAL IMPACT: This material is not sensitive to mechanical impact.

SENSITIVITY TO STATIC DISCHARGE: This material is not sensitive to static discharge.

11. TOXICOLOGICAL INFORMATION

Components:	<u>Hydrochloric Acid</u>
Eye Contact:	Rabbit: 5 mg/30 seconds, rinsed; Mild
Skin Contact:	No data available
Oral Rat LD₅₀:	No data available
Dermal Rabbit LD₅₀:	No data available
Inhalation Rat LC₅₀:	3,124 ppm/1 hour
Human Data:	Inhalation Human LC ₁₀ : 3,000 ppm/5 minutes
Other Toxicological Data:	Oral Rabbit LD ₅₀ : 900 mg/kg
Carcinogenicity:	No data available
Teratogenicity:	Inhalation Rat TC ₁₀ : 450 mg/m ³ /1 hour (female 1 Day prior to mating) Effects on Embryo or Fetus - Fetotoxicity; Specific Developmental Abnormalities - Homeostasis
Mutagenicity:	Hamster Cytogenetic Analysis; lung: 30 mmol/Liter
Synergistic Products:	None reported
Target Organs:	Eyes, Skin, Mucous membranes, Lungs, Gastrointestinal tract & Teeth
Medical Conditions	
Aggravated By Exposure:	Skin, Respiratory or Gastrointestinal disorders

12. ECOLOGICAL INFORMATION**ENVIRONMENTAL FATE:**

This material is completely soluble in water and will significantly affect the pH of the water. No specific environmental fate data is available on this material.

ENVIRONMENTAL CONSIDERATIONS:

The aquatic toxicity for Hydrogen Chloride is: 96 hour TLM *Gambusia affinis* (mosquito fish) = 282 ppm (fresh water). Cocker 48 hour LC₅₀ = 330 to 1,000 mg/Liter. Trout 24 hour LC₁₀₀ = 10 mg/Liter.

13. DISPOSAL CONSIDERATIONS

RCRA 40 CFR 261 CLASSIFICATION: Corrosive Waste

U.S. EPA WASTE NUMBER/DESCRIPTION: D002

If this material is disposed of as shipped, it meets the criteria of a hazardous waste as defined under 40 CFR 261 due to its corrosivity. If this material becomes a waste, it will be a hazardous waste which is subject to the Land Disposal Restrictions under 40 CFR 268 and must be managed accordingly. As a hazardous liquid waste, it must be disposed of in accordance with local, state, and federal regulations in a permitted hazardous waste treatment, storage, and disposal facility.

14. TRANSPORTATION INFORMATION

DOT PROPER SHIPPING NAME:	Hydrochloric acid		
	Hazard Class: 8	UN Number: UN1789	Packing Group: II
	Primary Label: Corrosive	Subsidiary Label(s): None Required	
	Primary/Subsidiary Placards: Corrosive		
DOT Reportable Quantity (RQ):	5,000 pounds (HCl)	RQ for Product:	16,923 pounds (1,647 gallons)
Marine Pollutant:	No		
2004 North American Emergency Response Guidebook No.:	157		
TDG PROPER SHIPPING NAME:	HYDROCHLORIC ACID		
	Hazard Class: 8	UN Number: UN1789	Packing Group: II
	Primary Label: Corrosive	Subsidiary Label(s): None Required	
	Primary/Subsidiary Placards: Corrosive		
TDG Reportable Quantity (RQ):*	At least 5 kg or 5 liters.		
TDG Schedule XII:	Yes (Greater than 20% concentration) for quantities exceeding 3,000 kg or 3,000 liters net/tank.		
Regulated Limit (RL):**	230 kg (HCl)	RL for Product:	732.5 kg (632 liters)
Other Shipping Information:	None		

* Canadian Transportation of Dangerous Goods Regulations (TDGR), Part IX, Table I, Quantities or levels for immediate reporting: releases of reportable quantities, RQ, that meet the definition of a "dangerous occurrence" (a threat to life, health, property, or the environment) must be reported to the appropriate authorities as outlined in TDGR 9.13(1) and 9.14(1).

** Reporting to Environment Canada is required for any releases exceeding the regulated limits, RL, of R2 materials (primary or secondary). The regulated limits are found in Schedule XIII of the TDGR.

15. REGULATORY INFORMATION

COMPONENTS: Hydrochloric Acid
OSHA Target Organs: Eyes, Skin, Mucous membranes,
 Lungs, Gastrointestinal tract &
 Teeth

Carcinogenic Potential:

Regulated by OSHA: No
Listed on NTP Report: No
Listed by IARC: Yes
IARC Group: Group 3
ACGIH Appendix A: (A4)
A1 Confirmed Human: Not applicable
A2 Suspected Human: Not applicable

U.S. EPA Requirements**Release Reporting****CERCLA (40 CFR 302)**

Listed Substance: Yes
Reportable Quantity: 5,000 pounds
Category: D
RCRA Waste No.: None listed

Unlisted Substance: Not applicable
Reportable Quantity: Not applicable
Characteristic: Not applicable
RCRA Waste No.: Not applicable

SARA TITLE III**Section 302 & 303 (40 CFR 355):**

Listed Substance: Not listed
Reportable Quantity: Not applicable
Planning Threshold: Not applicable

Section 311 & 312 (40 CFR 370):

Hazard Categories (product): Fire: **N** Sudden Release of Pressure: **N** Reactive: **N** Acute Health: **Y** Chronic Health: **N**
Planning threshold: 10,000 pounds

Section 313 (40 CFR 372):

Listed Toxic Chemical: Yes (Acid aerosols, mists & vapors)
Reporting Threshold: 25,000 pounds

U.S. TSCA Status

Listed (40 CFR 710): Yes

State Regulations**State of California: Safe Drinking Water and Toxins Enforcement Act, 1986 (Proposition 65):**

Carcinogen: No
Reproductive Toxin: No

Other Regulations

State Right To Know Laws: MA, NJ, PA

Canadian Regulations**Product Information:**

Controlled Product: Yes
WHMIS Hazard Symbols: Materials Causing Immediate and Serious Toxic Effect; Corrosive Material
WHMIS Class & Division: D.1A; E

Ingredient Information:

IDL Substance: Yes
DSL or NDSL Lists: DSL

PRODUCT IDENTIFIER: Hydrochloric Acid, 20° Be. All Grades

page 6 of 6

16. OTHER INFORMATION

EPA Registration number: Not applicable

Approved Product Uses: Not applicable

Special Notes:

This product does not contain any material, which the State of California has found to cause cancer and/or birth defects or other reproductive harm.

SARA 302 Additional Information:

Hydrogen Chloride gas is an extremely hazardous substance - RQ = 5,000 pounds; TPQ = 500 pounds.

The DEA regulates Hydrochloric Acid as an essential chemical only when it is exported to the following countries: Argentina, Bolivia, Brazil, Chile, Columbia, Ecuador, French Guyana, Panama, Paraguay, Peru, Suriname, Uruguay and Venezuela.

Special Instructions:

Store Hydrochloric Acid, 20° Baume in a cool, dry, well-ventilated area away from incompatible materials and products.

Do not add this material to hypochlorite bleaches, chlorine sanitizers or chlorinated cleaners as this generates toxic, corrosive Chlorine gas.

MSDS Revision Information: Information Revised This Issue Date: **New product MSDS.**

Form Revision made 2/03/06

MSDS Distributed by: Brenntag Pacific, Inc.

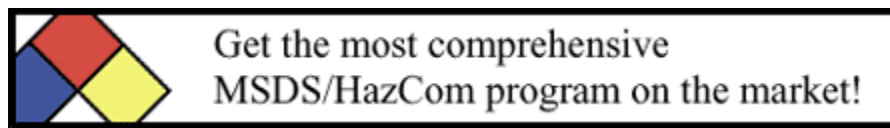
NW Environmental Department

Phone: 503-242-0200 FAX: 503-412-3390

Prepared By: Edward Doherty

Date Prepared: November 28, 2007

This Material Safety Data Sheet is provided as an information resource only. It should not be taken as a warranty or representation for which Brenntag Pacific, Inc. assumes legal responsibility. While Brenntag Pacific, Inc. believes the information contained herein is accurate and compiled from sources believed to be reliable, it is the responsibility of the user to investigate and verify its validity. The buyer assumes all responsibility of using and handling the product in accordance with applicable federal, state, and local regulations.



Material Safety Data Sheet

SECTION I - Material Identity
 SECTION II - Manufacturer's Information
 SECTION III - Physical/Chemical Characteristics
 SECTION IV - Fire and Explosion Hazard Data
 SECTION V - Reactivity Data
 SECTION VI - Health Hazard Data
 SECTION VII - Precautions for Safe Handling and Use
 SECTION VIII - Control Measures
 SECTION IX - Label Data
 SECTION X - Transportation Data
 SECTION XI - Site Specific/Reporting Information
 SECTION XII - Ingredients/Identity Information

SECTION I - Material Identity

Item Name	
Part Number/Trade Name	AQUA CLEAR (R) MGA
National Stock Number	6810L4163452027
CAGE Code	BAROI
Part Number Indicator	A
MSDS Number	192696
HAZ Code	B

SECTION II - Manufacturer's Information

Manufacturer Name	BAROID DRILLING FLUIDS / HALLIBURTON ENERGY
P.O. Box	1675
City	HOUSTON
State	TX
Country	US
Zip Code	77251
Emergency Phone	800-666-9260
Information Phone	281-871-4000

MSDS Preparer's Information

Date MSDS Prepared/Revised	08JUN00
Active Indicator	Y

Alternate Vendors

SECTION III - Physical/Chemical Characteristics

Net Propellant Weight (Ammo)	1.6
Appearance/Odor	SOLID, OFF WHITE, ODORLESS
Boiling Point	ND
Melting Point	ND
Vapor Density	ND
Specific Gravity	2.07
Solubility in Water	17.7
Container Type	R
Container Pressure Code	1
Temperature Code	4
Product State Code	S

SECTION IV - Fire and Explosion Hazard Data

Flash Point Method	UNK
Lower Explosion Limit	ND
Upper Explosion Limit	ND
Extinguishing Media	WATER, CARBON DIOXIDE, DRY CHEMICALS, FOAM
Special Fire Fighting Procedures	DECOMPOSITION IN FIRE MAY PRODUCE TOXIC GASES. DO NOT ALLOW RUNOFF TO ENTER WATERWAYS
Unusual Fire/Explosion Hazards	FULL PROTECTIVE CLOTHING AND APPROVED SCBA REQUIRED FOR FIRE FIGHTING PERSONNEL

SECTION V - Reactivity Data

Stability	YES
Stability Conditions to Avoid	KEEP AWAY FROM HEAT, SPARKS AND FLAME
Materials to Avoid	STRONG OXIDIZERS, STRONG ALKALIS, NITRIC ACID, AMMONIUM COMPOUNDS, MAINES
Hazardous Decomposition Products	OXIDES OF NITROGEN. OXIDES OF SULFUR. CARBON MONOXIDE AND CARBON DIOXIDE
Hazardous Polymerization	NO
Polymerization Conditions to Avoid	WILL NOT OCCUR

SECTION VI - Health Hazard Data

Route of Entry: Skin	U
Route of Entry: Ingestion	U
Route of Entry: Inhalation	U
Health Hazards - Acute and Chronic	[EYE] MAY CAUSE BURNS [SKIN] IRRITATION [INHAL] RESPIRATORY IRRITATION
Symptoms of Overexposure	SEE ABOVE
Medical Cond. Aggravated by Exposure	NR
Emergency/First Aid Procedures	[INHAL] REMOVE FROM AREA TO FRESH AIR. GET MED ATTEN IF RESPIRATORY IRRITATION DEVELOPS OR IF BREATHING BECOMES DIFFICULT. [SKIN] WASH WITH SOAP AND WATER. GET MED ATTEN IF IRRITATION PERSISTS. [EYE] IN CASE OF CONTACT, IMMEDIATELY FLUSH EYES WITH PLENTY OF WATER FOR AT LEAST 15 MIN AND GET MED ATTEN IF IRRITATION PERSISTS. [INGEST] GIVE AT LEAST 3-4 GLASSES OF WATER, BUT DO NOT INDUCE VOMITING. DO NOT GIVE ANYTHING BY MOUTH TO AN UNCONSCIOUS OR CONVULSING PERSON. GET MED ATTEN

SECTION VII - Precautions for Safe Handling and Use

Steps if Material Released/Spilled	USE APPROPRIATE PROTECTIVE EQUIPMENT. AVOID CREATING AND BREATHING DUST. SCOOP UP AND REMOVE
Neutralizing Agent	NR
Waste Disposal Method	BURY IN A LICENSED LANDFILL ACCORDING TO FEDERAL, STATE, AND LOCAL REGULATIONS
Handling and Storage Precautions	AVOID CREATING OR INHALING DUST. STORE AWAY FROM ALKALIS. STORE IN A COOL, DRY LOCATION
Other Precautions	NR

SECTION VIII - Control Measures

Respiratory Protection	DUST/MIST RESPIRATOR
Ventilation	USE IN A WELL VENTILATED AREA
Protective Gloves	IMPERVIOUS RUBBER GLOVES
Eye Protection	CHEMICAL GOGGLES - ALSO WEAR

Other Protective Equipment	FACE SHIELD IF SPLASHING HAZARE EXISTS
Work Hygenic Practices	EYEWASH FOUNTAINS AND SAFETY SHOWERS WASH THOROUGHLY AFTER HANDLING

SECTION IX - Label Data

Protect Eye	YES
Protect Skin	YES
Protect Respiratory	YES
Chronic Indicator	UNKNOWN
Contact Code	UNKNOWN
Fire Code	UNKNOWN
Health Code	UNKNOWN
React Code	UNKNOWN

SECTION X - Transportation Data

SECTION XI - Site Specific/Reporting Information

Volatile Organic Compounds (P/G)	0
Volatile Organic Compounds (G/L)	0

SECTION XII - Ingredients/Identity Information

Ingredient #	01
Ingredient Name	SULFAMIC ACID (60-100%)
CAS Number	5329146
Proprietary	NO
Percent	100
Ingredient #	02
Ingredient Name	SODIUM CHLORIDE (NACL) (10-30%)
CAS Number	7647145
Proprietary	NO
Percent	30



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San Bernardino County Fire Department • Hazardous Materials Division
620 South E Street, San Bernardino, CA 92415-0153 • (909) 386-8401 FAX (909) 386-8460

HAZARDOUS MATERIALS INVENTORY FORM - Chemical Description

MATERIAL
 WASTE

One page per item. Indicate if material OR waste (Do not combine material and waste on one form)
MAKE COPIES OF THIS FORM AS NEEDED.

ATTACH A MATERIAL SAFETY DATA SHEET (MSDS) IF THE MATERIAL IS NOT LISTED IN APPENDIX I OF THIS GUIDE.

ITEM NUMBER 48

FACILITY ID #	F A	CHEMICAL LOCATION INFORMATION
BUSINESS NAME	Rayne Christensen Co	FACILITY MAP #
BUSINESS SITE ADDRESS	11001 Etiwanda Ave Fontana CA, 92337	GRID COORDINATE(s)
		C-4

CHEMICAL INFORMATION

CHEMICAL NAME	Hydroxyacetic Acid	TRADE SECRET	<input checked="" type="checkbox"/> NO
COMMON NAME	Hydroxyacetic Acid	EHS*	<input type="checkbox"/> YES <input checked="" type="checkbox"/> NO
CAS#	79-14-1	EHS = Extremely Hazardous Substance (Appdx B) *If EHS is "YES", all amounts MUST be in pounds	

HAZARDOUS MATERIAL TYPE (Check one item only)	<input type="checkbox"/> a. PURE <input checked="" type="checkbox"/> b. MIXTURE <input type="checkbox"/> c. WASTE	RADIOACTIVE? Yes <input type="checkbox"/> No <input checked="" type="checkbox"/>	CURIES
PHYSICAL STATE (Check one item only)	<input type="checkbox"/> a. SOLID <input checked="" type="checkbox"/> b. LIQUID <input type="checkbox"/> c. GAS <input type="checkbox"/> d. DUST	SIZE OF LARGEST CONTAINER: 55 gal	

FED HAZARD CATEGORIES a. FIRE b. REACTIVE c. PRESSURE RELEASE d. ACUTE HEALTH e. CHRONIC HEALTH

AVERAGE AMOUNT	220	MAXIMUM AMOUNT	440	ANNUAL WASTE AMOUNT	STATE WASTE CODE
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UNITS* (Check one item only) a. GALLONS b. CUBIC FEET c. POUNDS d. TONS E. OTHER: _____

DAYS ON SITE: **365**

STORAGE CONTAINER (Check all that apply)

<input type="checkbox"/> a. ABOVEGROUND TANK	<input checked="" type="checkbox"/> e. PLASTIC/NONMETALLIC DRUM	<input type="checkbox"/> i. FIBER DRUM	<input type="checkbox"/> m. GLASS BOTTLE	<input type="checkbox"/> q. RAIL CAR
<input type="checkbox"/> b. UNDERGROUND TANK	<input type="checkbox"/> f. CAN	<input type="checkbox"/> j. BAG	<input type="checkbox"/> n. PLASTIC BOTTLE	<input type="checkbox"/> r. OTHER
<input type="checkbox"/> c. TANK INSIDE BUILDING	<input type="checkbox"/> g. CARBOY	<input type="checkbox"/> k. BOX	<input type="checkbox"/> o. TOTE BIN	
<input type="checkbox"/> d. STEEL DRUM	<input type="checkbox"/> h. SILO	<input type="checkbox"/> l. CYLINDER	<input type="checkbox"/> p. TANK WAGON	

STORAGE PRESSURE a. AMBIENT b. ABOVE AMBIENT c. BELOW AMBIENT

STORAGE TEMPERATURE a. AMBIENT b. ABOVE AMBIENT c. BELOW AMBIENT d. CRYOGENIC

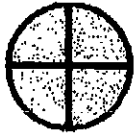
%WT	COMPOSITION (LIST ALL COMPONENTS, HAZARDOUS FIRST)	EHS	CAS #
1. 68%	Glycolic Acid	<input type="checkbox"/> YES <input checked="" type="checkbox"/> NO	79-14-1
2.		<input type="checkbox"/> YES <input type="checkbox"/> NO	
3.		<input type="checkbox"/> YES <input type="checkbox"/> NO	
4.		<input type="checkbox"/> YES <input type="checkbox"/> NO	
5.		<input type="checkbox"/> YES <input type="checkbox"/> NO	

If more hazardous components are present at greater than 1% by weight if non-carcinogenic or 0.1% by weight if carcinogenic, attach additional sheets

NOTES (Trade names/synonyms or other information relevant to the substances listed)

If EPCRA, Owner/Operator please sign this page

Date: _____



**HERMAN
CHEMICAL
TRADING**

99 Trophy Club Drive
Trophy Club, TX 76262
817-430-5845 phone
817-430-5832 fax

SECTION 1: CHEMICAL PRODUCT and COMPANY IDENTIFICATION

MSDS No. 131067

Product Name: Glycolic Acid Solution, 68% minimum
Synonyms: Hydroxyacetic acid.

Supplier: Herman Chemical Trading
Address: 99 Trophy Club Drive
Trophy Club, TX 76262

Business Phone: 817-430-5845
Business Fax: 817-430-5832

CHEMTREC Number:

For emergencies in the US, call CHEMTREC: 800-424-9300

SECTION 2: COMPOSITION, INFORMATION ON INGREDIENTS

Chemical Name	Glycolic acid
CAS#	79-14-1
% Weight (Typical)	68-70%

SECTION 3: HAZARDS IDENTIFICATION

Emergency Overview: Corrosive. Reproductive effects. Irritant.

Glycolic Acid:

Route of Exposure: Eyes. Skin. Inhalation. Ingestion.

Potential Health Effects:

Eye Contact: Corrosive, contact causes severe eye burns which may result in permanent tissue and corneal damage.

Skin Contact: Corrosive causes skin burns and severe irritation.

Inhalation: Corrosive. Vapor may cause severe irritation to the respiratory tract.

Ingestion: Risk of internal burns if ingested.

Target Organs: Eyes. Skin. Respiratory system. G.I. Tract. Kidney. Reproductive System.

SECTION 4 : FIRST AID MEASURES

Eye Contact:	Immediately flush eyes with plenty of water for at least 20 minutes. Assure adequate flushing of the eyes by separating the eyelids with fingers. Get immediate medical attention if irritation persists, or symptoms of overexposure become apparent.
Skin Contact:	Immediately wash skin with plenty of water for at least 20 minutes, while removing contaminated clothing and shoes. Get medical attention especially, if irritation develops, persists, or symptoms of overexposure become apparent.
Inhalation:	Remove to fresh air. If not breathing, give artificial respiration or give oxygen by trained personnel. Keep warm. Get immediate medical attention.
Ingestion:	If swallowed, call a physician or poison control center immediately. Never give anything by mouth to an unconscious person. Do not induce vomiting unless instructed by medical personnel. Get medical attention.

SECTION 5 : FIRE FIGHTING MEASURES

Flash Point:	No data
Extinguishing Media:	Use dry powder or carbon dioxide when fighting a fire involving this material.
Unsuitable Media:	Water extinguishers are not recommended.
Protective Equipment:	As in any fire, wear self-contained breathing apparatus pressure-demand, NIOSH (approved or equivalent) and full protective gear.

SECTION 6 : ACCIDENTAL RELEASE MEASURES

Personal Precautions:	Use proper personal protective equipment as listed in section 8.
Spill Cleanup Measures:	Clean up spills immediately, observing precautions in the Protective Equipment section. Sweep up, then place into a suitable container for disposal. Refer to section 13 for disposal requirements.
Environmental Precautions:	Do not allow material to enter drains or streams.

SECTION 7 : HANDLING and STORAGE

Handling:	This product should be handled only by, or under the close supervision of, those properly qualified in the handling and use of potentially hazardous chemicals, who should take into account the fire, health and chemical hazard data. It should always be handled in an efficient fume hood or equivalent system. The user should consider that the toxicological and physiological properties of many compounds are not yet well determined and that new hazardous products may arise from reactions between chemicals. Care should be taken to prevent any chemical from coming into contact with the skin or eyes and from contaminating personal clothing.
Storage:	Store in a cool, dry, well ventilated area away from sources of heat and incompatible substances. Keep container tightly closed when not in use. Product is hygroscopic.
Hygiene Practices:	Wash thoroughly after handling. Avoid contact with eyes and skin. Avoid inhaling dust.

SECTION 8 : EXPOSURE CONTROLS, PERSONAL PROTECTION

Engineering Controls:	Use appropriate engineering control such as process enclosures, local exhaust ventilation, or other engineering controls to control airborne levels below recommended exposure limits. Where such systems are not effective wear suitable personal protective equipment, which performs satisfactorily and meets OSHA or other recognized standards. Consult with local procedures for selection, training, inspection and maintenance of the personal protective equipment.
Skin Protection Description:	Wear suitable protective clothing to prevent contact with skin.
Hand Protection Description:	Wear appropriate protective gloves. Consult glove manufacturers for glove permeability data.
Eye/Face Protection:	Wear appropriate protective glasses or splash goggles as described by 29 CFR 1910.133, OSHA eye and face protection regulation, or the European standard EN 166.
Respiratory Protection:	A NIOSH approved air-purifying respirator with an appropriate cartridge or canister may be permissible under certain circumstances where airborne concentrations are expected to exceed exposure limits. Protection provided by air purifying respirators is limited to airborne concentrations that are typically within 10 times the exposure limit. Use a positive pressure air supplied respirator if there is any potential for an uncontrolled release, exposure levels are not known, or any other circumstances where air-purifying respirators may not provide adequate protection. A respiratory protection program that meets OSHA's 29 CFR 1910.134 and ANSI Z88.2 requirements must be followed whenever workplace conditions warrant a respirators use.
Other Protective:	Facilities storing or utilizing this material should be equipped with an eyewash facility and a safety shower.

SECTION 9 : PHYSICAL and CHEMICAL PROPERTIES

Physical State/Appearance:	Liquid
Color:	Amber liquid
pH:	2 (50 g/L @ 20°C (68°F))
Vapor Pressure:	Water
Flash Point:	> 200°F
Boiling Point:	230°~240°F
Melting Point:	N/A
n-Octanol/water partition coefficient:	N/A
Solubility in Water:	Very soluble
Density:	1.25
Molecular Formula:	C ₂ H ₄ O ₃
Molecular Weight:	76.05

SECTION 10 : STABILITY and REACTIVITY

Conditions to Avoid:	High temperatures, flames and sparks. Humidity.
Incompatibilities with Other Materials:	Oxidizing agents.
Possible Decomposition Product:	Carbon monoxide.

SECTION 11 : TOXICOLOGICAL INFORMATION

Glycolic Acid:	As 100% Glycolic Acid
RTECS Number:	MC5250000
Eye Effect:	Eye - rabbit: 2 mg; Severe Irritation. (RTECS)
Skin Effects:	No data reported in the cited references as of the revision date.
Ingestion Effects:	Oral - rat LD50: 1950 mg/kg [Behavioral - somnolence (general depressed activity) Gastrointestinal - other changes Kidney, Ureter, Bladder - other changes] (RTECS); Oral - rat LD50: 4240 mg/kg (Supplier data); Oral - guinea pig LD50: 1920 mg/kg [Behavioral - somnolence (general depressed activity) Gastrointestinal - other changes Kidney, Ureter, Bladder - other changes] (RTECS)
Inhalation Effects:	Inhalation - rat LC50: 7100 ug/m3/4H [Sense Organs and Special Senses (Olfaction) - effect, not otherwise specified Lungs, Thorax, or Respiration - dyspnea Nutritional and Gross Metabolic - weight loss or decreased weight gain] (RTECS); Inhalation - rat LC50: 7.7 mg/L/4H (Supplier data)
Chronic Ingestion Effects:	Oral - rat TDLo: 2480 gm/kg/35W-C Kidney, Ureter, Bladder - other changes Nutritional and Gross Metabolic - weight loss or decreased weight gain Related to Chronic Data - death; Oral - rat TDLo: 52500 mg/kg/3W-C Kidney, Ureter, Bladder - other changes Nutritional and Gross Metabolic - changes in calcium (RTECS)
Chronic Inhalation Effects:	Inhalation - rat TCLo: 2 gm/m3/6H/2W-I Sense Organs and Special Senses (Olfaction) - effect, not otherwise specified Lungs, Thorax, or Respiration - dyspnea Nutritional and Gross Metabolic - weight loss or decreased weight gain (RTECS)
Teratogenicity:	Teratogenic effects. (RTECS)
Exposure Limits:	None established.

SECTION 12 : ECOLOGICAL INFORMATION

Ecotoxicity:	LC50 Brachydanio rerio 5000 mg/L/96H (supplier data). May be harmful to aquatic organisms because of the pH shift.
Bioaccumulation:	Not expected to bioaccumulate and/or bioconcentrate in aquatic organisms.
Biodegradation:	Readily biodegradable in soil and water (supplier data).
Environmental Stability:	Not expected to cause long-term adverse effects in the environment.

SECTION 13 : DISPOSAL CONSIDERATIONS

Waste Disposal:	Consult with the US EPA Guidelines listed in 40 CFR Part 261.3 for the classifications of hazardous waste prior to disposal. Furthermore, consult with your state and local waste requirements or guidelines, if applicable, to ensure compliance. Arrange disposal in accordance to the EPA and/or state and local guidelines, by a licensed disposal company.
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SECTION 14 : TRANSPORT INFORMATION

DOT Shipping Name:	Corrosive solid, acidic, organic, n.o.s. (Glycolic acid)
DOT Hazard Class:	8
DOT Identification Number:	UN3261
DOT Packing Group:	II
DOT Subpart E Labeling Requirement:	8

SECTION 15 : REGULATORY INFORMATION

Glycolic Acid:

TSCA 8(b): Inventory Status:

Listed on the TSCA inventory.

TSCA 12(b): Export Notification

None of the chemicals are listed under TSCA Section 12b.

SARA:

CAS # 79-14-1: acute, chronic.

State:

Glycolic acid is not present on state lists from CA, PA, MN, MA, FL, or NJ. California No Significant Risk Level: None of the chemicals in this product are listed.

Risk Phrases:

R34 Causes burns.

Safety Phrase:

S26 In case of contact with eyes, rinse immediately with plenty of water and seek medical advice.

S36/37/39 Wear suitable protective clothing, gloves and eye/face protection.

S45 In case of accident or if you feel unwell, seek medical advice immediately

SECTION 16 : ADDITIONAL INFORMATION

Disclaimer:

This Health and Safety Information is correct to the best of our knowledge and belief at the date of its publication but we cannot accept liability for any loss, injury or damage which may result from its use. We shall ensure, so far as is reasonably practicable, that any revision of this Data Sheet is sent to all customers to whom we have directly supplied this substance, but must point out that it is the responsibility of any intermediate supplier to ensure that such revision is passed to the ultimate user. The information given in the Data Sheet is designed only as a guidance for safe handling, storage and the use of the substance. It is not a specification nor does it guarantee any specific properties. All chemicals should be handled only by competent personnel, within a controlled environment.



CUPA

San Bernardino County Fire Department • Hazardous Materials Division
620 South E Street, San Bernardino, CA 92415-0153 • (909) 386-8401 FAX (909) 386-8460

HAZARDOUS MATERIALS INVENTORY FORM - Chemical Description MATERIAL WASTE
 One page per item. Indicate if material OR waste (Do not combine material and waste on one form) MAKE COPIES OF THIS FORM AS NEEDED.
 ATTACH A MATERIAL SAFETY DATA SHEET (MSDS) IF THE MATERIAL IS NOT LISTED IN APPENDIX I OF THIS GUIDE.

ITEM NUMBER 5

FACILITY ID #	F A	CHEMICAL LOCATION INFORMATION
BUSINESS NAME	Layne Christensen Co	FACILITY MAP #
BUSINESS SITE ADDRESS	11001 Etiwanda ave, Fontana CA 92337	GRID COORDINATE(S)
		C-4

CHEMICAL INFORMATION

CHEMICAL NAME	Sodium Hypochlorite	TRADE SECRET	<input checked="" type="checkbox"/> NO
COMMON NAME	Sodium Hypochlorite	EHS*	<input type="checkbox"/> YES <input checked="" type="checkbox"/> NO
CAS#	007681-52-9	EHS = Extremely Hazardous Substance (Appdx B) *If EHS is "YES", all amounts MUST be in pounds	
HAZARDOUS MATERIAL TYPE (Check one item only)	<input type="checkbox"/> a. PURE <input checked="" type="checkbox"/> b. MIXTURE <input type="checkbox"/> c. WASTE	RADIOACTIVE? Yes <input type="checkbox"/> No <input checked="" type="checkbox"/>	CURIES
PHYSICAL STATE (Check one item only)	<input type="checkbox"/> a. SOLID <input checked="" type="checkbox"/> b. LIQUID <input type="checkbox"/> c. GAS <input type="checkbox"/> d. DUST	SIZE OF LARGEST CONTAINER: 55 gal	

FED HAZARD CATEGORIES a. FIRE b. REACTIVE c. PRESSURE RELEASE d. ACUTE HEALTH e. CHRONIC HEALTH

AVERAGE AMOUNT	220	MAXIMUM AMOUNT		ANNUAL WASTE AMOUNT		STATE WASTE CODE	
----------------	-----	----------------	--	---------------------	--	------------------	--

UNITS* (Check one item only) a. GALLONS b. CUBIC FEET c. POUNDS d. TONS e. OTHER: _____

DAYS ON SITE **365**

STORAGE CONTAINER (Check all that apply)

<input type="checkbox"/> a. ABOVEGROUND TANK	<input checked="" type="checkbox"/> e. PLASTIC/NONMETALLIC DRUM	<input type="checkbox"/> i. FIBER DRUM	<input type="checkbox"/> m. GLASS BOTTLE	<input type="checkbox"/> q. RAIL CAR
<input type="checkbox"/> b. UNDERGROUND TANK	<input type="checkbox"/> f. CAN	<input type="checkbox"/> j. BAG	<input type="checkbox"/> n. PLASTIC BOTTLE	<input type="checkbox"/> r. OTHER
<input type="checkbox"/> c. TANK INSIDE BUILDING	<input type="checkbox"/> g. CARBOY	<input type="checkbox"/> k. BOX	<input type="checkbox"/> o. TOTE BIN	
<input type="checkbox"/> d. STEEL DRUM	<input type="checkbox"/> h. SILO	<input type="checkbox"/> l. CYLINDER	<input type="checkbox"/> p. TANK WAGON	

STORAGE PRESSURE a. AMBIENT b. ABOVE AMBIENT c. BELOW AMBIENT

STORAGE TEMPERATURE a. AMBIENT b. ABOVE AMBIENT c. BELOW AMBIENT d. CRYOGENIC

%WT	COMPOSITION (LIST ALL COMPONENTS, HAZARDOUS FIRST)	EHS	CAS #
1. 12.5 ^{ppm}	Sodium Hypochlorite	<input type="checkbox"/> YES <input checked="" type="checkbox"/> NO	007681-52-9
2. 0.8 ^{ppm}	Sodium Hydroxide	<input type="checkbox"/> YES <input checked="" type="checkbox"/> NO	001310-73-2
3.		<input type="checkbox"/> YES <input type="checkbox"/> NO	
4.		<input type="checkbox"/> YES <input type="checkbox"/> NO	
5.		<input type="checkbox"/> YES <input type="checkbox"/> NO	

If more hazardous components are present at greater than 1% by weight if non-carcinogenic or 0.1% by weight if carcinogenic, attach additional sheets

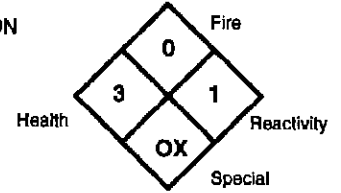
NOTES (Trade names/synonyms or other information relevant to the substances listed)	If EPCRA, Owner/Operator please sign this page

Date: _____

MATERIAL SAFETY DATA SHEET



NFPA 704 DESIGNATION
HAZARD RATING



4 = Extreme
3 = High
2 = Moderate
1 = Slight
0 = Insignificant

ISSUE DATE: 05/07/02

SUPERSEDES: 08/13/97

1. CHEMICAL PRODUCT IDENTIFICATION & COMPANY IDENTIFICATION

PRODUCT IDENTIFIER: SODIUM HYPOCHLORITE

GENERAL USE: This product is used as an industrial bleaching solution. This product is not registered with the EPA for use as a disinfectant or sanitizer and can not be used for these purposes.

PRODUCT DESCRIPTION: An aqueous solution of sodium hypochlorite. Synonyms for sodium hypochlorite include: bleach; Dakins solution; hyclorite; sodium chloride oxide; and sodium oxychloride.

INFORMATION PROVIDED BY: LA Chemical
4545 Ardine St.
South Gate, CA 90280
Phone: 323-832-5000 Fax: 323-773-0909

EMERGENCY PHONE NUMBERS

LA Chemical: 323-832-5000
CHEMTREC: 800-424-9300

2. COMPOSITION & INFORMATION ON INGREDIENTS

COMPONENT	CAS #	OSHA HAZARD	WL%	ACGIH		OSHA	
				TLV (TWA)	STEL	PEL (TWA)	STEL
Sodium Hypochlorite	007681-52-9	Corrosive; Lung Hazard	12.5 Minimum	N/A	N/A	N/A	N/A
Sodium Hydroxide	001310-73-2	Corrosive; Lung Hazard	0.8 Maximum	N/A Ceiling: 2 mg/m ³	N/A	2 mg/m ³	N/A

N/A = Not Applicable

3. HAZARDS IDENTIFICATION

EMERGENCY OVERVIEW:

A clear, yellow-green liquid with a chlorine-like odor. Liquid and mists may be corrosive to all tissues contacted. Inhalation of mist can cause permanent lung damage.

POTENTIAL HEALTH EFFECTS:

INHALATION: Inhalation of vapors or mists may cause severe irritation or burns to the respiratory tract. Symptoms of exposure may include: shortness of breath, sneezing, choking, chest pain, and impairment of lung function. Inhalation may result in permanent lung damage.

EYE CONTACT: Exposure to vapors, mists, or liquid may cause severe eye irritation or burns. Symptoms of exposure may include: tearing, redness, swelling, and pain. Corneal damage with impairment of vision may result from direct contact with liquid.

SKIN CONTACT: Exposure to vapors, mists, or liquid may cause severe skin irritation or burns. Symptoms of exposure may include: redness, swelling, itching, a stinging sensation, and pain. Prolonged skin exposure to liquid may cause destruction of the dermis with impairment of the skin, at site of contact, to regenerate. No published data indicates material is absorbed through the skin.

INGESTION: Ingestion may cause severe irritation or burns to the gastrointestinal tract. Symptoms of exposure may include: nausea, vomiting, diarrhea, abdominal pain, bleeding and/or tissue ulceration.

CHRONIC: The chronic health effects of exposure to liquid or mists would be the same as for acute exposure.

4. FIRST AID MEASURES

INHALATION: If inhaled, immediately move to fresh air. If not breathing, give artificial respiration. **Do not use mouth-to-mouth method** if victim ingested or inhaled the substance; **use** the Holger Nielsen method (back pressure-arm lift) or proper respiratory device. If breathing is difficult, give oxygen. Call a physician.

EYE CONTACT: In case of contact, immediately flush eyes with plenty of clean running water for at least 15 minutes, lifting the upper and lower lids occasionally. Remove contact lenses, if worn. Get medical attention immediately.

SKIN CONTACT: In case of contact, immediately flush skin with plenty of clean running water for at least 15 minutes, while removing contaminated clothing and shoes. If burn or irritation occurs, call a physician.

INGESTION: If swallowed, **DO NOT** induce vomiting. Get medical attention immediately. If victim is fully conscious, give plenty of water to drink. Never give anything by mouth to an unconscious person.

NOTE TO PHYSICIANS: Sodium hypochlorite solutions have a low oral toxicity, but may be corrosive to the eyes, skin, and mucous membranes. Consideration should be given to careful endoscopy as stomach or esophageal burns, perforations, or strictures may occur. Careful gastric lavage with an endotracheal tube in place should be considered. Treat exposure symptomatically.

5. FIRE FIGHTING MEASURES

Flashpoint and Method: Not applicable

Flammable Limits (in air, % by volume): Lower: Not applicable Upper: Not applicable

Autoignition Temperature: Not applicable

GENERAL HAZARD: The Uniform Fire Code physical hazard rating for this product is: **Oxidizer Class 1**. Contact with combustible material may initiate or promote combustion. Product will release oxygen. The Uniform Fire Code health hazard rating for this product is: **Corrosive (Alkaline)**. Dilute solutions may be corrosive. Acid or heat will accelerate decomposition.

FIRE FIGHTING INSTRUCTIONS: **EXTINGUISHING MEDIA:** Flood with water or CO₂.
Use water spray to cool containers exposed to fire.

FIRE FIGHTING EQUIPMENT: Fire fighters should wear full protective equipment, including self-contained breathing apparatus.

HAZARDOUS COMBUSTION PRODUCTS: When heated to dryness and decomposition, this material emits toxic fumes of Cl⁻ and toxic oxides of sodium.

6. ACCIDENTAL RELEASE MEASURES

LAND SPILL: Wearing recommended protective equipment and clothing, dike spill using soil, sand, or compatible commercial absorbent. Pick up bulk of liquid using pumps or vacuum truck or absorb liquid in sand or commercial absorbent. Place in approved containers for recovery, disposal, or satellite accumulation. Neutralize hypochlorite or available chlorine with a dilute sodium sulfite solution. Neutralize remaining alkalinity with a dilute acid. Liberally cover the spill area with sodium bicarbonate. Flush spill area with water; collect rinsates for disposal or sewer, as appropriate.

WATER SPILL: Wear protective equipment and clothing if contact with hazardous material can occur. Stop or divert water flow. Dike contaminated water and remove for disposal and/or treatment. As appropriate, notify all downstream users of possible contamination.

7. HANDLING AND STORAGE

STORAGE TEMPERATURE: Below 21 °C (70 °F)

STORAGE PRESSURE: Ambient

GENERAL: Store in a cool, dry area away from incompatible material. Protect from direct sunlight and heat to avoid deterioration. Do not allow product to freeze. Open containers slowly to relieve any possible pressure. Do not store in metallic containers. Keep containers tightly closed when not in use. Do not allow solution to dry out. Avoid breathing vapors, mists, or aerosols. Use only with adequate ventilation. Protect eyes, skin, and clothing from contact with product. Wear recommended protective equipment.

8. EXPOSURE CONTROLS/PERSONAL PROTECTION

CONTROL MEASURES: Use local mechanical exhaust ventilation capable of maintaining emissions in the work area below the OSHA-PEL or ACGIH ceiling level for sodium hydroxide, or if use generates mists or aerosols.

RECOMMENDED PERSONAL PROTECTIVE EQUIPMENT:

RESPIRATOR: For exposure above the OSHA-PEL or ACGIH ceiling level for sodium hydroxide, or if use generates mists or aerosols, wear a NIOSH-approved full facepiece or half mask air-purifying cartridge respirator or supplied air respirator.

EYES: Wear chemical goggles (recommended by ANSI Z87.1-1979), unless a full facepiece respirator is worn.

GLOVES: Neoprene, nitrile, or natural rubber gloves.

CLOTHING & EQUIPMENT: Wear a neoprene, nitrile, or natural rubber apron or full protective clothing when handling product. An eye wash station and safety shower should be available in the work area.

FOOTWEAR: Neoprene, nitrile, or natural rubber boots.

9. PHYSICAL AND CHEMICAL PROPERTIES

Appearance:	Clear, yellow-green	Bulk Density (pounds/ft³):	Not applicable
Physical State:	Liquid	Vapor Pressure:	No data available
Odor:	Chlorine-like	Vapor Density (air=1):	No data available
Odor Threshold:	0.3 ppm in air (chlorine)	Evaporation Rate (n-Butyl Acetate=1):	No data available
Molecular Formula:	Mixture	VOC Content:	Nil
Molecular Weight:	Mixture	% Volatile:	Approximately 86.5
Boiling Point:	Decomposes at 110 °C (230 °F)	Solubility in H₂O:	Complete
Freezing/Melting Point:	Less than -25 °C (-13 °F)	Octanol/Water Partition Coefficient:	No data available
Specific Gravity:	Approximately 1.22 @ 20 °C	pH (as is):	12.5 - 13.0
Density (pounds/gallon):	Approximately 10.17	pH (1% solution):	Approximately 11.5

10. STABILITY AND REACTIVITY

GENERAL: This product is stable and hazardous polymerization will not occur.

CONDITIONS TO AVOID: Avoid heat, light, decrease in pH, and contamination with heavy metals.

INCOMPATIBLE MATERIAL: Acids, alcohols, amines, ammonia, chlorinated isocyanurates, combustibles, cyanides, detergents, ethers, hydrocarbons, oxidizable materials, reducing agents.

HAZARDOUS DECOMPOSITION PRODUCTS: When heated to dryness and decomposition, this product may emit toxic fumes of Cl⁻ and toxic oxides of sodium. Solution will slowly liberate oxygen.

SENSITIVITY TO MECHANICAL IMPACT: This product is not sensitive to mechanical impact.

SENSITIVITY TO STATIC DISCHARGE: This product is not sensitive to static discharge.

15. REGULATORY INFORMATION

COMPONENTS: Sodium Hypochlorite Sodium Hydroxide

OSHA

Target Organs: Eyes, Skin & Lungs Eyes, Skin & Lungs

Carcinogenic Potential:

Regulated by OSHA: No No
 Listed on NTP Report: No No
 IARC Listing: Yes No

U.S. EPA Requirements

Release Reporting

CERCLA (40 CFR 302):
Listed Substance: Yes Yes
Reportable Quantity: 100 pounds 1,000 pounds
Category: B C
RCRA Waste No.: None listed None listed
Unlisted Substance: Not applicable Not applicable
Reportable Quantity: Not applicable Not applicable
Characteristic: Not applicable Not applicable
RCRA Waste No.: Not applicable Not applicable

SARA TITLE III

Section 302 & 303 (40 CFR 355)

Listed Substance: No No
Reportable Quantity: Not applicable Not applicable
Planning Threshold: Not applicable Not applicable

Section 311 & 312 (40 CFR 370)

Hazard Categories (product): Fire: Y Sudden Release of Pressure: N Reactive: N Acute Health: Y Chronic Health: N
Planning Threshold: 10,000 pounds 10,000 pounds

Section 313 (40 CFR 372)

Listed Toxic Chemical: No No
Reporting Threshold: Not applicable Not applicable

U.S. TSCA STATUS

Listed (40 CFR 710): Yes Yes

CANADIAN REGULATIONS

Controlled Product: Yes
WHMIS Hazard Symbols: Material Causing Other Toxic Effects, Corrosive Material
WHMIS Class & Division: D.2B, E
Product Identification Number: UN1791

IDL Substance: Yes Yes
Domestic Substance List: Yes Yes
CEPA Priority List: Not listed Not listed

Carcinogenicity:

ACGIH Appendix A: Not listed Not listed
 A1 Confirmed Human: Not applicable Not applicable
 A2 Suspected Human: Not applicable Not applicable
 IARC Group: Group 3 Not listed

STATE REGULATIONS:

State of California

Safe Drinking Water and Toxins Enforcement Act, 1985 (Proposition 65)

Carcinogen: No No
Reproductive Toxin: No No

OTHER REGULATIONS:

State Right To Know Laws: MA, NJ, PA MA, NJ, PA

16. OTHER INFORMATION

EPA Registration number: Not Applicable
Approved Product Uses: Not Applicable

Special Notes:

Do not contaminate water, food, or feed by storage, use or disposal.

This product contains available chlorine. Toxic, corrosive chlorine gas can be liberated if this product comes in contact with acids or acidic sanitizers.

This product does not contain any material which the State of California has found to cause cancer and/or birth defects or other reproductive harm.

MSDS Revision Information: Form Revision made 02/09/94
Information Revised This Issue Date: Updated information - sections 2, 3, 5, 6, 8, 9, 14-16.

MSDS distributed by **LA Chemical Company**
Environmental Department
Phone:323-832-5000 FAX: 323-773-0909

Prepared By:	Ruben Salgado	Date Prepared:	05/07/02
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This Material Safety Data Sheet is provided as an information resource only. It should not be taken as a warranty or representation for which Los Angeles Chemical Company assumes legal responsibility. While Los Angeles Chemical Company believes the information contained herein is accurate and compiled from sources believed to be reliable, it is the responsibility of the user to investigate and verify its validity. The buyer assumes all responsibility of using and handling the product in accordance with applicable federal, state, and local regulations.