

Final Draft

Health and Safety Plan
for Multi-Site Operation and Maintenance Activities

**Chromium(VI) Removal
Demonstration Facilities**
City of Glendale, California

AECOM Project No. 114116

Submitted to:
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This Health and Safety Plan (HASP) was prepared for employees performing a specific, limited scope of work. It was prepared based on the best available information regarding the physical and chemical hazards known or suspected to be present on the project site. While it is not possible to discover, evaluate, and protect in advance against all possible hazards, which may be encountered during the completion of this project, adherence to the requirements of the HASP will significantly reduce the potential for occupational injury.

By signing below, I acknowledge that I have reviewed and hereby approve the HASP for the work site. This HASP has been written for the exclusive use of the City of Glendale, its employees, contractors and subcontractors. The plan is written for specified site conditions, dates, and personnel, and must be amended if these conditions change.

Plan Approved By:

_____	Date: _____
_____	Date: _____
_____	Date: _____
_____	Date: _____

PERSONNEL ACKNOWLEDGMENT

By signing below, the undersigned acknowledges that he/she has read and reviewed the City of Glendale Health and Safety Plan (HASP) for the City of Glendale Operation & Maintenance (O&M) Sites referenced in this document. The undersigned also acknowledges that he/she has been instructed in the contents of this document, understands the information pertaining to the specified work, and will comply with the provisions contained therein.

Print Name	Signature	Organization	Date

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ACRONYMS AND ABBREVIATIONS

µg/L	microgram per liter
µR/hr	microRoentgen per hour
ACGIH	American Conference of Governmental Industrial Hygienists
ALARA	as low as is reasonably achievable
ANSI	American National Standards Institute
CCR	California Code of Regulations
CDPH	California Department of Public Health
CFR	Code of Federal Regulations
CHP	Certified Health Physicist
City	City of Glendale, Water and Power
COC	chemical of concern
CPR	cardiopulmonary resuscitation
CSP	Certified Safety Professional
EMT	Emergency Medical Technician
EPA	Environmental Protection Agency
ERC	Emergency Response Coordinator
ERM	Emergency Response Manager
FM	Field Manager
GOU	groundwater operating unit
H&SP	Health and Safety Professional
HASP	Health and Safety Plan
HEPA	high-efficiency particulate air
MCL	maximum contaminant level
mg/m ³	milligram per cubic meter
mR/hr	milliRoentgen per hour
MSDS	Material Safety Data Sheet
NIOSH	National Institute for Occupational Safety and Health
O&M	Operation and Maintenance
OSHA	Occupational Safety and Health Administration
pCi/L	picoCurie per liter
PE	Professional Engineer
PEL	permissible exposure limit
PM	Project Manager
ppb	part per billion
PPE	Personal Protective Equipment
ppm	part per million
RCF Facility	Reduction, Coagulation, Filtration Chromium(VI) Removal Demonstration Facility
Rem	Roentgen equivalent in man
RM	Regional Manager
RPM	Regional Project Manager
RSO	Radiation Safety Officer
RWP	radiation work permit
SH&E	Safety, Health and Environmental (Procedure)
SOP	Standard Operating Procedure
SOW	Statement of Work
SP	Safety Professional

ACRONYMS AND ABBREVIATIONS

SPF	solar protection factor
SSO	Site Safety Officer
STEL	short term exposure limit
TCE	trichloroethylene
THA	task hazard analysis
TLV	threshold limit value
VOC	volatile organic compound
WBA Facility	Weak-Base, Anion-Exchange Chromium(VI) Removal Demonstration Facility

1. INTRODUCTION

This Health and Safety Plan (HASP) covers activities associated with the operation and maintenance (O&M) of the Weak-Base, Anion-Exchange (WBA) and Reduction, Coagulation, Filtration (RCF) Chromium(VI) Removal Demonstration (CRD) Facilities [(WBA Facility) and (RCF Facility)] owned and operated by the City of Glendale (City).

The activities covered by this HASP include but are not limited to:

- Routine operation and maintenance of the facilities,
- Equipment repair,
- Oversight of contractors performing operations, maintenance, and repair work (including media exchanges and waste handling),
- Oversight of construction projects related to the sites,
- Collection of water and media samples, and
- Recording plant operating data.

Chemical and physical hazards known to be associated with the City -managed activities at these sites are also addressed in this document.

Additional sites and sampling points may be added in the future. This HASP will be revised if additional sites are added or the scope of work changes.

This HASP includes MSDS information in Attachment 1 and task hazard analyses (THAs) in Attachment 2 for chemical handling and specific, routine tasks performed by staff. Additional THAs will be generated as necessary to address any new activities or changes in site conditions that may occur during field operations. Once generated, each new THA will be reviewed and acknowledged by field personnel prior to the start of applicable work activities and included in HASP revisions.

The safety, health, and environmental (SH&E) standard operating procedures (SOPs) referenced in this document are included in Attachment 3. Additional procedures will be included as necessary to address any new activities or changes in site conditions that may occur during field operations.

1.1 GENERAL

The provisions of this HASP are mandatory for all City personnel engaged in fieldwork associated with the O&M activities being conducted at the subject sites. All personnel doing work on site must read and acknowledge understanding of the required procedures by signing and dating the Personnel Acknowledgement on page v. **A copy of this HASP and any applicable HASP supplements must be kept at each site at all times.**

Record keeping will be maintained in accordance with this HASP and the applicable SH&E SOPs. In the event of a conflict between this HASP, the SOPs, and federal, state, and local regulations, workers shall follow the most stringent/protective requirements.

1.2 REGULATORY REQUIREMENTS

This HASP conforms to the regulatory requirements and guidelines established in the following documents:

- Title 8, Chapter 4, Subchapter 4 of the California Code of Regulations (CCR), Construction Safety Orders.
- Title 8, Chapter 4, Subchapter 7 of the CCR, General Industry Safety Orders, with special attention to 8 CCR Section 5192.

- Title 29, Section 1910 of the Code of Federal Regulations (CFR), Occupational Safety and Health Standards with special attention to Subsection 126, Construction.
- Standard Operating Safety Guides (EPA 1992).

2. SITE INFORMATION

The following is a summary of information concerning conditions at the sites and a description of work activities to be performed as part of the O&M contract.

Work will be performed in accordance with the scope of work (SOW) described herein and any additional task-specific SOWs that are prepared from time to time for work not listed in this HASP. Deviations from the listed SOW will require that the Health and Safety Professional (H&SP) review changes made to this HASP to ensure adequate protection of personnel and other property.

2.1 BACKGROUND

Well site GS-3 in the City of Los Angeles on Goodwin Street near San Fernando Road, and the other The City of Glendale's groundwater supply in the San Fernando Valley has been contaminated with a variety of chemicals, including hexavalent chromium, trichloroethylene (TCE), tetrachloroethene (PCE), 1,2,3-trichloropropane (TCP), and others, mainly as a result of the improper disposal of industrial waste products.

In Glendale and other cities such as Los Angeles and Burbank in the San Fernando Valley, public concern about Cr(VI) in the groundwater supply led the City to embark on a multi-phase study to identify and install Cr(VI) treatment in anticipation of a Cr(VI) maximum contaminant level (MCL) lower than the current total Cr MCL in California. The City instituted a policy to minimize Cr(VI) concentration in treated water through blending and strategic use of wells. However, the USEPA requires maximum feasible pumping of the wells to capture contaminant plumes. As a result, additional Cr treatment is needed to fulfill both goals (in addition to National Pollutant Discharge Elimination System requirements).

The Phase III Demonstration-Scale Study will finalize the treatment evaluation, residuals assessment, and cost estimate development by implementing one or more Cr(VI) removal technologies. For the demonstration facilities, the City selected the construction of the WBA Facility to treat water from Well GS-3 at a design capacity of 425 gallons per minute (gpm) and a 100-gpm, reduction with ferrous sulfate, coagulation, and filtration system adjacent to the existing Glendale Water Treatment Plant (GWTP) to treat water from the North Operable Unit.

The objective of the project is to construct two different viable demonstration facilities using two different technologies for the removal of Cr(VI) in groundwater.

The two processes selected are:

- Weak-base anion exchange
- Reduction with ferrous sulfate, coagulation, and filtration

The WBA Facility is designed to treat the water from Well GS-3 at a design flow of 425 gpm. The treatment process (shown in Figure 2-1) involves pumping water from the well, adjusting the pH by CO₂ injection, sending the water through the steel vessels containing resin, and conveyance of the treated water to the GWTP for VOC removal. The steel vessels contain a patented "resin" that is designed to remove the Cr(VI) in the water. The main components of the treatment facility are:

- Carbon dioxide (CO₂) pH control system
- Bag filters for particulate removal
- Existing GAC vessels retrofitted with IX resin.
- Backwash tank

The RCF Facility treats water from the NOU at a design flow of 100 gpm. The facility is located adjacent to the GWTP.

The RCF treatment process (shown on Figure 2-2) involves the addition of ferrous sulfate to the groundwater to convert the Cr(VI) in the water to trivalent chromium [Cr(III)]. The conversion occurs in the reduction tank followed by an aeration chamber to assist the reaction. Polymer is added to the water in the rapid-mix tank to enhance iron and chromium floc formation. The water and floc mixture is then pumped to two pressurized dual-media filters in down-flow mode. The dual-media filters consist of approximately 24 inches of anthracite covering approximately 12 inches of sand, with a supportive gravel underdrain. A backwash system is used to clean the filters periodically. The main components of the treatment facility are:

- Reduction mix tanks (three in series)
- Aeration tank
- Rapid mix tank
- Ferrous sulfate injection system
- Polymer injection system
- Product storage and feed tanks
- Dual-media filters
- Product water holding tank
- Settling tank
- Sludge Filter

For both facilities there are also various other features like under-ground and above-ground piping, electrical control facilities, chemical feed pumps, electrical/mechanical equipment, water pumps, water storage tanks, and chemical storage facilities typically found at water treatment plants. The treated water from the demonstration facilities is delivered to the GWTP for further VOC treatment before the water is delivered to the Glendale customers.

Site plans showing the location of major equipment and emergency eyewash/shower station are shown on Figure 2-3 and Figure 2-4.

2.2 SITE LOCATIONS

The demonstration facilities are located within the County of Los Angeles. Site addresses are as follows:

WBA Facility:

4041½ Goodwin Ave.
Los Angeles, CA 90039

RCF Facility:

800 Flower Street
Glendale, CA 91201

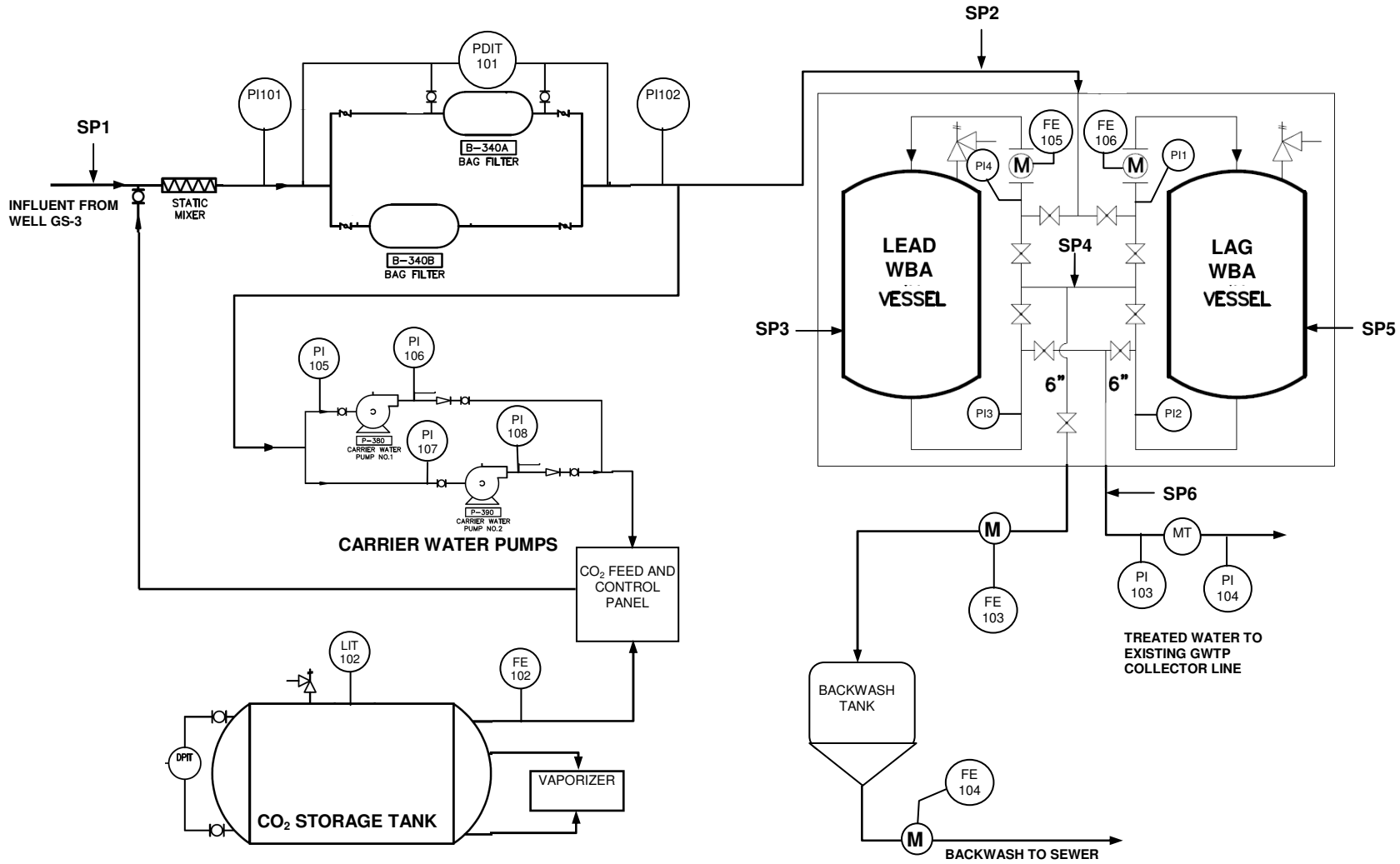


Figure 2-1: WBA Treatment System Process Flow Diagram

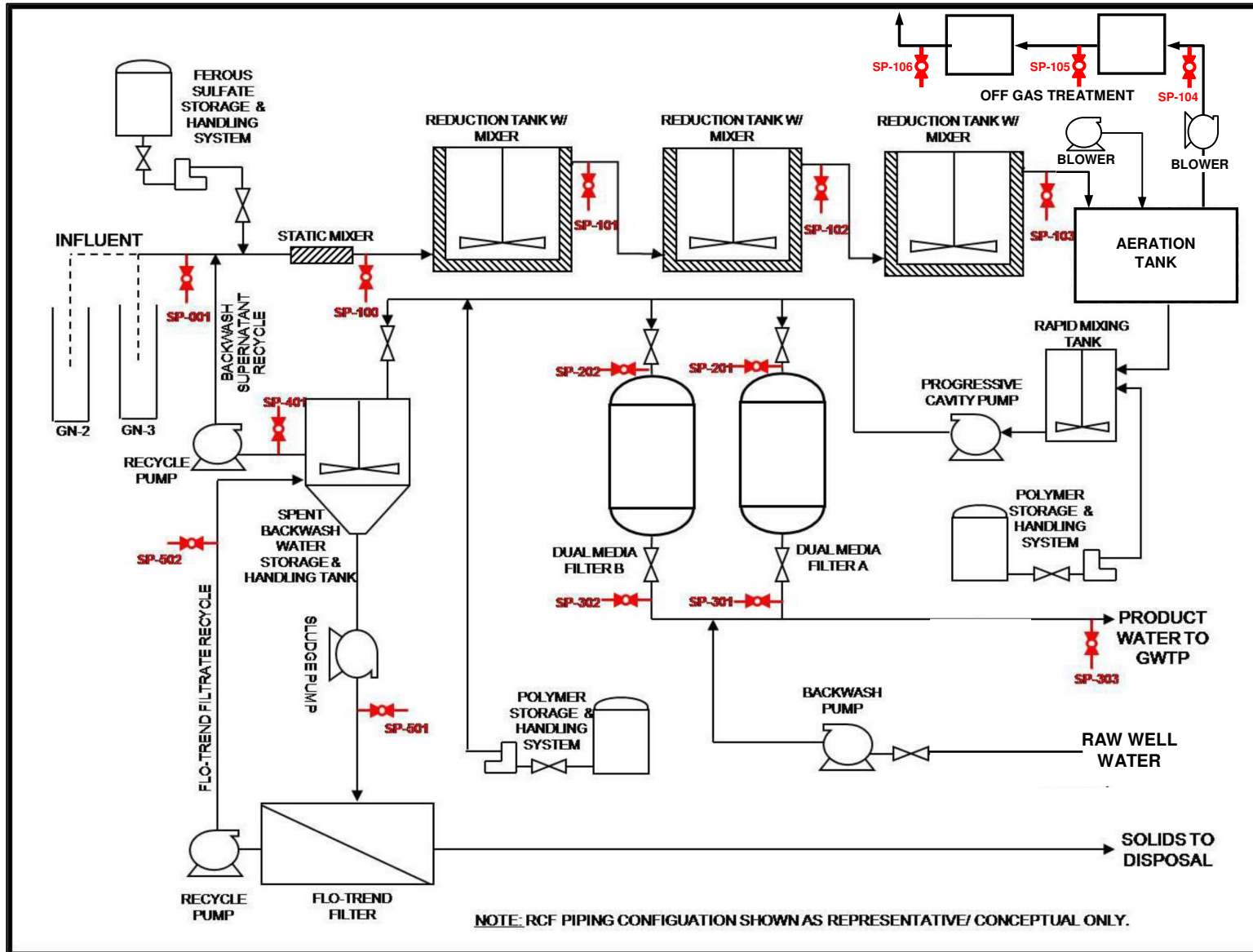


Figure 2-2: RCF Treatment System Process Flow Diagram

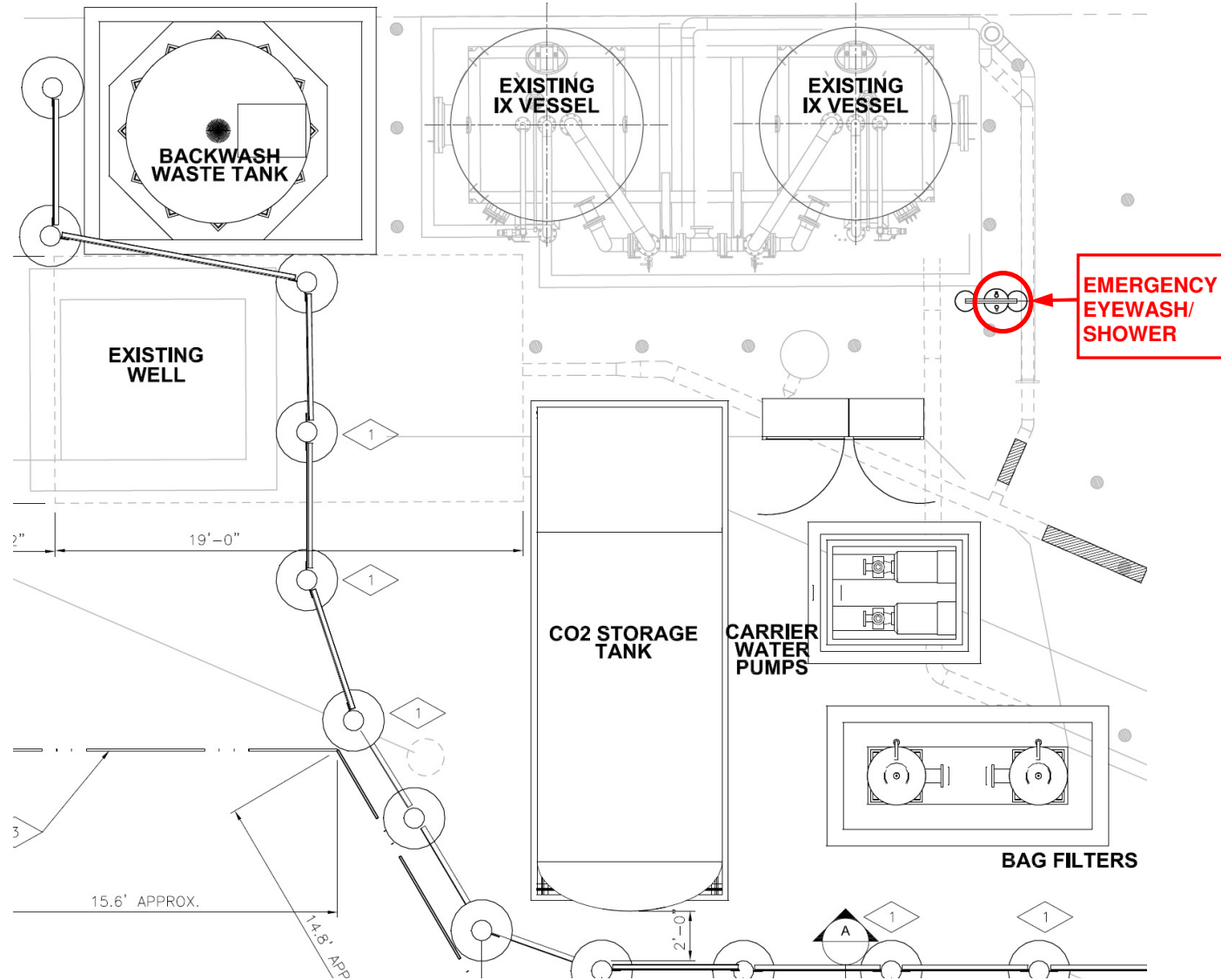


Figure 2-3: Site Plan of WBA Facility

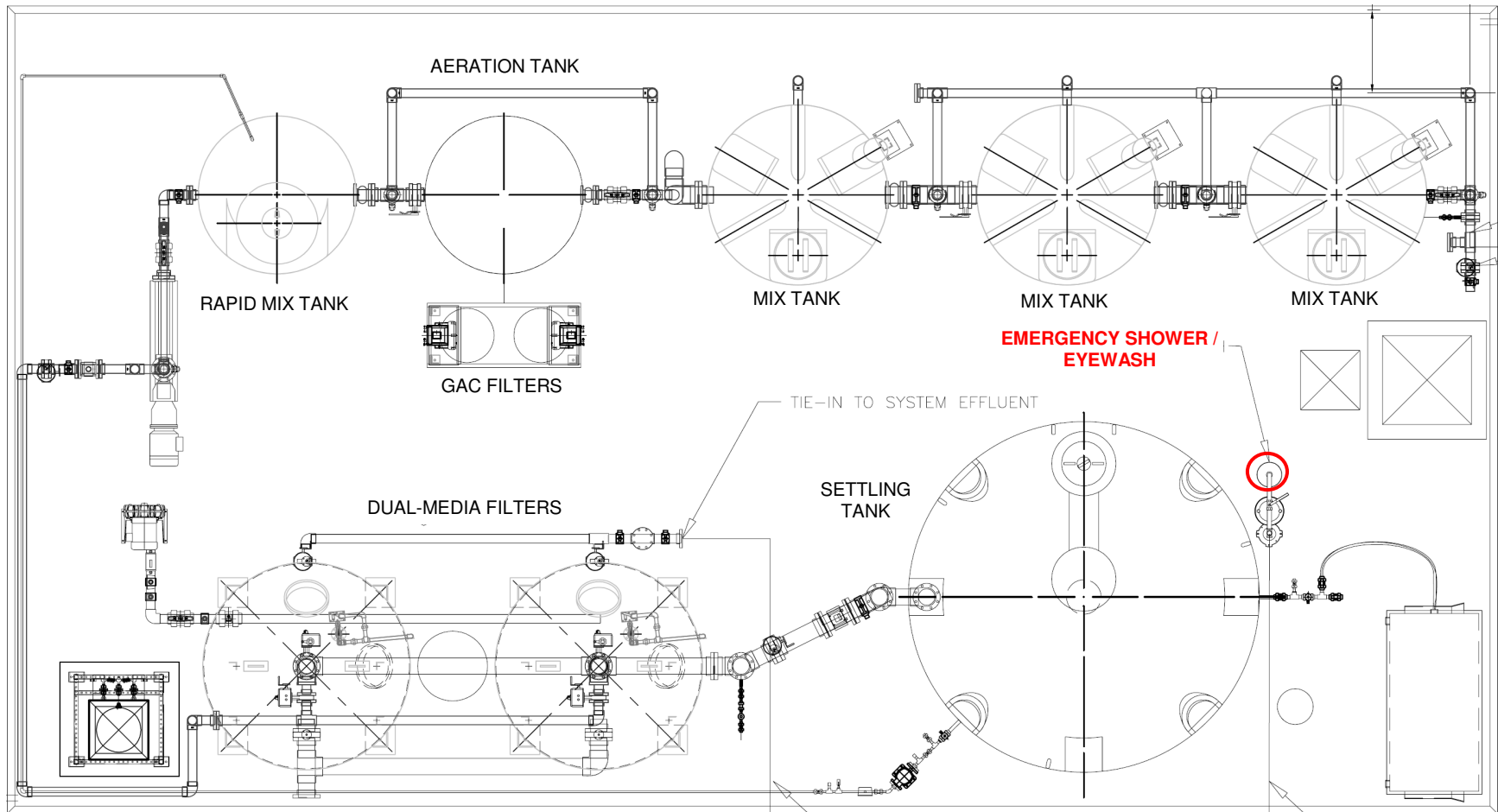


Figure 2-4: Site Plan of RCF Facility

3. PROJECT HEALTH AND SAFETY ORGANIZATION

3.1 PROJECT MANAGER

The O&M PM is responsible for coordinating with local client representatives, discipline managers, and subcontractors to perform the O&M tasks in accordance with requirements set forth in this HASP and/or other health and safety documentation. The PM has final responsibility for managing all aspects of the work operations, and is responsible to the City of Glendale management for the safe performance and completion of the work activities performed directly or subcontracted by the City. The specific safety responsibilities for the PM include:

- Ensuring that an approved HASP is prepared that addresses all aspects of the work to be performed;
- Ensuring that all personnel assigned to perform on-site activities meet the required qualifications;
- Providing adequate resources and supplies to fulfill all work safety requirements;
- Assigning the Site Supervisor and Site Safety Officer (SSO) to provide on-site management of work activities;
- Providing the Site Supervisor with the appropriate work plans for the site; and
- Contacting the H&SP for guidance regarding any health and safety related matters.

3.2 HEALTH AND SAFETY PROFESSIONAL

The Health and Safety Professional (H&SP) is assigned by the City to oversee health and safety requirements for the project and provide any needed technical support. The H&SP will be the first point-of-contact for all of the project's health and safety matters. Duties include the following:

- Approving this HASP and any required changes;
- Approving of the designated SSO;
- Reviewing all personal exposure monitoring results; and
- Investigating any reported unsafe acts or conditions.

3.3 SITE SUPERVISOR

The Site Supervisor has the overall responsibility and authority to direct work operations at the job site according to the provided work plans. The PM or other City employee with sufficient training and site experience, appointed by either the Site Supervisor or the PM, may act as the Site Supervisor while on site.

The Site Supervisor is responsible for field implementation of the specified health and safety requirements for all personnel and subcontractors. This includes communicating site requirements to all personnel, observing that Site Supervisors and subcontractors enforce all provisions of the HASP or other health and safety documentation, working with the SSO to implement all health and safety performance elements, and consulting with the H&SP regarding any necessary changes to health and safety requirements. The Site Supervisor will share the following responsibilities with the SSO:

- Discuss deviations from the work plan with the SSO and PM.
- Discuss safety issues with the PM, SSO, and field personnel.
- Assist the SSO with the development and implementation of corrective actions for site safety deficiencies.
- Assist the SSO with the implementation of this HASP and ensuring compliance.
- Assist the SSO with inspections of the site for compliance with this HASP and applicable SH&Es.
- Conduct periodic safety reviews of the project site and project documentation.
- Perform regular and frequent site inspections to identify hazards and observing subcontractors and employees at work.

- Shall have stop work authority as described in Section 4.3.
- Determine emergency evacuation routes, establishing and posting local emergency telephone numbers, and arranging emergency transportation.
- Ensure that all City personnel, contractors, and visitors have received the proper training and medical clearance prior to entering the site.
- Establish any necessary controlled work areas (see Section 8, Site Control) with assistance from the SSO (as designated in this HASP or other health and safety documentation).
- Conduct tailgate safety meetings in conjunction with the SSO and maintain attendance logs and records in accordance with SH&E SOP 202, Safety Meetings.

Other responsibilities of Site Supervisor include:

- Read and become familiar with the HASP;
- Enforce the HASP and other safety regulations;
- Ensure that no work is performed which is not properly addressed in this HASP (or approved supplemental guidance);
- Maintain the presence of at least one qualified first aid provider on site at all times; and
- Contact the H&SP for guidance regarding any health and safety related matters.

The Site Supervisor has authority to:

- Verify that all operations are in compliance with the requirements of this HASP and halt any activity that (1) poses a potential hazard to personnel, property, or the environment, or (2) is not contemplated in the Hazard Analysis of this HASP.
- Temporarily suspend individuals from field activities for infractions against the HASP pending consideration by the SSO, the H&SP, and the PM.

3.4 SITE SAFETY OFFICER

The SSO is responsible for the execution of the routine on-site duties for health and safety of City personnel and its contractors with assistance and direction from the designated H&SP. The responsibilities of the SSO include:

- Prepare the site-specific HASP and providing updates to reflect changes in site conditions or the scope of work. HASP updates must be reviewed and approved by the H&SP.
- Be aware of changes in the City of Glendale Safety Policy.
- Monitor the lost time incidence rate and work toward improving it.
- Inspect the site for compliance with this HASP and the SOPs using the appropriate audit inspection checklist provided in *SH&E SOP 104, SH&E Audits, Inspections, and Corrective Actions*.
- Work with the Site Supervisor and PM to develop and implement corrective action plans to correct deficiencies discovered during site inspections. Deficiencies will be discussed with project management to determine appropriate corrective action(s).
- Contact the H&SP for technical advice regarding safety issues.
- Provide a means for employees to communicate safety issues to management in a discreet manner (i.e., suggestion box).
- Determine emergency evacuation routes, establishing and posting local emergency telephone numbers, and arranging emergency transportation.
- Ensure that all site personnel, subcontractors, and visitors have received the proper training and medical clearance prior to entering the site.
- Establish any necessary controlled work areas (as designated in this HASP or other safety documentation).
- Discuss potential health and safety hazards with the Site Supervisor, the H&SP, and the PM.
- Select an alternate SSO by name and inform him/her of their duties, in the event that the SSO must leave or is absent from the site.
- The SSO has authority to:

- Verify that all operations are in compliance with the requirements of this HASP.
- Issue a “Stop Work Order” under the conditions set forth in Section 4.3 of this HASP.
- Temporarily suspend individuals from field activities for infractions against the HASP pending consideration by the H&SP and the PM.

3.5 RADIATION SAFETY OFFICER

The Radiation Safety Officer (RSO) is responsible for all facets of radiological work conducted, and as such will be responsible for all radiation safety issues and policies. Responsibilities include:

- Implementing Radiation Safety Programs.
- Reporting radiological hazards to the SSO.
- Stopping work as described in Section 4.3.
- Coordinating all radiological activities.
- Providing radiation awareness training for on-site personnel.
- Making certain that on-site personnel use radiological personnel protective equipment (PPE) properly.
- Making certain that on-site personnel use dosimetry devices (applicable personnel only) properly.
- Ensuring radiation doses are kept below the limits specified in *SH&E SOP 128, Radiation Exposure Assessment*.

The RSO is required to have completed an 8-hour HAZWOPER Supervisor Training Course in accordance with 8 CCR §5192 (e)(4) within the past three (3) years. The RSO is required to be approved by the Radiation Safety Manager (RSM).

3.6 RADIATION SAFETY MANAGER

The RSM provides overall policy guidance consistent with Federal, State, and City requirements. Additional responsibilities include:

- Approval of the Site RSO.
- Approval of radiation protection plans.
- Approval of worker training materials and requirements.
- Review of radiation dosimetry and bioassay results.
- Consultative support to ensure proper monitoring techniques, selection of equipment and laboratory procedures.
- Periodic radiation protection program audits.

3.7 EMPLOYEES

Responsibilities of employees associated with this project include, but are not limited to:

- Understand and abide by the policies and procedures specified in the HASP and other applicable safety policies, and clarify those areas where understanding is incomplete.
- Provide feedback to health and safety management relating to omissions and modifications in the HASP or other safety policies.
- Notify the SSO, in writing, of unsafe conditions and acts.

The health and safety authority of each employee assigned to the site includes the following:

- The authority to refuse to work and/or stop work authority when the employee feels that the work is unsafe (including work being done by contractors), or where specified safety precautions are not adequate or fully understood.
- The authority to refuse to work on any site or operation where the safety procedures specified in this HASP or other safety policies are not being followed.
- The authority to contact the SSO or the H&SP at any time to discuss potential concerns.

3.8 CONTRACTORS

Each City of Glendale contractor is responsible for assigning specific work tasks to their employees. Each contractor's management will provide qualified employees and allocate sufficient time, materials, and equipment to safely complete assigned tasks. In particular, each contractor is responsible for equipping its personnel with any required personal protective equipment (PPE).

The City considers each contractor to be an expert in all aspects of the work operations for which it is tasked to provide, and each contractor is responsible for compliance with the regulatory requirements that pertain to those services. Each contractor is expected to perform its operations in accordance with its own unique safety policies and procedures, in order to ensure that hazards associated with the performance of the work activities are properly controlled. Copies of any required safety documentation for a contractor's work activities will be provided to the City for review prior to the start of on-site activities, if required.

Hazards not listed in this HASP but known to any contractor, or known to be associated with a contractor's services, must be identified and addressed to the City PM or Site Supervisor prior to beginning work operations. The Site Supervisor or authorized representative has the authority to halt any contractor operations, and to remove any contractor or contractor employee from the site for failure to comply with established health and safety procedures or for operating in an unsafe manner. Any disruptions to the work or cost increases due to this action is the sole responsibility of the contractor.

3.9 CITY OF GLENDALE VISITORS

Visitors to the site that are not performing work and have been invited by the City (e.g., vendors, contractors on site walks for bidding purposes, or City of Glendale management staff) must, at a minimum, follow the health and safety guidelines outlined in this document. City-authorized visitors may only obtain entry to a work location when City personnel is present on the site and will be briefed by the PM or the Site Supervisor on the hazards present at that location. City visitors will be escorted at all times at the work location. In addition, this HASP specifies the minimum acceptable qualifications, training and PPE that are required for entry to any controlled work area; visitors must comply with these requirements at all times.

Unauthorized visitors and visitors not meeting the specified qualifications will not be permitted within established controlled work areas.

4. GENERAL HEALTH AND SAFETY PROCEDURES

4.1 SITE-SPECIFIC SAFETY TRAINING

All personnel performing field activities at the site will receive safety training, which includes:

- Instruction on the contents of applicable portions of this HASP and any supplemental health and safety information developed for the tasks to be performed.
- Information about the potential routes of exposure, protective clothing, precautionary measures, and symptoms or signs of chemical exposure and heat stress.
- Awareness of task-specific physical hazards and other hazards that may be encountered during site work. This includes any client-specific required training for health and safety.
- Awareness of fire prevention measures, fire extinguishing methods, and evacuation procedures.

Training will include the requirements specified in the following:

SH&E SOP 202, Safety Meetings.

SH&E SOP 115, Hazard Communication Program.

The site-specific training will be performed prior to the worker performing the subject task and on an as-needed basis thereafter. Training will be conducted by the SSO (or his/her designee) and will be documented on the form attached to *SH&E SOP 202, Safety Meetings*.

4.2 HAZARD COMMUNICATION

Any organization wishing to bring any hazardous material onto any City-controlled work site must first provide a copy of the item's Material Safety Data Sheet (MSDS) to the SSO for approval and filing. MSDSs may not be available for locally-obtained products, in which instance some alternate form of product hazard documentation will be acceptable. In accordance with the requirements of *SH&E SOP 115, Hazard Communication Program*, all personnel shall be briefed on the hazards of any chemical product they use, and shall be aware of and have access to all MSDSs. MSDSs for both facilities are included in Attachment 1. The list of products for which MSDS are necessary are as follows:

WBA Facility:

- Amberlite PWA7 Ion Exchange Resin
- Liquid Carbon Dioxide
- Chlorine solution used for equipment disinfection

RCF Facility:

- Ferrous Sulfate Solution
- Magnafloc E38, Flocculant polymer
- Chlorine solution used for equipment disinfection

The chemicals of concern (COC) being treated by the systems are present in the groundwater at concentrations that do not generally pose a risk to workers. Chemical exposure limits for workers for the chemicals of concern are provided in Section 5.

All containers on site shall be properly labeled to indicate their contents. Labeling on any containers not intended for single-day, individual use shall contain additional information indicating potential health and safety hazards (e.g., flammability, reactivity).

4.3 STOP WORK AUTHORITY

All employees or contractors have the right and duty to stop work when conditions are unsafe, and to assist in correcting these conditions as specified in *SH&E SOP 206, Stop Work Authority*. Whenever the SSO determines that workplace conditions present an uncontrolled risk of injury or illness to employees, immediate resolution with the appropriate supervisor shall be sought. Should the supervisor be unable or unwilling to correct the unsafe conditions, the SSO is authorized and required to stop work, which shall be immediately binding on all affected City employees and contractors.

Upon issuing the stop work order, the SSO shall implement corrective actions so that operations may be safely resumed. Resumption of safe operations is the primary objective. However, operations shall not resume until the H&SP has concurred that workplace conditions meet acceptable safety standards.

4.4 WASTE

If wastes are generated during any phase of the project, whether nonhazardous, hazardous, solid or liquid, the wastes shall be accumulated, labeled, and disposed of in accordance with applicable Federal, State, and/or local regulations.

4.5 GENERAL SAFETY RULES

All site personnel shall adhere to *SH&E SOP 201, General Safety Rules*, during site operations. In addition, the housekeeping and personal hygiene requirements listed below will also be observed.

4.5.1 Housekeeping

During site activities, work areas will be continuously inspected for excess trash and unnecessary debris. Debris and trash will be collected and stored in appropriate containers (e.g., plastic trash bag, garbage can, roll-off bin) prior to disposal.

Waste PPE used to handle nonhazardous waste or materials may be disposed of with other trash. PPE used on hazardous materials must be collected separately and disposed of appropriately.

4.5.2 Smoking, Eating, or Drinking

Smoking, eating and drinking will not be permitted inside any controlled work area at any time. Field workers will first wash hands and face immediately after leaving controlled work areas (and always prior to eating or drinking).

4.5.3 Personal Hygiene

Potable water is available on site. Non-potable water may be used for hand washing and cleaning activities.

There are no toilet facilities on site. Operators, contractors, and visitors must plan for this.

4.5.4 Buddy System

All field personnel will use the buddy system when working within any controlled work area. Personnel belonging to another organization on site can serve as "buddies" for City personnel. Under no circumstances will any employee be present alone in a controlled work area. Routine O&M activities and periodic water sampling does not normally require entry into a controlled work area, and thus does not normally require use of the buddy system.

4.5.5 Heat and Cold Stress

Heat and cold stress may vary based upon work activities, PPE/clothing selection, geographical locations, and weather conditions. To reduce the potential of developing heat/cold stress, be aware of the signs and symptoms of heat/cold stress and watch fellow employees for signs of heat/cold stress. For additional requirements, refer to *SH&E SOP 124, Heat Stress Prevention Program*, and *SH&E SOP 125, Cold Stress Prevention Program*.

Heat stress can be a significant field site hazard, particularly for non-acclimated personnel operating in hot, humid environments. Site personnel should be familiar in the identification of a heat stress victim, the first-aid treatment procedures for the victim and the prevention of heat stress casualties. Work-rest cycles should be determined and the appropriate measures taken to prevent heat stress as outlined in *SH&E SOP 124, Heat Stress Prevention Program*. Refer to Section 9.7.1 for emergency procedures to be taken for different levels of heat stress.

4.5.5.1 SOLAR PROTECTION

To protect against exposure to solar radiation, workers will observe the following requirements:

1. Workers will wear safety glasses that provide protection against ultraviolet radiation meeting American National Standards Institute (ANSI) Z87 standards at all times when working outdoors during daylight hours.
2. Workers will use a commercial sun-block with a minimum solar protection factor (SPF) of 15 on all exposed skin.
3. Wear hard hats or other type of head protection as the work activity permits.

4.5.6 Radiological Safety

WBA resin has an affinity for naturally-occurring uranium contained in the water. Uranium that accumulates on the resin may become a concentrated source of radiation. Therefore, certain precautions with regards to radiation safety must be followed.

4.5.6.1 AS LOW AS IS REASONABLY ACHIEVABLE (ALARA)

Even though current occupational exposure limits provide a very low risk of injury, it is prudent to avoid unnecessary exposure to radiation. The objective is thus to reduce occupational exposures as far below the specified limits as is reasonably achievable by means of good radiation protection planning and practice, as well as commitment to policies that foster vigilance against departures from good practice.

In addition to maintaining doses to individuals as far below the limits as is reasonably achievable, the sum of the doses received by all exposed individuals should also be maintained at the lowest practicable level. It would not be desirable, for example, to hold the highest doses to individuals to some fraction of the applicable limit if this involved exposing additional people and significantly increasing the sum of radiation doses received by all involved individuals.

Two basic assumptions are considered necessary for keeping occupational exposures as far below the specified limits as is reasonably achievable. Those two conditions are management commitment to maintaining exposures ALARA, and the personnel responsible for radiation protection should be continuously vigilant for means to reduce exposure.

It good policy to plan and conduct radiological activities safely and in such a fashion as to protect the health and safety of employees, contractors, members of the public, and the environment. To achieve this, the PM shall ensure that efforts are taken to reduce radiological exposures and releases to the environment to ALARA, taking into account social, technical, economic, practical and

public policy considerations. Earth Tech is committed to implementing a radiological control program that reflects this policy.

To implement this policy, the PM in conjunction with the Site RSO and RSM shall:

- Review radiological operations and analyze the hazards.
- Develop and implement controls that reduce or eliminate unnecessary dose and keep the necessary doses low.
- Document the controls in the HASP, or other work document.
- Document areas surveyed for radioactive material and retain the records according to SH&E SOP 126.
- Establish ALARA goals for individuals or work groups (SH&E SOP 129).
- Provide feedback to workers and managers by tracking an individual's dose (from all operations) relative to their ALARA goal.
- Reevaluate the situation if it appears an individual is likely to exceed their ALARA goal.

4.5.6.2 RADIATION WORK PERMITS

A Radiation Work Permit (RWP) system will be established by the Site RSO, if necessary, to control hazards associated with radiological work activities. Any work activity involving disturbance of radiological material or exposure to a dose rate in excess of 5 milliRoentgen per hour (mR/hr) will require the prior completion of an RWP.

The RWP will;

- outline the steps associated with the work task,
- specify the expected radiological hazards of the work and the appropriate control measures necessary (e.g., protective clothing/equipment, applicable engineering controls, etc.),
- specify any monitoring procedures to be implemented,
- identify the task manager and all work participants, and
- specify the approved duration of the work operation.

The permit will be approved by the RSO prior to initiating work, and a copy of the RWP posted at the entry to the work area until all work is completed. Completed RWPs will be maintained by the Site RSO and kept on file. All RWPs will be maintained on site for the duration of the project, and for at least three years after work completion in the project files.

4.5.7 Use of Nuclear Density Gauges

Nuclear density gauges are used for in-place density tests during structural fill or backfill operations. These gauges contain a gamma source (about 10 milliCuries) such as Cesium-137 and a neutron source. Only the personnel who have received safety-related training, and pertinent certifications and licenses for the use of the nuclear density gauge will handle and use them at the site. The use of the nuclear density gauges will be in accordance with the radiation safety and emergency response procedures of the geotechnical subcontractor. The geotechnical subcontractor will be required to maintain a copy of the radiation safety program onsite. The nuclear density gauge operator and SSO will ensure that except for the operator, no other person comes within 10 feet of the nuclear density gauge, while the test is being conducted. Use of Nuclear Density Gauges requires prior approval of the RSO. The RSO will verify that the gauge operator has a current radioactive materials license.

5. HAZARD ASSESSMENT

For this project, the City will perform or oversee tasks associated with the O&M activities. Performance of these tasks can expose personnel to a variety of hazards due to the operational activities, physical conditions of the work locations, and the potential presence of environmental contaminants (see Section 2.1). This section presents an assessment of hazards to on-site personnel due to chemicals identified at the sites during previous investigations.

5.1 TASK HAZARD ANALYSIS

Task hazard analysis (THA) is a technique used to identify hazards and hazard controls associated with a specific job function. THAs focus on the relationship between the workers, the task, resources required to complete the task, and the work environment. These variables must be evaluated to identify the potential hazards associated with the task. Once identified, steps can be taken to eliminate, reduce, or control the hazards to an acceptable risk level.

The following listing identifies the specialized work tasks to be performed or hazards associated with O&M activities that require specific health and safety attention. None of the tasks are regulated under HAZWOPER regulation (Title 8 of the CCR Part 5192, Paragraph (b) [8 CCR §5192(b)]).

1. System O&M/Monitoring and Sampling;
2. Media Exchange Supervision;
3. Confined Space Entry Attendant;
4. Chlorine Disinfection; and
5. Radiation Safety.

To ensure safe performance and completion of work activities, a THA has been prepared for each task or hazard, which specifies the major performance steps, identifies the related hazards and applicable safety procedures, and specifies any additional requirements. All THAs can be found in Attachment 2.

5.1.1 Unanticipated Work Activities/Conditions

Operations at the site may require additional tasks not identified in Section 1 or addressed in the THAs. Before performing any task not covered in this HASP, a THA must be prepared and approved by the H&SP.

The H&SP may issue an exemption to this requirement based on the nature of the work activities to be undertaken.

5.2 ENVIRONMENTAL CONTAMINANT EXPOSURE HAZARDS

The information presented below is intended to inform site personnel about the expected hazards associated with known or suspected environmental contaminants. Hazards associated with the use of commercially available hazardous materials are addressed as part of worker hazard communication requirements (see Section 4.2).

Known or suspected environmental contaminants associated with the sites include:

- Volatile organic compounds,
- Chromium and chromium compounds, and
- Radionuclides.

Contaminant concentrations in the groundwater vary depending on the well. Laboratory analyses of the groundwater show concentrations of chromium, TCE, and PCE in from the City Wells GS-3, GN-2 & GN-3. Table 5-1 lists the two-year maximum concentrations of contaminants measured as well as federal and state MCLs and hazardous limits for these contaminants as applicable.

Table 5-1: Maximum Measured Concentrations and Federal and State Limits for Contaminants

Compound	Maximum Concentrations (µg/L) ¹			Federal MCL (µg/L)	State MCL (µg/L)	Federal Toxicity Limits ² (mg/L)	State Toxicity Limits ³	
	GS-3	GN-2	GN-3				STLC (mg/L)	TTLc (mg/kg)
TCE	13	90	450	5	5	0.5	204	2,040
PCE	14	125	15	5	5	0.7	NA	NA
1,2,3-Trichloropropane	0.004	0.047	0.005	NA	NA	NA	NA	NA
Cr(VI) compounds	50	7	67	NA	NA	NA	5	500
Cr and/or Cr(III) compounds				100	50	5.0	5	2,500
Uranium	NA	NA	NA	30 µg/L	20 pCi/L	NA	NA	NA
Combined Radium 226, 228	NA	NA	NA	5 pCi/L	5 pCi/L	NA	NA	NA
Radon 222	NA	NA	NA	NA	NA	NA	NA	NA
Gross alpha radiation (excluding radon and uranium)	NA	NA	NA	15 pCi/L	15 pCi/L	NA	NA	NA
Gross beta radiation	NA	NA	NA	4 mRem/yr	50 pCi/L 4 mRem/yr	NA	NA	NA

Notes:

µg/L = microgram per liter

MCL = maximum concentration level

mg/kg = milligram per kilogram

mg/L = milligram per liter

mRem/yr = milliRoentgen equivalent in man per year

NA = not available or not applicable (i.e., none established)

pCi/L = picoCurie per liter

¹ Based on two-year maximum concentration in samples collected from groundwater as of June 2009.

² Taken from Title 22 of the California Code of Regulations Section 66261.24, Table I – Maximum Concentration of Contaminants for the Toxicity Characteristics (using the Toxicity Characteristic Leaching Procedure [TCLP]).

³ Taken from Title 22 of the California Code of Regulations Section 66261.24, Table II & Table III – List of Organic & Inorganic Persistent and Bioaccumulative Toxic Substances and their Soluble Threshold Limit Concentration (STLC) and Total Threshold Limit Concentration (TTLc) Values.

5.2.1 Chromium and chromium compounds

Chromium may exist in one of three valence states in compounds +2, +3, and +6. Chromium (elemental) is a steel-gray lustrous metal. Chromium metal is used for greatly increasing resistance and durability of metals and for chrome plating of other metals.

Routes of entry are inhalation, ingestion, and eye and skin contact. Points of attack for chromium metal and insoluble salts are the respiratory system and lungs. Local effects can include chromium compounds acting as allergens which cause dermatitis to exposed skin. With respect to systemic effects, chromium compounds in the trivalent (+3) state are of a low order toxicity. In the hexavalent (+6) state, chromium compounds are irritants and corrosive. Acute exposures to dust or mist may cause coughing and wheezing, headache, dyspnea, pain on deep inspiration, fever and weight loss. Hexavalent chromium is also associated with nasal septum perforation, liver/kidney damage, and again, sensitizing dermatitis. Chromium can affect workers when inhaled. Chromium metal ore has been reported to cause lung allergy. Chromium fumes can cause "metal fume fever", a flu-like

illness lasting about 24 hours with chills, aches, cough and fever. Chromium particles can irritate the eyes.

Since chromium is a reasonably reactive metal, thought must be given to the actions of combined chromium and particularly to the presence or absence of carcinogenic effects in various chromium compounds. The table provided below differentiates between noncarcinogenic and carcinogenic chromium (VI) compounds as provided by National Institute for Occupational Safety and Health (NIOSH).

Cr(VI) compounds vary in solubility from those that are readily soluble to those which are practically insoluble in water. In 1975 NIOSH documented the carcinogenic effects of water-insoluble Cr(VI) compounds. The NIOSH 1988 testimony to Occupational Safety and Health Administration (OSHA) on the air contaminants standard recommended that all Cr(VI) compounds, regardless of their degree of solubility in water, be considered occupational carcinogens.

The permissible exposure limit (PEL) and threshold limit value (TLV) for divalent (+2) and trivalent (+3) chromium are 0.5 mg/m³. For water soluble hexavalent (+6) chromium, the TLV is 0.05 mg/m³ and the ceiling PEL is 0.1 mg/m³. The TLV for insoluble hexavalent (+6) chromium is 0.01 mg/m³. The PEL for chromium metal is 1 mg/m³ and the TLV is 0.5 mg/m³. The immediately dangerous to life or health (IDLH) concentration is 250 mg/m³.

Level C (full-face with a high-efficiency particulate air [HEPA] filter cartridge) can be used to 50 mg/m³ for chromium metal. For hexavalent chromium (+6), North approves level C (full-face with HEPA cartridge) up to 2.5 mg/m³. Level B must be used above these values.

5.2.2 Volatile Organic Compounds

The widespread use of organic solvent compounds for a variety of cleaning and surface treating industrial applications has occurred for many decades. During that time, usage patterns have changed and better compounds have been identified. Costs have changed and/or knowledge concerning the hazards associated with particular solvents has prompted replacement with less hazardous alternatives.

Two compounds, TCE and PCE, are the primary VOCs of concern in the groundwater treated at the plants. Should other solvent materials be identified, supplemental information can be provided to this HASP. However, since most solvents share similar hazards and modes of exposure (inhalation and skin contact), the work procedures, monitoring requirements and protective equipment already required should be adequate to address these situations.

5.2.2.1 TRICHLOROETHYLENE

Moderate exposures to TCE cause symptoms similar to those of alcohol inebriation. Higher concentrations cause narcotic effects. Ventricular fibrillation has been cited as the cause of death following heavy exposures. TCE-induced hepatocellular carcinomas have been detected in mice during tests conducted by the National Cancer Institute. Organ systems affected by overexposure to TCE are the central nervous system (CNS) (euphoria, analgesia, anesthesia), degeneration of the liver and kidneys, the lungs (tachypnea), heart (arrhythmia) and skin (irritation, vesication, and paralysis of fingers when immersed in liquid TCE). Contact with the liquid defats the skin, causing topical dermatitis. Certain people appear to experience synergistic effects from TCE exposure concomitant with exposure to caffeine, alcohol, and other drugs. Other reported symptoms of TCE exposure include abnormal fatigue, headache, irritability, gastric disturbances, and intolerance to alcohol. The OSHA PEL for TCE is 25 parts per million (ppm) while the American Conference of Governmental Industrial Hygienists (ACGIH) TLV is 50 ppm; the ACGIH short-term exposure limit (STEL) is set at 100 ppm.

5.2.2.2 TETRACHLOROETHYLENE

PCE is widely used for dry-cleaning fabrics and metal degreasing operations. The main effects of tetrachloroethylene in humans are neurological, liver, and kidney effects following acute (short-term) and chronic (long-term) inhalation exposure. Adverse reproductive effects, such as spontaneous abortions, have been reported from occupational exposure to PCE. Results from epidemiological studies of dry-cleaners occupationally exposed to PCE suggest increased risks for several types of cancer. Animal studies have reported an increased incidence of liver cancer in mice, via inhalation, and kidney and mononuclear cell leukemia in rats.

The OSHA PEL for PCE is 25 parts per million (ppm) while the ACGIH TLV is 25 ppm; the ACGIH STEL is set at 100 ppm.

5.2.2.3 1,2,3-TRICHLOROPROPANE

1,2,3-Trichloropropane is a synthetic chemical that is also known as allyl trichloride, glycerol trichlorohydrin, and trichlorohydrin. It is a colorless, heavy liquid with a sweet but strong odor. It evaporates very quickly and small amounts dissolve in water. It is mainly used to make other chemicals. Some of it is also used as an industrial solvent, paint and varnish remover, and cleaning and degreasing agent.

Exposure to 1,2,3-trichloropropane may occur from drinking water or from breathing air that is contaminated. This is most likely to occur near facilities that produce the chemical or near hazardous waste sites. People who are exposed to 1,2,3-trichloropropane can have eye and throat irritation. Exposure Limits: OSHA General Industry: PEL: 50 ppm, 300 mg/m³; OSHA Construction Industry: PEL: 50 ppm, 300 mg/m³ TWA, ACGIH TLV: 10 ppm, 60 mg/m³ TWA (Skin); NIOSH REL: 10 ppm time-weighted average (TWA) (Skin), Potential Carcinogen.

5.2.3 Radionuclides

5.2.3.1 URANIUM

Uranium is a hard, dense, malleable, ductile, silver-white, radioactive metal. Uranium metal has very high density. When finely divided, it can react with cold water. In air it is coated by uranium oxide, tarnishing rapidly. It is attacked by steam and acids. Uranium can form solid solutions and intermetallic compounds with many of the metals.

Exposure to uranium can result in both chemical and radiological toxicity. The main chemical effect associated with exposure to uranium and its compounds is kidney toxicity & cancer. This toxicity can be caused by breathing air containing uranium dusts or by eating substances containing uranium, which then enters the bloodstream. Once in the bloodstream, the uranium compounds are filtered by the kidneys, where they can cause damage to the kidney cells. Exposure to Uranium can also cause cancer over a period of time.

The current OSHA PELs for uranium and the insoluble uranium compounds (measured as uranium) are 0.2 milligram per cubic meter (mg/m³) of air as an 8-hour TWA concentration and 0.6 mg/m³ as a 15-minute TWA STEL. A STEL is the maximum 15-minute concentration to which workers may be exposed during any 15-minute period of the working day [29 CFR 1910.1000, Table Z-1-A]. The NIOSH has not issued a recommended exposure limit (REL) for uranium or its insoluble uranium compounds; however, NIOSH concurs with the PEL established for this substance by OSHA. The ACGIH has assigned uranium and the insoluble uranium compounds a TLV of 0.2 mg/m³ as a TWA for a normal 8-hour workday and a 40-hour workweek and a STEL of 0.6 mg/m³ for periods not to exceed 15 minutes. The OSHA and ACGIH limits are based on the risk of kidney and blood disorders and on the radiological damage associated with exposure to uranium or an insoluble uranium compound.

6. ACTIVITY-SPECIFIC REQUIREMENTS

6.1 SUPPLEMENTAL SAFETY PROCEDURES

As discussed in Section 4, personnel may be exposed to a variety of chemical and physical hazards. Safety guidelines for some of the physical hazards that may be encountered on the sites are provided in the following SOPs included in Attachment 3.

- SH&E SOP 118, Confined Space Entry Program
- SH&E SOP 119, Lock Out and Tag Out Program
- SH&E SOP 404, Manual Lifting
- SH&E SOP 501, Ladders
- SH&E SOP 506, Manual Hand Tools
- SH&E SOP 514, Manlifts
- SH&E SOP 109, Hearing Conservation Program

6.1.1 Confined Space Entry Program

The City may be requested to work as a confined space attendant for a confined space contractor (if needed) during media change-outs. No entry is needed by City personnel. On occasion, repairs or inspections must be done and entry is required by media-loading contractors. The media-loading contractor will be responsible for the entry permits (if needed). The City will review the entry permits and act as an attendant. The attendant will follow the guidelines established under *SH&E SOP 118, Confined Space Entry Program*.

6.1.2 Lock Out and Tag Out

Lock out and tag out of energy sources must be performed by an authorized employee performing the work. All lock out and tag out procedures must be followed. Refer to *SH&E SOP 119, Lock Out and Tag Out Program* for requirements and procedures.

6.1.3 Manual Lifting Guidelines

Most materials associated with normal O&M activities are moved by hand. The human body is subject to severe damage in the forms of back injury, muscle strains, and hernia if caution is not observed in the handling process. Whenever possible, use at least two people to lift, or roll/lift with your arms as close to the body as possible. Under no circumstances should any one person lift more than 49 pounds unassisted. For additional requirements, refer to *SH&E SOP 404, Manual Lifting*.

6.1.4 Ladders

Use of ladders to perform maintenance work is strongly discouraged. Manlifts or scaffolds are the preferred methods. However, it is understood that from time to time, work must be performed at elevations above ground surface that require the use of ladders. Ladders may be used for elevated work only where use of a manlift or scaffold is impractical such as accessing manholes on reactor vessels during inspections or performing maintenance work on equipment at elevations less than or equal to six feet above ground surface and in a confined area. Refer to *SH&E SOP 501, Ladders*, for detailed procedures.

6.1.5 Manual Tools

All manually-operated hand tools and equipment shall be used, handled, and stored in accordance with the requirements outlined in *SH&E SOP 506, Manual Hand Tools*.

6.1.6 Manlifts

Manlifts are the preferred tool for performing work at elevations greater than 6 feet from the ground surface. Refer to *SH&E SOP 514, Manlifts*, for detailed instructions and procedures.

6.1.7 Slips, Trips, Falls, and Protruding Objects

A variety of conditions may exist that may result in injury from slips, trips, falls, and protruding objects. Slips and trips may occur as a result of wet, slippery, or uneven walking surfaces. To prevent injuries from slips and trips, always keep work areas clean; keep walkways free of objects and debris; and report/clean up liquid spills. Serious injuries may occur as a result of falls from elevated heights. Always wear fall protection while working at heights of 6 feet or greater above the next lower level. Protruding objects are any objects that extend into the path of travel or working area that may cause injury when contacted by personnel. Personnel should always be aware of protruding objects and, when feasible, remove or label the protruding object with an appropriate warning.

For additional information, refer to *SH&E SOP 210, Walking-Working Surface Protection* and *SH&E SOP 208, General Housekeeping/Accountability*.

6.1.8 Hazardous Noise Environments

Working around heavy equipment often creates excessive noise. The effects of noise can include physical damage to the ear, pain, and temporary and/or permanent hearing loss. Workers can also be startled, annoyed, or distracted by noise during critical activities.

Noise monitoring data compiled from O&M activities indicate that working within 25 feet of operating heavy equipment (e.g., pumps, air compressors, earth-working equipment, etc.) can result in exposure to hazardous levels of noise (levels greater than 90 decibels [A-weighted scale]). Accordingly, all personnel are required to use hearing protection (earplugs or earmuffs) within 25 feet of any operating piece of noisy equipment.

The H&SP may also monitor employee exposure to hazardous noise levels to determine compliance with *SH&E SOP 109, Hearing Conservation Program*.

6.1.9 High Pressure Washers

All uses of high pressure washing equipment by City personnel or by contractors on City-controlled sites will meet the requirements in *SH&E SOP 510, High Pressure Washers*.

7. PERSONAL PROTECTIVE EQUIPMENT

The purpose of PPE is to provide a barrier, which will shield or isolate individuals from the chemical and/or physical hazards that may be encountered during work activities. *SH&E SOP 113, Personal Protective Equipment*, lists the general requirements for selection and usage of PPE. Table 7-1 lists the minimum PPE required during site operations and additional PPE that may be necessary. The specific PPE requirements for each work task are specified in the individual THAs found in Attachment 2.

By signing this HASP you are acknowledging that you have been properly trained in the use, limitations, care and maintenance of the PPE you will use at this project. If you have not received training on the proper use, care, and limitations of the PPE required for this project, please see the PM/SSO for the proper training prior to signing this HASP.

Table 7-1: Personal Protective Equipment

Type	Material	Additional Information
Minimum PPE		
Safety Boots	Leather uppers with rubber soles	ANSI approved safety toe
Safety Glasses		ANSI Approved with ultraviolet protection if worn in daylight
Hard Hat		ANSI Approved
Work Uniform		No shorts/cutoff jeans or sleeveless shirts
Additional PPE		
Hearing Protection	Ear plugs and/ or muffs	In hazardous noise areas
Gloves	Leather, rubber, insulated as appropriate based on task	If working with sharp objects, powered equipment, welding equipment, wetting and/or slippery objects, or vibratory equipment.
Protective Chemical Gloves	Inner: Best Safety n-DEX Outer: Ansell-Edmont SOLVEX	When sampling or handling disinfection chemicals
Fall Protection	Harness and lanyard	Use as directed in SH&E SOP 120 whenever performing work above ground level.

Note:
ANSI = American National Standards Institute

8. SITE CONTROL

8.1 GENERAL

The purpose of site control is to minimize potential contamination of workers, protect the public from site hazards, and prevent vandalism. The degree of site control necessary depends on the site characteristics, site size, and the surrounding community.

Controlled work areas will be established at each work location, and if required, will be established directly prior to the work being conducted. Diagrams designating specific controlled work areas will be drawn on site maps, posted in the support vehicle and discussed during the daily safety meetings. If the site layout changes, the new areas and their potential hazards will be discussed immediately after the changes are made.

8.2 SITE ACCESS DOCUMENTATION

If implemented by the PM, all personnel entering the site shall complete the "Site Entry/Exit Log" located at the primary site support vehicle.

8.2.1 Visitor Access

Visitors to any controlled-work area must comply with the health and safety requirements of this HASP, and demonstrate an acceptable need for entry into the work area. All visitors desiring to enter any controlled work area must observe the following procedures:

1. A written confirmation must be received by the City documenting that each of the visitors has received the proper training required by this HASP. Verbal confirmation can be considered acceptable provided such confirmation is made by an officer or other authorized representative of the visitor's organization.
2. Each visitor will be briefed on the hazards associated with the site activities being performed and acknowledge receipt of this briefing by signing the appropriate tailgate safety briefing form.
3. All visitors must be escorted by a City employee.
4. If the site visitor requires entry to any Exclusion Zone, but does not comply with the above requirements, all work activities within the Exclusion Zone must be suspended. Until these requirements have been met, entry will not be permitted.

8.3 SITE SECURITY

Site security is necessary to:

- Prevent the exposure of unauthorized, unprotected people to site hazards.
- Avoid the increased hazards from vandals or persons seeking to abandon other wastes on the site.
- Prevent theft.
- Avoid interference with safe working procedures.

To maintain site security during working hours:

- Maintain security Exclusion Zone and at access control points.
- Establish an identification system to identify authorized persons and limitations to their approved activities.

- Assign responsibility for enforcing authority for entry and exit requirements.
- When feasible, install fencing or other physical barrier around the site.
- If the site is not fenced, post signs around the perimeter and, whenever possible, use guards to patrol the perimeter. Guards must be fully apprised of the hazards involved and trained in emergency procedures.
- Have the PM approve all visitors to the site. Make sure they have valid purpose for entering the site. Have trained site personnel accompany visitors at all times and provide them with the appropriate PPE.

To maintain site security during off-duty hours secure the equipment within fenced areas if possible, making sure not to obstruct access by purveyor personnel to any operating parts of the plant.

9. EMERGENCY RESPONSE PLANNING

9.1 EMERGENCY ACTION PLAN

Although the potential for an emergency to occur is remote, an emergency action plan has been prepared for this project should such critical situations arise. The only significant type of on-site emergency that may occur is physical injury or illness to a member of the O&M team. The emergency action plan must be reviewed by all personnel prior to the start of field activities.

Three major categories of emergencies could occur during site operations:

1. Illnesses and physical injuries (including injury-causing chemical exposure).
2. Catastrophic events (fire, explosion, earthquake, or chemical).
3. Safety equipment problems.

9.2 RESPONSIBILITIES

9.2.1 Emergency Response Manager

The PM will designate Site Supervisor or SSO as an Emergency Response Manager (ERM), who will be present on site full-time. The ERM will report directly to the PM regarding site activities. The ERM will be the primary responder and will be responsible for coordinating all emergency response activities. The following are the minimum responsibilities of the ERM:

- Implementing contingency plan procedures.
- Maintaining project site layouts, evacuation plans, and hospital location maps in readily accessible locations.
- Understanding on-site wastes, including location, volume, and characteristics.
- Understanding the resources available for use during emergency response activities.
- Having an awareness of surrounding properties and populations that may be impacted by site emergencies.

9.2.2 Emergency Response Coordinators

Subcontractors working at the site will be required to designate an Emergency Response Coordinator (ERC) who will support the ERM during a response. At least one ERC, certified in administering first aid and cardiopulmonary resuscitation (CPR), will assume the role of the ERM should the primary ERM be incapacitated or be unavailable during an emergency incident or emergency response.

If the ERM plans to be offsite for any period of time, an ERC will be designated to stand in for the ERM during the ERM's absence. The ERM will inform workers of the change in authority at the tailgate meeting or other means prior to the absence.

9.2.3 Site-Specific Emergency Procedures

Prior to the start of site operations, the Site Supervisor must complete Table 9-1 with any site-specific information regarding evacuations, muster points, communication, and other site-specific emergency procedures that will depend on existing site and meteorological conditions.

Table 9-1: Emergency Planning

Emergency	Evacuation Route	Muster Location
Fire/Explosion	Away from construction site	Open area upwind and adjacent to site
Additional Information		
Communication Procedures	Observing party to contact the City of Glendale Project Manager, who will contact the City of Glendale Program Manager	
CPR/First Aid Trained Personnel	May be any of the City of Glendale personnel on site or other trained personnel.	
Employee in Charge	Site Supervisor or person appointed by Site Supervisor or Project Manager	

9.3 COMMUNICATION

All field personnel are required to communicate any potentially hazardous situations, or possible deficiencies within the HASP to the ERM and/or ERC. The ERM and/or ERC report any deficiencies/potential hazards to the PM so that corrective actions can be taken.

9.4 EMERGENCY EQUIPMENT

In accordance with 29 CFR 1910, subpart K, the following emergency equipment will be available at the work site and in proper working condition.

9.4.1 First Aid Kit

A first aid kit will be available that meets the following requirements:

- First aid kits will be in weatherproof containers, be approved by the H&SP, meet all regulatory requirements, and be present at all locations where City employees and contractors are working.

Use of any item from the first aid kit necessitates completion of a Supervisor's Report of Incident as outlined in Section 9.8. The report will be submitted to the Health and Safety department within one working day.

Personnel permitted to use first aid kits will possess a current first aid card. A minimum of two trained first aid/CPR provider will be present on site at all times.

9.4.2 Fire Extinguisher

A fire extinguisher with a minimum rating of 1A:10B:C will be available on site at all times. Site personnel will be trained in the use of the available fire extinguisher type(s), and will be kept aware of any on-site locations where extinguishers are placed (for access in case of fire).

In addition, a fire extinguisher will be mounted on each piece of heavy equipment for use in an emergency. The minimum rating for each vehicle-mounted extinguisher will be 2A, 10B.

9.4.3 Emergency Eyewash

An eyewash unit or potable water will be available at the work site at all times. The eyewash must meet the latest requirements of ANSI Standard Z358.1, and will be capable of supplying hands-free irrigation for both eyes for at least 15 minutes at a flow rate of at least 0.4 gallons per minute.

9.5 RESPONSE ACTIONS – SAFETY EQUIPMENT PROBLEMS

A malfunction or other problem with any health and safety equipment can potentially lead to a medical emergency. Examples include the following:

- Leaks or tears in protective clothing;
- Failure of respiratory protective devices (i.e., self-contained breathing apparatus or air-purifying respirators); and
- Encountering contaminants for which prescribed protective equipment may not be suitable.

These equipment problems must be corrected before proceeding with field activities. Personnel affected by the equipment problem(s) must exit the work area until the problem has been corrected.

9.6 RESPONSE ACTIONS — CHEMICAL RELEASE OR OTHER SIGNIFICANT INCIDENT

On-site personnel will implement the following procedure in response to any “incident” which results in an injury, causes damage to owners property or other property which could exceed \$500, causes a stoppage in work of more than two hours, or which requires response service from the municipalities, water purveyors, or other off-site agency.

9.6.1 Incident Response Actions

The senior on-site leader, typically either the Site Supervisor or SSO will assume full control of all work activities as the designated Response Manager (RM).

The RM will make an assessment of the incident consequences and will order an immediate evacuation of the site, if an uncontrolled hazard exists to site personnel.

Once the risk of worker injury is controlled, priority will be given to identifying and treating injuries, under the direction of the RM. First aid procedures will be implemented immediately for all victims; emergency medical assistance will be contacted (in accordance with HASP procedures) if injuries warrant response by emergency medical technicians. As appropriate, less severely injured personnel should be transported to the designated hospital (as time/resources permit), sent home, or released to resume work.

Once injury response activities are under control, the RM will perform an assessment of the site conditions and determine if off-site support is required to implement control or corrective procedures. If no outside support is necessary, the RM will direct worker recovery actions to allow resumption of normal activities. Once activities are restored, the RM will contact the PM and HASP-designated H&SP and provide a complete report of the incident occurrence, any resulting injuries or damage, and the completed response actions. Additional directions issued by the PM or H&SP will be implemented by the RM. The PM will be responsible for notifying the remedial project manager (RPM) and the PM of the incident in as timely a manner as possible. Additional follow-up notifications will be performed, as needed, in accordance with the follow-up activities discussed below.

If outside support is required in response to post-incident conditions, the RM will contact the other designated/appropriate response agency in accordance with the HASP. The response agency will be provided with information concerning site location, the nature of the incident, the assessment of conditions, and what type of support is required. In addition, during the initial contact, the response agency must be informed that the work site is undergoing environmental investigation and that response actions may entail exposure to environmental contaminants.

After notifying the response agency of the incident, the RM will immediately contact the PM and HASP-designated H&SP and provide a complete report of the incident occurrence, any resulting injuries or damage, and the status of the on-going response actions. Additional directions issued by the PM or H&SP will be implemented by the RM. The PM will

be responsible for notifying the RPM and the Program Manager of the incident before close of business that day, if possible, or else at the start of the next business day. Additional follow-up notifications will be performed as needed, in accordance with the follow-up activities discussed below.

If response team support will be immediate, the RM will remain on site to meet the response team. If response will be delayed, the RM will coordinate the response schedule to be present when the response agency arrives¹. The RM will provide the response team leader with a copy of the HASP, along with a concise briefing on site conditions, known physical/chemical hazards, and recommended safety procedures. The RM will attempt to answer any questions the response team leader may have regarding the environmental conditions of the site or the circumstances of the incident.

Once the status briefing is complete, the RM will relinquish operational control of the site to the response team. The RM will remain on site throughout the response team's work unless dismissed by the response team leader or relieved by an appropriate representative (e.g., the PM). However, the RM will NOT direct any response team actions. When the response team has completed its work, control of the site will return to the RM.

Once response activities have been completed the RM will notify the PM and the H&SP.

9.7 RESPONSE ACTIONS – MEDICAL EMERGENCIES

A medical emergency is a situation that presents a significant threat to the health of personnel on-site. Chemical exposure, heat stress, cold stress, and poisonous insect bites can cause medical emergencies. Proper care must be initiated immediately. Proper care may be in the form of first aid treatment or emergency hospitalization.

Response personnel will accompany victims to the medical facility, whenever possible, to advise on decontamination. Table 9-2 provides instructions to respond to general categories of medical emergencies.

Table 9-2: How to Respond to Common Medical Emergencies

Emergency	Response
Inhalation	<ol style="list-style-type: none"> 1. Call for medical assistance. 2. Workers wearing proper respiratory protective equipment should remove the victim from the contaminated atmosphere. 3. Voluntary basis only: If the victim is not breathing, administer mouth-to-mouth resuscitation or CPR immediately.
Eye Contact	<ol style="list-style-type: none"> 1. Do not rub eyes. 2. Flood eyes with emergency eyewash solution. Hold the eye open and flood so that all surfaces are thoroughly washed. 3. Continue washing for 15 minutes while calling for medical assistance.
Skin Exposure	<ol style="list-style-type: none"> 1. Wash skin with soap and water for a minimum of 15 minutes. All contaminated areas on the body, including hair, should be thoroughly decontaminated. 2. If clothing is contaminated, it should be removed in a way to minimize further contact with the substance. 3. Seek medical assistance.

¹ If response will not be immediate, the RM will ensure that the site is controlled and poses no health or safety hazard to persons or property before leaving. If this cannot be ensured, the RM or other designated personnel will stay on site to maintain control until the response team arrives.

9.7.1 Responding to Heat-Related Illness

The guidance in Table 9-3 will be used in identifying and treating heat-related illness.

Table 9-3: Identification and Treatment of Heat-Related Illness

Type of Heat-Related Illness	Description	First Aid
Mild Heat Strain	The mildest form of heat-related illness. Victims exhibit irritability, lethargy, and significant sweating. The victim may complain of headache or nausea. This is the initial stage of overheating, and prompt action at this point may prevent more severe heat-related illness from occurring.	<ul style="list-style-type: none"> • Provide the victim with a work break during which he/she may relax, remove any excess protective clothing, and drink cool fluids. • If an air-conditioned spot is available, this is an ideal break location. • Once the victim shows improvement, he/she may resume working; however, the work pace should be moderated to prevent recurrence of the symptoms.
Heat Exhaustion	Usually begins with muscular weakness and cramping, dizziness, staggering gait, and nausea. The victim will have pale, clammy moist skin and may perspire profusely. The pulse is weak and fast and the victim may faint unless they lie down. The bowels may move involuntarily.	<ul style="list-style-type: none"> • Immediately remove the victim from the work area to a shady or cool area with good air circulation (avoid drafts or sudden chilling). • Remove all protective outerwear. • Call a physician. • Treat the victim for shock. (Make the victim lie down, raise his or her feet 6–12 inches, and keep him or her cool by loosening all clothing). • If the victim is conscious, it may be helpful to give him or her sips of water. • Transport victim to a medical facility as soon as possible.
Heat Stroke	The most serious of heat illness, heat stroke represents the collapse of the body's cooling mechanisms. As a result, body temperature may rise to 104 degrees Fahrenheit or higher. As the victim progresses toward heat stroke, symptoms such as headache, dizziness, and nausea can be noted, and the skin is observed to be dry, red, and hot. Sudden collapse and loss of consciousness follows quickly and death is imminent if exposure continues. Heat stroke can occur suddenly.	<ul style="list-style-type: none"> • Obtain emergency medical assistance (call 911). Since heat stroke is a severe medical condition requiring professional medical attention, emergency medical help should be summoned immediately to provide on-site treatment of the victim and proper transport to a medical facility. • Immediately evacuate the victim to a cool and shady area. • Remove all protective outerwear and as much personal clothing as decency permits. • Lay the victim on his or her back with the feet slightly elevated. • Apply cold wet towels or ice bags to the head, armpits, and thighs. • Sponge off the bare skin with cool water or rubbing alcohol, if available. • The main objective is to cool without chilling the victim. • Give no stimulants or hot drinks.

9.7.2 Medical Assistance

Emergency contact information is provided in see Table 9-4. The Site Supervisor or SSO will ensure the list of emergency telephone numbers and locations of the local fire department, hospitals, ambulance service, and other emergency services are kept on hand by all employees performing work under this contract.

Table 9-4: Emergency Contact Information

Name	Title/Workstation	Telephone	Mobile Phone
Emergency Contacts/ Key Personnel (Listed in the order to be notified)			
Peter Kavounas	Assistant General Manager (City of Glendale)	818 548-2137	
Dan Hutton	CDM Project Manager	562 577-1212	
Charles Cron	Chief Plant Operator (CDM)	818-550-5975	562-755-0905
Incident Reporting Organization / Agency			
Police			911
EMERGENCY	Fire Department		911
	Ambulance (EMT will determine appropriate hospital for treatment)		911
Hospital, Glendale Memorial (Use by site personnel is only for non-emergency cases)			818-502-1900
Poison Control Center (if a toxic substance has been ingested, inhaled, injected through or come in contact with the skin)			800-222-1222
National Response Center (for toxic chemical and oil spills)			800-424-8802

Note:
EMT = Emergency Medical Technician

In the event of severe injury, transport personnel to Loma Linda University Medical Center at the following address:

Hospital

Glendale Memorial Hospital
120 South Central Avenue
Glendale, CA 91204
Tel: 818-502-1900

The route to the medical center is shown on . The hospital is located approximately 1.3 miles from the WBA Facility site and 3.3 miles away from the RCF Facility. The quickest routes from the general site areas taking into account distance and traffic are as follows:

Hospital Directions from the WBA Facility

1. Head east on Goodwin Ave toward Brunswick Ave
2. Turn right at Alger St
3. Turn left at Checy Chase Drive
4. Turn right at San Fernando Road
5. Turn left at South Central Avenue
6. Turn right at West Laurel Street, the hospital is located on the left

Hospital Directions from the RCF site

1. Head northeast on Flower St toward Grand Central Ave
2. Turn left at Air Way
3. Turn right at Grandview Avenue
4. Turn right at San Fernando Road
5. Turn left at South Central Avenue
6. Turn right at West Laurel Street, the hospital is located on the left

At least two qualified first aid provider will be present on site at all times to provide immediate care in the event of accident or injury. The SSO will inform hospital personnel of any medical treatment administered to personnel for on-site injury, illness, or exposure to chemical contaminants.

9.8 ACCIDENT/INCIDENT REPORTING

All accidents, incidents, and near misses that occur on-site during any field activity will be promptly reported to the SSO and the Site Supervisor in accordance with *SH&E SOP 101, Injury, Illness, and Near-Miss Reporting*. In addition, the observing employee will contact the PM, who will in turn contact the City Operations Manager.

If any City employee is injured and requires medical treatment, the Site Supervisor will **first secure first aid treatment** for the injured person **then** contact City to report the incident. Table 9-4 lists emergency contacts and phone numbers.

The Site Supervisor will initiate a written report, using the ***Supervisor's Report of Incident*** form (see SH&E SOP 101). The Site Supervisor will complete the first two sections of this form and forward to the PM for completion of Section 3. The report will then be provided to the H&SP before the end of the following shift.

If any employee of a subcontractor is injured, documentation of the incident will be accomplished in accordance with the subcontractor's procedures. However, copies of all documentation (which at a minimum must include the OSHA Form 301 or equivalent) must be provided to the SSO within 24 hours after the accident has occurred.

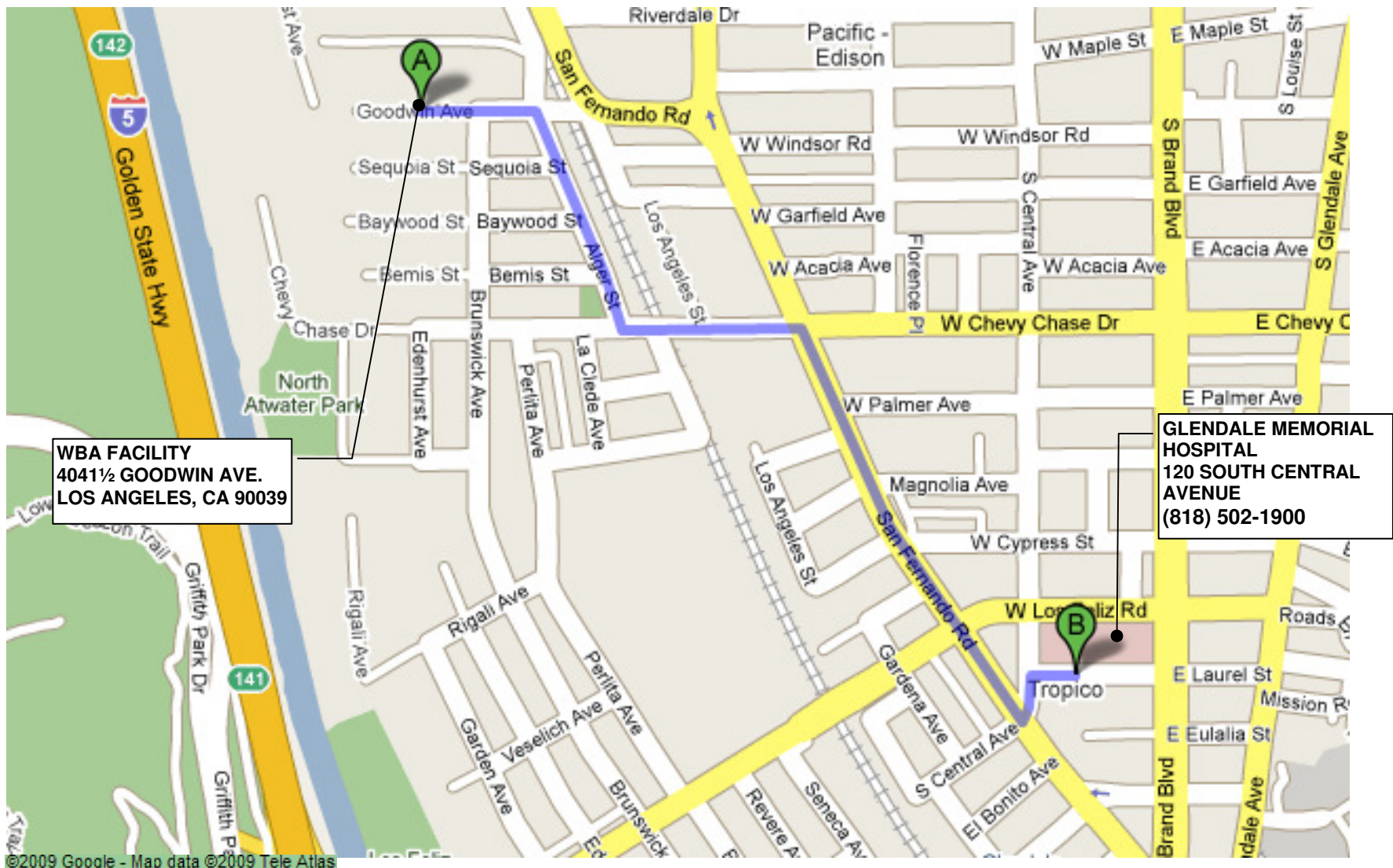


Figure 9-1: Hospital Route Map from WBA Facility

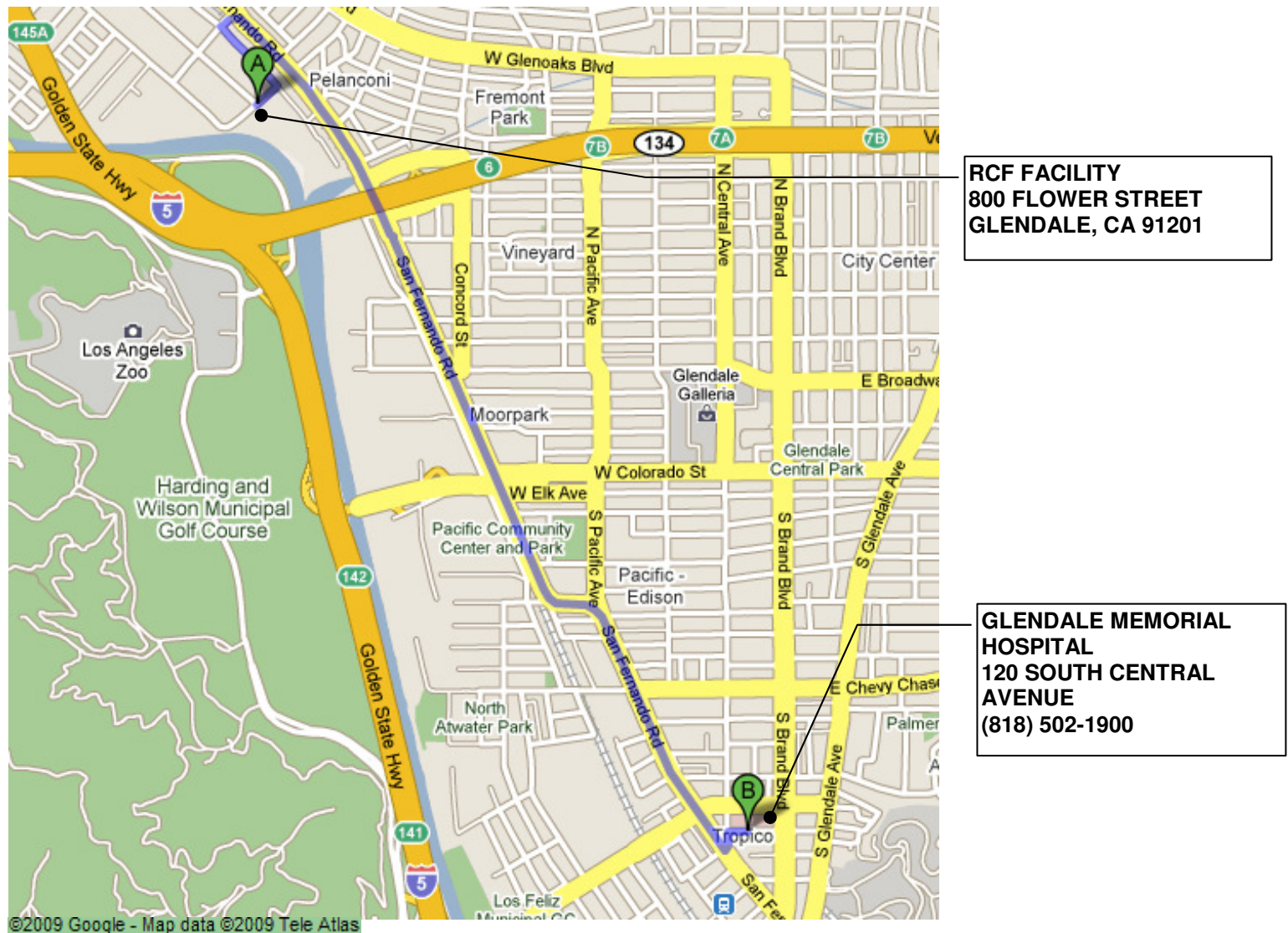


Figure 9-2: Hospital Route Map from RCF Facility

10. REFERENCES

AECOM. *Safety, Health & Environmental (SH&E) Standard Operating Procedures*.

Environmental Protection Agency (EPA), United States. 1992. *Standard Operating Safety Guides*. PB92-963414. Office of Emergency and Remedial Response. June.

Malcolm Pirnie, Inc. 2007. Experimental Design and Operations Plan for Hexavalent Chromium Removal using Weak-Base Anion Exchange Resin: A Demonstration-Scale Study. Santa Monica. October.

Malcolm Pirnie, Inc. 2008. Experimental Design and Operations Plan for Hexavalent Chromium Removal using Weak-Base Anion Exchange Resin: A Demonstration-Scale Study. Santa Monica. October.

Attachment 1 Material Safety Data Sheets

List of Material Safety Data Sheets

*AMBERLITE™ PWA7 Resin
Liquid Carbon Dioxide
Ferrous Sulfate Solution (6%)
Magnaflow E38
Chlorine*

Attachment 2 Task Hazard Analysis

System O&M Monitoring

Media Replacement Supervision

Confined Space Entry

Chlorine Disinfection

Radiation Safety

Attachment 3
Standard Operating Procedures

List of Standard Operating Procedures

SH&E SOP 101, Injury, Illness, and Near-Miss Reporting

SH&E SOP 104, Inspections, Audits, and Corrective Actions

SH&E SOP 109, Hearing Conservation Program

SH&E SOP 113, Personal Protective Equipment

SH&E SOP 115, Hazard Communication Program

SH&E SOP 118, Confined Space Entry

SH&E SOP 119, Lock Out & Tag Out Program

SH&E SOP 120, Fall Protection Program

SH&E SOP 124, Heat Stress Prevention Program

SH&E SOP 125, Cold Stress Prevention Program

SH&E SOP 126, Radiation Safety Program

SH&E SOP 128, Radiation Exposure Assessment

SH&E SOP 129, ALARA

SH&E SOP 201, General Safety Rules

SH&E SOP 202, Safety Meetings

SH&E SOP 206, Stop Work Authority

SH&E SOP 208, General Housekeeping, Hygiene, and Sanitation

SH&E SOP 210, Walking-Working Surface Protection

SH&E SOP 404, Manual Lifting

SH&E SOP 501, Ladders

SH&E SOP 506, Manual Hand Tools

SH&E SOP 510, High Pressure Washers

SH&E SOP 514, Manlifts

Attachment 3
Standard Operating Procedures

List of Standard Operating Procedures

SH&E SOP 101, Injury, Illness, and Near-Miss Reporting

SH&E SOP 104, Inspections, Audits, and Corrective Actions

SH&E SOP 109, Hearing Conservation Program

SH&E SOP 113, Personal Protective Equipment

SH&E SOP 115, Hazard Communication Program

SH&E SOP 118, Confined Space Entry

SH&E SOP 119, Lock Out & Tag Out Program

SH&E SOP 120, Fall Protection Program

SH&E SOP 124, Heat Stress Prevention Program

SH&E SOP 125, Cold Stress Prevention Program

SH&E SOP 126, Radiation Safety Program

SH&E SOP 128, Radiation Exposure Assessment

SH&E SOP 129, ALARA

SH&E SOP 201, General Safety Rules

SH&E SOP 202, Safety Meetings

SH&E SOP 206, Stop Work Authority

SH&E SOP 208, General Housekeeping, Hygiene, and Sanitation

SH&E SOP 210, Walking-Working Surface Protection


SH&E SOP 404, Manual Lifting

SH&E SOP 501, Ladders

SH&E SOP 506, Manual Hand Tools

SH&E SOP 510, High Pressure Washers

SH&E SOP 514, Manlifts

 Safety, Health & Environmental Procedure	PROCEDURE NO. <u>SH&E 101</u>
	DATE <u>March 25, 2005</u>
INJURY, ILLNESS, AND NEAR-MISS REPORTING	REVISED <u>August 15, 2008</u>
	PREVIOUSLY <u>EHS 101</u>

This procedure applies to all U.S.-based personnel, projects, offices, business units and activities. Any exceptions to this procedure must be approved, in writing, by the responsible District/Business Unit Manager and Safety Manager.

1.0 PURPOSE

All work-related injuries, illnesses, and near-miss situations, to include vehicle accidents and general liability claims, must be documented and reported to the Safety, Health & Environmental (SH&E) Department and Earth Tech management in a timely and accurate manner.

2.0 SCOPE

This procedure applies to all safety, health, and/or environmental incidents as defined below:

1. Any work-related injury or illness to an Earth Tech or subcontractor employee;
2. Fire, explosion, or flash;
3. Any accidents involving company-owned, rented, or leased vehicles (including personal vehicles used for company business);
4. Property damage resulting from any Earth Tech or subcontractor activity;
5. Unexpected release or imminent release of a hazardous material;
6. Unexpected chemical exposures to workers or the public;
7. A safety related complaint from the public regarding Earth Tech activities;
8. Incidents that could result in adverse public media interest concerning Earth Tech or an Earth Tech project;
9. Incidents that could result in, or any actual investigation by, OSHA, DOT, EPA, or any other State, Federal, or local safety, health, & environmental enforcement agency;
10. Near-Miss Incidents, defined as an incident having the potential to cause injury or property damage as described in the above categories – but did not. Examples of a near-miss include:
 - A worker steps off a ledge and falls three feet (1 meter) to the floor and is uninjured.
 - A crane drops a 1,000-pound (454 kg) beam during a lift – and nobody is hurt, no equipment is damaged.
 - A work crew is conducting a survey along the highway. A vehicle leaves the roadway (driver asleep) and the vehicle enters the survey area at 50 mph (80 kph). The vehicle misses an employee by 3-feet (1 meter), the driver recovers control of the vehicle and leaves the area.

11. Significant Learning Experience, defined as a near-miss incident that the affected group (i.e. project team, office staff, etc.) believes could have wide-ranging impacts throughout Earth Tech. Examples may include; an incident involving a chlorine distribution system used by multiple wastewater treatment plants (WWTPs); an incident involving the failure of a fall protection system used throughout Earth Tech.

3.0 PROCEDURES

The following response procedures will be followed in the event of any work-related injury, illness, incident, or near miss occurring at an Earth Tech work location as defined in Section 2.0 (Attachment 1 summarizes the Incident Reporting Procedures, to include incidents, injuries, auto accidents, and general liability claims). Incidents are to be reported to the 1-800-348-5046 hotline, or in accordance with your District/Business Unit-specific reporting procedures, after the site has been secured and/or medical treatment has been provided, and no later than the end of the work shift.

1. Affected Employee: Each injured/ill employee must notify his/her supervisor immediately that an incident (to include near misses) has occurred, the circumstances involved, the nature and extent of the injuries/illness, and whether medical treatment may be required. Except for emergency aid, affected employees will discuss their medical status with the supervisor and SH&E representative prior to obtaining medical treatment.
2. Workplace Supervisor: The workplace supervisor must **immediately** perform the following notifications:
 - In a life-threatening situation, use the emergency phone numbers and seek immediate medical care.
 - Follow the directions provided by the 1-800-348-5046 hotline to report an incident/near miss by the end of the current work shift.
 - Notify the SH&E professional listed in the contact information (provided in your HASP, emergency response listing, etc.) if immediate assistance is required.
 - Complete the applicable paperwork (e.g., Supervisor's Report of Incident [SRI], Vehicle Incident Form, General Liability Form) and fax a draft copy to Earth Tech SH&E at (562) 499-4012 by the next work day (Attachments 2-4).
 - Notify his/her manager, and secure the manager's signature on the applicable form within 48 hours. If the supervisor's manager is unavailable, obtain the signature from a designated acting manager.
 - Initiate an Incident Investigation and Review per the requirements of SH&E 102.
 - Fatalities must be reported to the appropriate SH&E Professional and Corporate SH&E Director as soon as reasonably possible but no more than 2 hours after the incident.
3. Manager: Review the applicable paperwork and forms as prepared by the workplace supervisor. Forward to the SH&E Professional within 48 hours of receipt.

4.0 RECORDKEEPING

Earth Tech records company safety statistics and generates reports to identify incident trends and recommend appropriate corrective actions to minimize risk. The Corporate Safety

Administrator maintains these records and statistics, which are also required by regulatory agencies, insurance carriers, and for client pre-qualification.

4.1 Reports and Requirements

- The Corporate SH&E Director has overall responsibility for recordkeeping and statistical reports to disseminate company-wide to identify accident trends and appropriate control measures to minimize risk to the company.
- Reports for the previous calendar year summarizing Earth Tech's Statistics are distributed for posting at all offices and project sites from February 1 – April 30. The reports will be posted in a conspicuous place, and taken down after April 30.
- Statistical reports are available from the Corporate Safety Administrator for client prequalification.
- It is imperative that injuries, incidents and near misses are reported to maintain accurate statistical data.

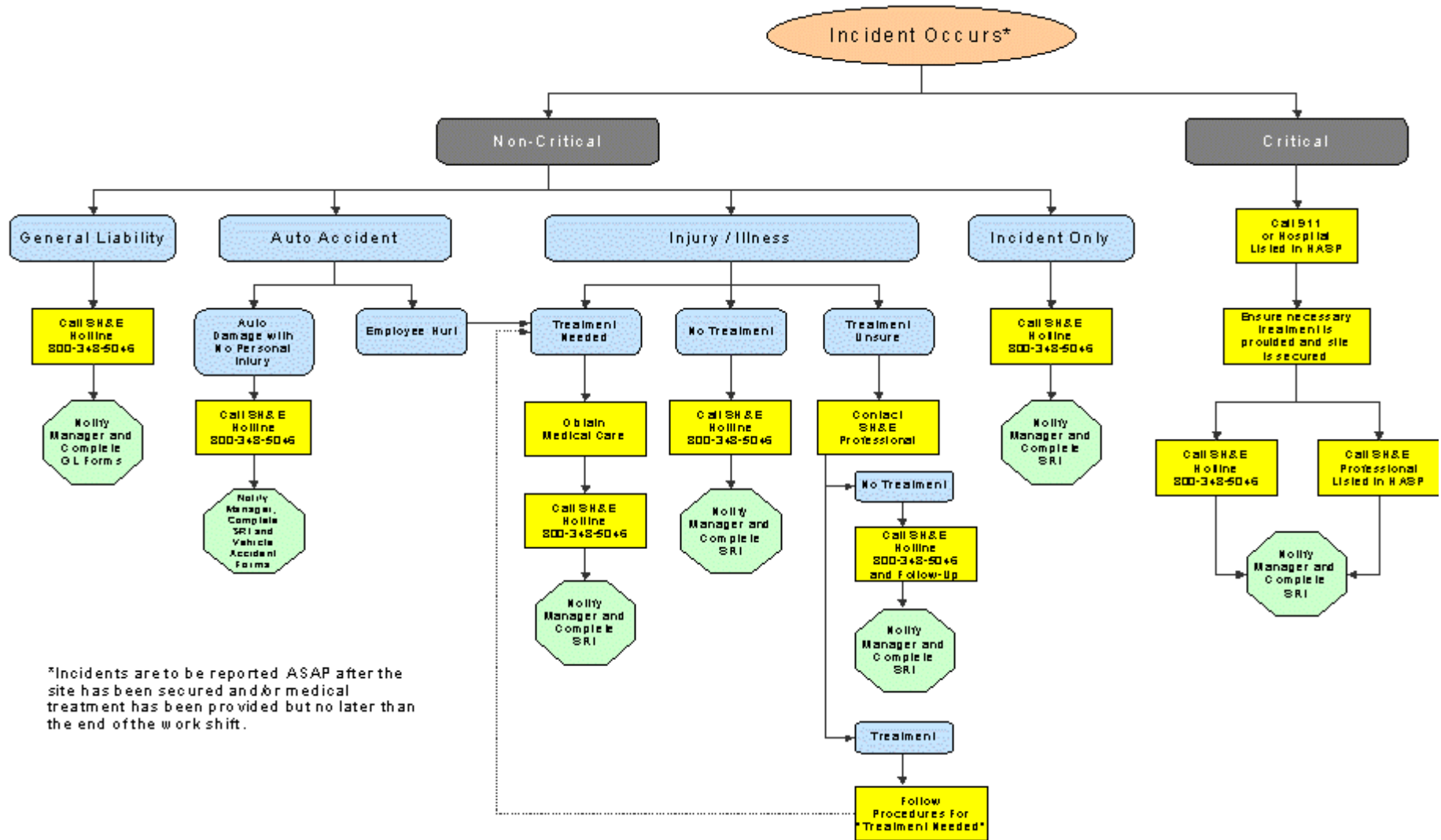
5.0 ATTACHMENTS

Attachment 1 - Supervisor's Incident Reporting Procedures Flow Chart
Attachment 2 - Supervisor's Report of Incident (SRI) Form

6.0 REFERENCES

SH&E 004 - Safety Administrative Support
SH&E 102 - Incident Investigation and Review

Supervisors Incident Reporting Procedure Flow Chart



Supervisor's Report of Incident

1. Seek immediate medical attention if necessary.
2. Employee must report all incidents and near misses to their supervisor **immediately**.
3. Supervisor calls the Earth Tech Incident, Injury and Near Miss Reporting Line at **(800) 348-5046**.

Section 1 - Organization Information

Division: <input type="checkbox"/> GC&E <input type="checkbox"/> GWPP	District:	Section/Dept (4-digit #):
Office Address:	Office Code (3-digit #):	
Client Name:	Project Number:	
Project Name:		

Section 2 - Type of Incident

<input type="checkbox"/> Near Miss (Sections 3, 4 and 7)	<input type="checkbox"/> Injury/ illness (Sections 3, 4, and 7)	<input type="checkbox"/> Vehicle Incident (Sections 3, 4, 5, and 7)	<input type="checkbox"/> General liability (Sections 3, 4, 6 and 7)	<input type="checkbox"/> Environmental Spill/Release (Sections 3, 4, and 7)
<input type="checkbox"/> Regulatory Inspection or Notification: (Sections 3, 4,7)			<input type="checkbox"/> Other (describe)	

Section 3 - Contact Information

Employee/Claimant Name:	Employee Job Title:	<input type="checkbox"/> Subcontractor <input type="checkbox"/> Temp Agency <input type="checkbox"/> Earth Tech Part-Time <input type="checkbox"/> Third Party	
Work Phone:	Cell Phone:	Home Phone:	Employee Number:
Date/Time of Incident:	Date/Time Reported to Supervisor:		
Street Address of Incident or approximately:	City:	State/Zip:	
Body Part Injured:	Type of Treatment:	Medical/hospital or doctor	<input type="checkbox"/>
		First Aid Only	<input type="checkbox"/>
Medical facility contact info: (Name, Address, Phone)			

Section 4 - Descriptions of Incident *(employee, supervisor and witness statements)*

<i>Employee Description of Incident:</i>	
<i>(use additional paper if necessary)</i>	
Employee Signature:	Date and Time:

Supervisor Description of Incident: (Supervisor signs in Section 7)

(use additional paper if necessary)

Witness Name :	Witness Address:	Witness Phone No.:
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Witness Description of the Incident:

(use additional paper if necessary)

Witness Signature:	Date and time:
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Section 5 - Vehicle Incident Information (fill out for motor vehicle incidents only)

5a - Earth Tech Driver Name:		Drivers License #:	State Issued:	Expiration Date:	
Vehicle Year:	Make:	Model:	Color:	License Plate:	State:
VIN Number:					
Earth Tech Vehicle was:			Who was involved?		
<input type="checkbox"/> Earth Tech Owned <input type="checkbox"/> Rented <input type="checkbox"/> Leased <input type="checkbox"/> Personal Vehicle			<input type="checkbox"/> Earth Tech Vehicle(Section 5a) <input type="checkbox"/> Pedestrian <input type="checkbox"/> Another Vehicle(Section 5b) <input type="checkbox"/> Property		
Use of Vehicle at Time of Incident:			Vehicle Type:		
<input type="checkbox"/> Office Visit <input type="checkbox"/> Site Visit <input type="checkbox"/> Client Meetings <input type="checkbox"/> Field Work <input type="checkbox"/> Personal <input type="checkbox"/> Other _____			<input type="checkbox"/> Commercial Motor Vehicle <input type="checkbox"/> Non Commercial Motor Vehicle		

5b - Name of Other Driver:		Address:	City:	State/Zip:	
Work Phone:		Cell Phone:			
Date of Birth:	Drivers License #:	State Issued:	Expiration Date:		
Vehicle Year:	Make:	Model:	Color:	License Plate:	State:
VIN Number:					

If Vehicle Owner is different from driver then complete owner's contact information	Owner Name:	
	Address, City, State, Zip:	
	Work Phone:	Cell Phone:
Authorities contacted? <input type="checkbox"/> Yes <input type="checkbox"/> No	If so, who responded?	
Citations Issued? <input type="checkbox"/> Yes <input type="checkbox"/> No	Type of Citation:	Person Cited:

Section 6 - General Liability*(Fill out for property damage only)*

Description of damaged property:	
Where can the property be seen?	
Property Owner Name:	
Address, City, State, Zip:	
Work Phone:	Cell Phone:

Section 7- Signatures

Supervisor

Print Name:	Signature:	Date:	Telephone:
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Section Manager

Print Name:	Signature:	Date:	Telephone:
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District Safety Manager

Print Name:	Signature:	Date:	Telephone:
Comments:			

Attention: This form must be completed and forward to the District Safety Manager within one (1) business day following the occurrence of the incident.

	PROCEDURE NO. <u>SH&E 104</u>
	DATE <u>March 25, 2005</u>
Safety, Health & Environmental Procedure	REVISED <u>August 15, 2008</u>
	PREVIOUSLY <u>ENV 105 / EHS 110</u>
Inspections, Audits, and Corrective Actions	

This procedure applies to all U.S.-based personnel, projects, offices, business units and activities. Any exceptions to this procedure must be approved, in writing, by the responsible District/Business Unit Manager and Safety Manager.

1.0 PURPOSE

To establish the protocol for Earth Tech to perform inspections, audits, and implement appropriate corrective actions to minimize risk to employees and the Company.

2.0 SCOPE

Earth Tech projects and offices will be inspected and audited by upper management, project management, site personnel and the SH&E Department to ensure compliance and maintain a safe workforce.

3.0 PROCEDURE

3.1 Inspections

The Project Manager (PM) and supervisory personnel will ensure that protection of employees, property and the environment is their first and primary concern. The PM and supervisory personnel will provide for the correction of unsafe conditions and actions and ensure continuous observance of established safety practices. To ensure project safety and compliance, the project supervisors, managers, or designated SH&E professional will:

1. Conduct periodic self-inspections of their operations or facilities. Depending on the scope of work and potential severity of hazard agents, the self-inspections will be conducted on a daily basis. Additional unscheduled audits or inspections may be requested at the discretion of the SH&E Department in response to regulatory agency inspections or a significant on-site accident/injury. A self-inspection checklist will be developed prior to site activities to document compliance. The SH&E Department can provide examples of a compliance checklist (see attached).
2. Site Supervisors will conduct daily walkthrough inspections of their work areas to assess safety and health problems, deficiencies, or adverse conditions. Corrective action will be taken when violations and/or deficiencies are observed.
3. Participate in all compliance inspections, with subcontractor supervisors being involved in all compliance inspections of their work areas.
4. The responsible individual will attempt to eliminate the hazard or violation on the spot or as soon as possible after completion of the inspection.

5. For all non-compliance items, the violation, abatement efforts, and time period will be discussed among the site safety and health representative and the responsible supervisor/manager; agreement should be reached on issues to be resolved.
6. Imminent dangers and/or serious conditions will be corrected immediately and work stopped until corrective action has been taken and accepted. These conditions, when they occur, will be promptly reported to the SH&E Department.

3.2 Audits—Self Assessment

Based on the type and duration of identified projects, the SH&E Department will develop a formal audit process to meet the requirements of Corporate SH&E and Tyco initiatives. If a project is designated as high risk and/or is longer than nine months in duration, a self assessment audit program will be formalized and scheduled with the Project Management Team.

3.3 Tracking

The tracking, maintenance, and supporting documentation generated during the corrective action process will be the responsibility of Project Management.

4.0 FOLLOW UP / CORRECTIVE ACTION IMPLEMENTATION & CLOSURE

The PM is responsible for implementing corrective actions for every identified item, and will utilize the listing to track the status of each item. Requirements for implementation of corrective actions are as follows:

- Whenever possible, on-the-spot correction of items will be accomplished. For these cases, information regarding the corrective action can be provided to the SH&E Department when reporting the results of the audit/inspection.
- For items which cannot be corrected immediately, the PM will identify appropriate corrective actions to the SH&E Department for concurrence.
- If implementation of the final corrective action will require more than 30 calendar days to accomplish, an “interim action” must also be implemented to prevent accident/injury from occurring until the final corrective action is implemented.
- As each corrective action is implemented, the PM will provide written notification to the SH&E Department, but will continue to track the item as open. Close of each identified item will occur only after the SH&E Department approves the implemented corrective action(s).

5.0 REFERENCES

SH&E 131 - Safety Assessment Program

6.0 ATTACHMENTS:

Attachment 1 – SH&E Inspection Form Example.

(See your SH&E District Safety Manager for other examples)

PROJECT SITE SH&E INSPECTION FORM

Project Name:

Date of Inspection:

Project Number:

SH&E Inspector:

Project Manager:

Client POC:

Site Safety Plan	YES	NO	NA
1. Is a site safety plan posted on site or accessible to all employees?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
2. Have potential hazards been described to employees on site?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
3. Are material safety data sheets available for review by employees on site?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
4. Is there a designated safety official on site?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
5. Are employees aware and knowledgeable of the results of exposure?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Site Posters			
Are the following documents posted in a prominent and accessible area?			
6. Minimum Wage	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
7. OSHA Job Safety and Health Protection (or state equivalent)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
8. Equal Employment Opportunity	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Medical and First Aid			
9. Are first aid kits accessible and identified?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
10. Are emergency eye wash and safety showers available?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
11. Are daily logs for first aid present and up to date?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
12. Are first aid kits inspected weekly?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Site Set Up			
13. Are work zones clearly defined?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
14. Are support trailers located to minimize exposure from a potential release?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
15. Is general housekeeping up to Earth Tech standards?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Personal Protective Equipment			
16. Have levels of personal protection been established?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
17. Do all employees know their level of protection?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
18. Are respirators used, decontaminated, inspected, and stored according to standard procedures?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
19. Have employees been fit-tested?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
20. Is defective personal protective equipment tagged?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
21. Does compressed breathing air meet CGA grade "D" minimum?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
22. Are there sufficient quantities of safety equipment and repair parts?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

Fire Prevention	YES	NO	NA
23. Is smoking prohibited in flammable storage areas?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
24. Are fire lanes established and maintained (where applicable)?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
25. Are flammable dispensing systems grounded and bonded?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
26. Are proper receptacles available for storage of flammables?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
27. Has the local fire department been contacted to inform of work ops?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Welding and Cutting			
28. Are fire extinguishers present at welding and cutting operations?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
29. Are confined spaces, such as, tanks, pipelines, and trenches, tested prior to cutting and welding operations?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
30. Are hot work permits available?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
31. Are proper helmets, aprons and gloves available for welding and cutting operations?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
32. Are welding and machines properly grounded?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
33. Are oxygen and fuel gas cylinders stored a minimum of 20 feet apart?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
34. Are only trained personnel permitted to operate welding and cutting equipment?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Hand and Power Tools			
35. Are defective hand and power tools tagged and taken out of service?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
36. Is eye protection available and used when operating power tools?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
37. Are guards and safety devices in place on power tools?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
38. Are power tools inspected before each use?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
39. Are non-sparking tools available?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Motor Vehicles			
40. Are vehicles inspected before each use?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
41. Are personnel licensed for the equipment they operate?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
42. Are unsafe vehicles tagged and reported to supervision?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
43. Are vehicles shut down before fueling?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
44. When backing vehicles, are spotters provided (<i>when necessary</i>)?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
45. Is safety equipment on vehicles?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
46. Are loads secure on vehicles?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

PROJECT SITE SH&E INSPECTION FORM

Project Name:
Project Number:
Project Manager:

Date of Inspection:
SH&E Inspector:
Client POC:

Emergency Plans	YES	NO	NA
47. Are emergency telephone numbers current and posted ?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
48. Have emergency escape routes been designated?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
49. Are employees familiar with site-specific emergency signals?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Materials Handling			
50. Are materials stacked and stored as to prevent sliding or collapsing?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
51. Are flammables and combustibles stored in non-smoking areas?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
52. Is machinery braced when personnel are performing maintenance?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
53. Are tripping hazards labeled?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
54. Are semi-trailers chocked?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
55. Are fixed jacks used under semi-trailers?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
56. Are riders prohibited on materials handling equipment?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
57. Are cranes inspected as prescribed and logged?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
58. Are OSHA-approved manlifts provided for the lifting of personnel?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
59. Are all containers labeled as to contents?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
60. Are flammable liquids stored in approved safety cans?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Hazardous Waste Compliance			
61. Are hazardous wastes stored in DOT approved containers?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
62. Is hazardous waste stored in a secure area?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
63. Are hazardous waste containers labeled and dated?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
64. Are waste container dates outdated?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
65. Is a contingency plan on file?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
66. Is there a preparedness and prevention plan in effect?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
67. Are warning signs posted where required?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Fire Protection			
68. Has a fire warning system been established?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
69. Do employees know the location and use of all fire extinguishers?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
70. Are fire extinguishers marked and inspected weekly?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
71. Are combustible materials segregated from open flames?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

Electrical	YES	NO	NA
72. Are warning signs exhibited on high voltage equipment (≥ 250 V)?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
73. Is electrical equipment and wiring properly guarded?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
74. Are electrical lines, extension cords, and cables guarded and maintained in good condition?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
75. Are extension cords kept out of wet areas?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
76. Is damaged electrical equipment tagged and taken out of service?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
77. Have underground electrical lines been identified by proper authorities?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
78. Has positive lock-out system been established by project electrician?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Slings and Chains			
79. Are damaged slings/chains/rigging tagged and taken out of service?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
80. Are slings inspected before each use?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
81. Are slings padded or protected from sharp corners?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
82. Do employees keep clear of suspended loads?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Compressed Gas Cylinders			
83. Are breathing air cylinders charged only to prescribed pressures?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
84. Are like cylinders segregated in well ventilated areas?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
85. Is smoking prohibited in cylinder storage areas?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
86. Are cylinders stored secure and upright?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
87. Are cylinders protected from snow, rain, etc.?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
88. Are cylinder caps in place before cylinders are moved?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
89. Are fuel gas and O ₂ cylinders stored a minimum of 20 feet apart?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Ladders and Scaffolding			
90. Are ladders/scaffolds placed on a flat, firm surface?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
91. Are ladders/scaffolds planks free of mud, ice, grease, etc.?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
92. Are ladders/scaffolding inspected before each use?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
93. Are defective ladders or scaffold parts taken out of service?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
94. Does scaffold height exceed 4 times the width or base dimension?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
95. Does scaffold planking overlap a minimum of 12 inches?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
96. Does scaffold planking extend over end supports between 6" to 18"?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

PROJECT SITE SH&E INSPECTION FORM

Project Name:
Project Number:
Project Manager:

Date of Inspection:
SH&E Inspector:
Client POC:

Walking and Working Surfaces	YES	NO	NA
97. Are accessways, stairways, ramps, and ladders clean of ice, mud snow or debris?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
98. Do ladders exceed maximum lengths?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
99. Are ladders used in passageways, doors, or driveways?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
100. Are broken or damaged ladders tagged and taken out of service?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
101. Are metal ladders prohibited in electrical service?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
102. Are stairways and floor openings guarded?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
103. Are safety feet installed on straight and extension ladders?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
104. Is general housekeeping up to Earth Tech standards?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
105. Are support trailers accessible for approach by emergency vehicles?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
106. Is the site properly secured during and after work hours?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Heavy Equipment			
107. Is heavy equipment inspected as recommended by the manufacturer?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
108. Is defective heavy equipment tagged and taken out of service?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
109. Are project roads and structures inspected for load capacities and proper clearances?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
110. Is heavy equipment shut down for fueling and maintenance?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Excavation			
111. Are the sides of excavations sloped or shored to prevent caving in on employees?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
112. Are guardrails or fences placed around excavations, near pedestrian or vehicle thoroughfares?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
113. Prior to opening excavations, are utilities located and marked?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
114. Are ladders used in trenches over 4 feet deep (when entered)?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
115. Is material excavated placed a minimum of 24 inches from the trench?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Confined Spaces			
116. Have employees scheduled to be part of the confined space entry team been trained to the level of their responsibilities?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
117. Are confined space permits available on project site?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
118. Is a confined space entry procedure on the project site?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

Personnel Decontamination	YES	NO	NA
119. Are decontamination stations set up in the site contamination reduction zone(s)?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
120. Are waste receptacles available for contaminated clothing / PPE?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
121. Are steps taken to contain liquids used for decontamination?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
122. Have decontamination steps and procedures been covered by the site supervisor or acting site safety officer?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
123. Are personnel using utility knives or equivalent equipment to doff PPE?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
124. Is all personal protective equipment and respiratory equipment being cleaned on a daily basis (when applicable)?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

Inspection Summary:


I have reviewed this inspection checklist with the safety inspector, fully understand the recommendations and will make every attempt to immediately implement the appropriate corrective actions.

 Project/Response Manager

 Date

 Safety Inspector (or designated alternate)

 Date

	PROCEDURE NO. <u>SH&E 109</u>
	DATE <u>March 25, 2005</u>
Safety, Health & Environmental Procedure	REVISED <u>August 15, 2008</u>
	PREVIOUSLY <u>EHS 508</u>
Hearing Conservation Program	

This procedure applies to all U.S.-based personnel, projects, offices, business units and activities. Any exceptions to this procedure must be approved, in writing, by the responsible District/Business Unit Manager and Safety Manager.

1.0 PURPOSE

To establish a standard set of procedures to ensure personal noise exposure remains within acceptable limits. Additionally, to establish the requirements of an acceptable hearing conservation program in accordance with 29 CFR 1910.95.

2.0 SCOPE

This procedure applies to all locations/facilities/projects where employee noise exposure may equal or exceed 50 percent of the allowable noise dose or Permissible Exposure Limit (PEL). Table 1 provides information relative to the current PEL for noise exposure expressed as a time-weighted average.

**Table 1
Permissible Exposure Level**

SOUND LEVEL (dB A)	TIME (hours)
85	16
90	8
95	4
100	2
105	1
110	0.5
115	0.25

Table 2 provides information relative to the Action Level (or 50 percent allowable noise dose) expressed as a time-weighted average. The action levels outlined in the table below, and PELs described in Table 1, are calculated without regard to the protection afforded by the use of hearing protectors.

**Table 2
Action Levels for Hearing Conservation Program**

SOUND LEVEL (dB A)	TIME (hours)
85	8
90	4
95	2
100	1
105	0.5
110	0.25
115	0.125

3.0 RESPONSIBILITIES

3.1 Plant/Project/Facility Manager

- The implementation and oversight of this program.
- Ensuring that the Program Coordinator, supervisors, and employees are meeting their obligations outlined in the facility Hearing Conservation plan.
- Implementing engineering controls to reduce noise levels when such measures are considered feasible and required by regulation.

3.2 Program Coordinator

- Ensuring that noise monitoring is performed in all areas of the facility where a potential noise hazard exists.
- Ensuring that a noise survey is conducted when a change in equipment, procedures or personnel may increase employee exposure to noise.
- Informing employees of noise monitoring results when full-shift noise exposure is at or above the action level.
- Designating areas and tasks where employees' exposure is at or above the action level
- Notifying employees of local hearing protection requirements
- Placing warning signs in areas where sound levels would require the use of hearing protectors.
- Purchasing, monitoring and replenishing supply of hearing protection devices for employees.
- Ensuring individuals included in the program receive training and that the training meets the criteria outlined in this program
- Investigating and implementing corrective action to all reports of non-conformance with this procedure including reports of standard threshold shifts or employees' failure to wear hearing protectors in designated areas.

3.3 Supervisors

- Maintaining an awareness of the noise levels in work areas for which s/he is responsible.
- Requesting a noise survey be conducted when a change in equipment, procedures or personnel may increase employee exposure to noise.
- Ensuring that all employees are aware of the requirements for hearing protection for any designated area or task
- Enforcing the use of hearing protection by employees in designated areas and for designated tasks.

3.3 Employees

- Complying with the requirements of the Hearing Conservation program
- Inspecting and maintains hearing protection devices
- Wearing hearing protection devices in designated areas or for designated tasks.
- Reporting any suspected change in noise levels of work area to supervisor.
- Reporting any signs or symptoms experienced that could be the result of overexposure to noise to supervisor
- Participating in audiometric testing and hearing protection training when required.

4.0 PROCEDURE

Any facility/project where an employee may be exposed to noise at or above an action level, as defined in section 2.0 of this procedure, shall develop a written hearing conservation program that meets the requirements of this general program and all applicable state-specific regulations. Attachment 1 provides a template for use in developing these written programs.

4.1 Audiometric Testing

- All Earth Tech personnel with potential exposure greater than the action level (noise dose equivalent to an 8-hour, time-weighted average noise exposure at or above 85-dBA) will be enrolled in the Earth Tech medical surveillance program and undergo a baseline audiogram in accordance with current program requirements. Thereafter, annual audiograms will be compared with the baseline exam.
- When a Standard Threshold Shift (STS), as noted by the Corporate Medical Provider, is noted between the last valid baseline and the annual audiogram, the following steps will be taken:
 - a. A retest will be conducted within 30 days to confirm the STS. The employee will not be exposed to workplace/hobby noise for 14 hours or will be provided with adequate hearing protection prior to testing.
 - b. If the STS persists, ear protection will be upgraded to one with a greater Noise Reduction Rating (NRR). The minimum NRR will be 26 dBA.
 - c. The employee will be counseled, and Earth Tech will obtain information regarding the employee's possible noise exposure away from the workplace or existing ear pathology.
 - d. Qualified medical personnel will review the audiograms. This group will determine the need for a medical referral.
 - e. The employee will be notified in writing by either the SH&E Department or Earth Tech medical provider of the STS, within 21 days of determination, as required by OSHA.
 - f. The employee's supervisor will be notified of the shift in hearing threshold.
 - g. If the employee who has experienced an STS is exposed to 85 dBA for 8 hours or 80 dBA for 12 hours, mandatory use of ear protection is required.
 - h. Temporary employees will receive audiograms during their exit physicals if they have worked around heavy equipment or have received an exposure to noise levels in excess of 85 dBAs.

4.2 Monitoring of Noise Levels

As deemed necessary by an SH&E Professional, Earth Tech will periodically monitor personal and area noise levels using noise dosimetry and/or sound level meters.

4.3 Hearing Protectors

Selection of appropriate hearing protectors must be based on actual or anticipated exposure levels. At a minimum, hearing protectors must provide a level of protection that brings actual or anticipated exposure below the PEL established for the time period shown in the table above. Additional information relative to hearing protector use is as follows:

- Hearing protection will be mandatory for all employees exposed above a sound level for any period of time in excess of that listed in the table above.
- Hearing protection will be mandatory for all employees working in any area that has not been evaluated for noise exposure and the ambient noise level in the area is such that you must raise your voice to have a normal conversation with someone less than 5 feet from you.
- Hearing protection will be mandatory for all employees exposed to 85 dBA for 8 hours and 80 dBA for 12 hours.

- Hearing protection will be mandatory for all employees who work on or near heavy equipment unless personal dosimetry or other techniques have been used to document actual exposure.
- Hearing protectors will be made available to all employees exposed to 85 dBA for 8 hours or more.
- Hearing protection will be mandatory for all employees exposed to 85 dBA for any period of time and who have experienced an STS.
- The SH&E Department will approve all hearing protection. All employees will be trained in the proper use, care, and maintenance of the protectors.

5.0 RETENTION OF RECORDS

- Noise exposure measurement records will be retained for three years at the project/facility.
- Audiogram records will be retained in the employee's medical records per SH&E 108 for a period as directed by Earth Tech's Medical Provider.
- Annual employee training session documentation will be retained for the duration of employment.

6.0 TRAINING

- All employees with potential exposure above the action levels established in section 2.0 of this procedure, or who otherwise utilize any type of hearing protector, will be listed on the "Listing of Employees Included in the Hearing Conservation Program" and participate in an annual training program.
- The training program will include a discussion of the following:
 - a. The effects of noise on hearing, recognizing hazardous noise and symptoms of overexposure to hazardous noise
 - b. When and/or where hearing protectors are required to be worn
 - c. The purpose of hearing protectors
 - d. The advantages, disadvantages, and effectiveness of various types of protectors
 - e. Instructions on how to select, use, fit and care for hearing protectors
 - f. The purpose of audiometric testing, including an explanation of the test procedures
 - g. Hearing Conservation Program requirements and responsibilities

Hearing Protection Training is conducted annually for all affected employees, or more frequently for employees who do not properly use hearing protectors or otherwise fail to comply with this policy.

7.0 REFERENCES

SH&E 108 – Medical Monitoring and Surveillance

SH&E 113 – Personal Protective Equipment

8.0 ATTACHMENTS

Attachment 1 – Site-Specific Hearing Conservation Program Template

**Site-Specific Hearing Conservation Program
for the _____ Site**

1.0 Monitoring

As per 29 CFR 1910.95, noise monitoring will be conducted by

Such monitoring will consist of (check those that apply):

_____ Sound level meter surveying

_____ Noise dosimetry

Specific instrumentation to be used is (Make/Model):

Make	Model

and will be calibrated at a frequency of _____ and documented in the _____.

Monitoring strategy is as follows: (List all equipment and activities on site which may involve sound pressure levels above 80 dBA and an explanation of the strategy to document actual exposures.)

Area/Equipment	Monitoring Strategy

All monitoring will be documented utilizing the format illustrated following Section 7.0 (attach form developed for the specific site). These forms will be maintained in accordance with Section 7.0 of this program. Monitoring frequency will be in accordance with the strategy outlined above and when the following changes in site conditions/activities occur:

1.
2.
3.
4.
5.

2.0 Employee notification

All site employees exposed above the OSHA action level (85 dBA - 8 hour TWA) will be notified of the monitoring results by _____ (Name/Title) at an interval not to exceed _____ after completion of monitoring.

Notification shall be written with copy to SH&E Department. Documentation of employee notifications and corresponding signatures of notified employees will be kept in the health and safety logbook/files.

3.0 Observation of monitoring

All employees affected by the monitoring, or a designated employee representative, shall be given the opportunity to observe noise monitoring procedures. This will be achieved by:

4.0 Audiometric testing program and requirements

ET personnel who perform field activities where noise exposure above action levels is expected are required to participate in the ET audiometric testing meeting the requirements of OSHA 29 CFR 1910.95. Additionally, any subcontractors performing work on ET projects where noise levels exceeding action level will be required to provide documentation that they participate in an audiometric testing program which meets the requirements of 29 CFR 1910.95.

Documentation of participation in the testing program will be maintained by _____ and will be located at _____.

5.0 Hearing protectors and estimating attenuation

A selection of suitable hearing protectors will be made available to all employees who are expected to have 8-hour TWA noise exposures above 85 dBA. The types anticipated to be available include:

Protection Type	Attenuation

Hearing protector attenuation will be evaluated by _____ for specific noise environments according to the following method prior to determining their suitability for use:

1.
2.
3.

The following site personnel will be required to wear hearing protectors during specific activities as determined in accordance with 29 CFR 1910.95 and the results of site-specific monitoring conducted according to Section 1.0 of this program. (This section can be completed after monitoring, if necessary.)

Employee Name	Activity Type	Type of Protection

Hearing protectors will be properly fitted by _____ upon initial distribution to site workers. Size and type of protector for each employee fitted will be recorded in the PPE form found in ET SOP _____.

Training in the use and care of hearing protectors shall be conducted by _____ during the initial site-specific health and safety training (as part of the PPE section) required by the ET Health and Safety Manual. Training contents shall be as per the requirements set forth in 29 CFR 1910.120.

Hearing protectors will be distributed by _____ from the storage location at the _____.

6.0 Access to information and training materials

All information required by 29 CFR 1910.95 to be made available to the employees will be posted by _____ (Name/Title) at the _____.

OSHA standard 29 CFR 1910.95 will also be kept on site.

7.0 Recordkeeping

Records required by 29 CFR 1910.95 shall be completed by _____ and maintained at the _____ and placed on permanent file at the _____, for the minimum duration required by the standard.


Employees can access their individual records by contacting _____ (Name/Title).

All records required by this section will be transferred to any employees successive employer if ET ceases to do business.

8.0 Approvals

Project Manager: _____ Date: _____

SH&E: _____ Date: _____

 Safety, Health & Environmental Procedure	PROCEDURE NO. <u>SH&E 113</u>
	DATE <u>March 25, 2005</u>
Personal Protective Equipment	REVISED <u>August 15, 2008</u>
	PREVIOUSLY <u>EHS 401</u>

This procedure applies to all U.S.-based personnel, projects, offices, business units and activities. Any exceptions to this procedure must be approved, in writing, by the responsible District/Business Unit Manager and Safety Manager.

1.0 PURPOSE

Personal protective equipment (PPE) is specifically designed to protect select parts of the body from chemical, physical and biological hazards. Types of PPE include, but are not limited to, hard hats, safety glasses, safety shoes, full body harnesses, and coated coveralls. This written program, along with site-specific hazard analyses, will provide the requirements for the selection, use and maintenance of personal protective equipment to comply with the provisions of 29 CFR 1910, Subpart

2.0 SCOPE

A hazard assessment must be conducted for each task being performed for the purpose of identifying the potential hazards and selecting appropriate personal protective equipment based on the identified hazards. A written certification must be in place verifying that the hazard assessment has been performed. Attachment 1 (or 1A) of this procedure contains a PPE Hazard Assessment template that can be used to document this requirement. Other formats, such as formal project-specific Health and Safety Plans (HASPs) and Task Hazard Analyses (THAs), can also be used when approved by the business unit SH&E Manager. All PPE Hazard Assessments must be reviewed annually (at a minimum) to ensure proper PPE has been identified, selected, and issued according to the identified hazards.

3.0 PROCEDURE

3.1 Hierarchy of Controls

Engineering controls are used to eliminate, stop, contain, or capture a hazard at the source or intercept it along its path to the worker. When feasible, these controls are preferred to administrative controls or the use of PPE. Administrative controls are measures to limit the duration of exposure to the hazard. With the exception of administrative controls to prevent heat-, cold-, or radiation- related exposures, the use of administrative controls requires the approval of the SH&E Department.

3.2 General Requirements

1. Earth Tech will provide suitable PPE as required for the nature of the job being performed, such as, but not limited to, steel-toe (or tech-toe if approved by SH&E Manager) boots, chemical protective clothing, respirators, eye and face protection, hardhats, and gloves.
2. Employees will use all required PPE as outlined in project-specific HASPs, THAs and/or PPE Hazard Assessments, or business unit (e.g. NACO) PPE policy.

3. All PPE will meet all applicable current OSHA, MSHA, ANSI and NIOSH standards for the particular equipment.

3.3 Minimum PPE Requirements

The following minimum requirements are mandatory as a condition of working at Earth Tech-controlled field projects, construction projects, and operating facilities (i.e. Water-, Waste Water-, or Groundwater- Treatment Plants) unless the activity is being conducted within a field trailer or facility control room and the project has established these locations as “office-like” areas. Minimum PPE requirements include:

1. Hardhats
2. Safety glasses (ANSI Z-87 w/sideshields)
3. Safety-toe boots or shoes
4. A sleeved work shirt is required to cover the upper torso, if required by the client or hazard
5. Full-length trousers (shorts are prohibited)
6. High-visibility vests – when working around heavy/mobile equipment, moving vehicles, or as required by the DSM/client. See Section 3.12 for additional information.

3.4 Hazard Assessment

1. A PPE hazard assessment of the workplace will be conducted to identify the need and type(s) of PPE to be utilized. This hazard assessment will be performed as part of the initial development of project and site health and safety plans.
2. The workplace hazard assessment must be in written form and shall certify that the required workplace hazard assessment has been performed. The certification shall identify all of the following:
 - a. The workplace evaluated.
 - b. The person certifying that the evaluation has been performed.
 - c. The date of the hazard assessment.

3.5 PPE Training

1. In accordance with SH&E 114 - Safety Training Programs, employees will receive training on the proper use, inspection, and maintenance of PPE prior to being required to utilize any assigned equipment. The training will include:
 - a. Discussion of when and what PPE is required
 - b. How to properly don, doff, adjust, and wear PPE
 - c. Limitations of the PPE
 - d. Decontamination procedures
 - e. Proper care, maintenance, useful life, and disposal of the PPE
2. Employee training must be verified by a written certification. The certification must include the names of the employees trained, signature of instructor and participants, and the date of training. It must also be identified as a certification of training on the use of PPE.
3. Training documentation may include completion of Tailgate Safety Briefings with specific emphasis on PPE use and selection requirements.
4. Training will be repeated whenever the workplace hazards change, specified PPE changes, or when incorrect or incomplete use of PPE is observed, or as required by the re-training frequency.

3.6 Eye and Face Protection

3.6.1 Basic Eye Protection

Eye and face protection prevents injuries due to particulates, splashing, flying objects and certain forms of ultraviolet radiation. Forms of eye protection include safety glasses, coverall goggles (both chipping and chemical splash), face shields, welding goggles and welding shields. Contact lenses do not meet the requirements of eye protection. All eye and face protection shall comply with the provisions of ANSI standard Z87.1 as follows:

1. Eye and face protection purchased prior to July 5, 1994 must comply with Z87.1, 1968;
2. Eye and face protection purchased after July 5, 1994 must comply with Z87.1, 1989.

All non-prescription safety glasses, goggles, and face shields shall be provided at no cost to the employee. Prescription safety glasses are provided at no charge (up to a predetermined amount) through the Earth Tech prescription safety glasses program (See Intranet).

The following are the general use requirements for eye and face protection:

1. Employees who wear prescription lenses shall either obtain prescription safety glasses with side shields, or goggles that completely cover the employees' prescription lenses without disturbing the spectacle adjustment.
2. Face and eye protection shall be comfortable and of the proper size to fit the employee.
3. All equipment shall be kept clean and in good repair by the employee. If the equipment cannot be cleaned (i.e. dried paint), or is damaged, it must be properly discarded and new equipment shall be obtained.
4. Equipment (except prescription glasses) can be used by different employees, as long as the equipment has been cleaned and disinfected between use by each person.
5. Safety glasses shall be worn under welding shields.
6. Prescription safety glasses shall be replaced as necessary (i.e. damaged, change in prescription, lost). The employee will discuss replacement of safety glasses with his/her supervisor.
7. Selection of eye and face protection shall be in accordance with Table 1 and 2 located at the end of this written program.
8. Selection of proper shade number or filter lenses for welding operations shall be in accordance with Table 3 located at the end of this written program.
9. Work around lasers is not anticipated.
10. Eye and face personal protective equipment shall be distinctly marked to facilitate identification of the manufacturer.

3.6.2 Contact Lenses

Wearing contact lenses is prohibited at worksites where the possibility of particles and chemicals getting behind the contact lens exist. Contact lenses do not provide eye protection; contact lens wearers must use the same additional eye protection as non-lens wearers.

3.6.3 Chemical (Splash-Proof) Goggles

Chemical goggles will be used as follows:

1. Approved chemical mono-goggles will be provided to ensure protection from the hazards associated with handling or dispensing liquid chemicals.

2. The appropriate Material Safety Data Sheets (MSDS) will provide specific information for the use of chemical goggles. The MSDSs can be obtained in accordance with SH&E 115 Hazard Communications Program.
3. Basic eye protection and chemical goggles (with the exception of prescriptions glasses) will not be worn at the same time, but a face shield may be worn in conjunction with chemical goggles and may be required for certain operations.

3.6.4 Face Shield

1. An approved full-face shield will be worn to provide protection from flying particles, splashes, or mist, where required.
2. A face shield only provides protection to the face from direct impact objects, and does not provide acceptable eye protection. Additional standard eye protection or goggles must be worn in conjunction with a face shield.

3.6.5 Burning Goggles

Approved burning goggles will be worn to provide employee protection from optical radiation. Burning goggles will be worn whenever an oxy-gas torch is used for cutting or burning.

3.6.6 Welding Hood

A welding hood with either a filtered lens of number 10 shade or darker, or an auto-darkening lens providing the same shade number or darker (see applicable shading requirements), will be used to provide protection from the optical radiation produced during electric arc welding. Approved safety glasses with side shields will be worn in conjunction with the welding hood to ensure protection from popping hot slag when the hood is raised. Welding hoods will meet ANSI standards Z87 (EC;EN 187).

3.7 Head Protection

3.7.1 Basic Head Protection

1. Approved hardhats will include only plastic or fiberglass hats that meet ANSI Z89.1.
2. Metal hardhats or bump caps are not considered approved head protection and will not be used on Earth Tech projects.
3. Hardhats must also be worn during all cutting and welding operations; no soft caps are allowed.
4. Metal and "cowboy" style hardhats are prohibited.
5. Approved hardhats will be worn by all employees exposed to hazards that could cause injury to the head (moving equipment, falling objects, protruding objects, etc.).
6. Compliance with state and/or local requirements is mandatory (e.g., chinstrap accessory, etc).
7. Protective helmet designed to reduce electrical shock hazard shall be worn by employee when near exposed electrical conductors which could contact the head.

3.7.2 Issuance of Head Protection

An approved hardhat will be issued to all employees exposed to overhead hazards. The decision to charge a fee for replacement hardhats will depend on the requirements of the individual project and will be determined by the Project Manager.

3.7.3 Color Coding

Color coding of hardhats will be at the discretion of the Site Project Manager for each individual project.

3.7.4 General Maintenance Requirements

Hardhats will conform to the approved specifications of ANSI Z89.1. Therefore, it will be forbidden for employees to:

1. Drill holes in the shell of the hardhat.
2. Alter the shape of the hardhat or bill.
3. Remove the suspension straps or cut/alter them in any way.
4. Paint the hat or cover in non-approved decals.
5. Wear hardhats with the brim to the rear; or
6. Alter hardhat in any other manner that may compromise its integrity e.g. pasting stickers other than standard Earth Tech logo.

3.8 Hearing Protection

1. Employees will not be exposed to noise in excess of the Permissible Exposure Limits (PELs) established by OSHA. SH&E 109 - Hearing Conservation Program provides guidance on hearing conservation.
2. The two types of recognized hearing protection available for use in effectively reducing noise exposure are earplugs and earmuffs.
3. In most instances, universal-fit earplugs (expandable foam) will be acceptable hearing protection. Cotton plugs are not acceptable.
4. When using earmuffs for hearing protection, special care will be taken to ensure that the muffs are disinfected before being issued to another employee.
5. The SH&E Department will indicate whether both earplugs and earmuffs must be worn to provide adequate hearing protection.

3.9 Hand Protection

Hand protection serves two purposes:

- Control of physical hazards
- Control of skin contact with hazardous materials

3.9.1 General Purpose Gloves

Where workers are exposed to physical hazards the use of standard leather or cloth work gloves will be employed. These gloves do not need to conform to any ANSI or other standard, however selected gloves should:

- Be of sturdy construction.
- Be suitable to protect against the particular hazard(s) associated with the job (e.g., insulated gloves for hot work).
- Properly fit the worker's hands.

3.9.2 Special Purpose Gloves

Gloves intended to provide chemical protection must be rated by the manufacturer as effective against the substance(s) expected to be encountered. Specific selection will be made on a task-by-task basis and approved by the SH&E Department. Special purpose gloves may at times be required when employees are performing certain tasks as indicated below:

- Working with solvents or fuels (thinners, degreasers, gasoline, safety solvents, etc.).
- Handling pesticides, herbicides, or any poison.
- Working with insulating materials.
- Assisting welders or handling hot materials.

Special purpose gloves include:

- "Hot" gloves for electrical work (must be tested every 12 months and records maintained)
- Cut-resistant gloves.
- Chemical-resistant gloves.
- Standard rubber gloves.
- Heat-resistant gloves.

Hydrocarbon-resistant rubber gloves will be worn to protect the hands when using petroleum-based cleaning agents or handling petrochemical products.

Barrier creams/moisturizing lotions can provide additional protection from minor exposure to some irritants and will be used as specified. However, Barrier creams cannot be used as a substitute for gloves and shall be used in conjunction with gloves, where required.

- Barrier creams will be evaluated to ensure the proper protection is provided for the specific task to be performed. Barrier creams are NOT a substitute for gloves.
- Moisturizing lotion/creams will be utilized to restore the natural oils to the skin removed through frequent hand washing.

3.10 Foot Protection

3.10.1 Basic Foot Protection

Safety footwear will meet the following requirements:

1. Comply with ANSI standard Z41 1991
2. Minimum height of 6 inches.
3. Safety-toed footwear will be worn at all job sites unless a variance is obtained from the SH&E Department.
4. Sneakers, sandals, tennis shoes, high heels, and leather-soled street or dress shoes will not be considered approved industrial or construction footwear.
5. The safety footwear program, with Red Wing shoe store information and locations, is available on the SH&E homepage under Forms. Please call the SH&E Department with any questions, comments, or concerns.

3.10.2 Special Purpose Footwear

Special footwear may be required to provide maximum protection to the employee.

1. Whenever employees may be exposed to corrosives or irritant chemicals (e.g., pouring concrete, applying form oils), they will wear the appropriate special purpose footwear.

2. Special purpose footwear may include PVC or neoprene boots, preferably with steel shanks.
3. Special purpose footwear may also be used when employee feet are exposed to electrical hazards.

3.10.3 Foot Protectors

Employees performing tasks that potentially expose them to extreme foot injury hazards (e.g., operating a ground tamper or chipping concrete with jackhammer) will wear metal foot protectors and/or metatarsal protection.

3.11 General Clothing Requirements

1. Employees performing tasks on Earth Tech projects will wear appropriate clothing. Cotton is the best all-around material to wear.
2. Synthetic materials are not recommended because some melt easily and may burn rapidly when exposed to small ignition sources.
3. Clothing will be in good condition. Frayed or tattered clothing can be a hazard to the employee.
4. Pants will fit properly and not have large cuffs or belled or frayed bottoms.
5. Tank tops or sleeveless shirts (less than 4 inches below shoulder) will not be worn.
6. If dictated by the client or the hazards, long-sleeve shirts will be required.
7. Shirts will be worn tucked in at all times. Employees flame cutting or welding must have clothing suitable for that operation (i.e., prevent slag from being caught in cuffs, waist, or pocket openings).
8. Neckties, gauntlet-type gloves, and baggy, loose, or ragged clothing will not be worn when working near or with moving machinery.
9. Jewelry such as rings, watchbands, necklaces, earrings, or the like can cause or contribute to accidents. Loose, dangling jewelry will not be allowed.
10. No jewelry shall be worn when employee is exposed to electrical hazard.
11. In situations where an employee may be exposed to hazardous materials, such as corrosives, fire, toxins, irritants, heat, or sensitizers, the task will be evaluated and the employee will wear the appropriate clothing for the hazard identified.
12. All employees or contractors working on site controlled by Earth Tech with a potential to use respiratory protection (for normal as well as emergency escape purposes) must be shaved and shall not have facial hair (long mustache, long side burns, beard) that can affect sealing of respiratory protection equipment.
13. All employees working inside the approach boundary for electrical shock or Arc will wear appropriately rated protective clothing in accordance with NFPA-70E.

3.12 High-Visibility Vests – Communication

1. Fluorescent safety vests, or other approved high-visibility clothing made with reflecting orange, white, or yellow materials, are mandatory when working around heavy equipment. The reflecting material must be visible from all angles (360 degrees).
2. Site vehicles must be parked in a safe place, away from heavy equipment traffic.
3. All personnel who leave a site vehicle to conduct work on foot in the vicinity of heavy equipment must wear a high-visibility safety vest and other appropriate PPE (e.g., hardhat, safety glasses, safety shoes).
4. Eye contact must be established with the heavy equipment operator prior to approaching the equipment. Never approach the equipment from a blind spot or blind angle.

5. Before starting any type of activity that involves site vehicles, heavy equipment, and/or ground activities, communication must be established and maintained (radio contact when possible).
6. Ground activities (e.g., soil density testing, surveying, sampling) will take place no closer than approximately 100 feet from moving heavy equipment without an approved, job-specific hazard analysis that identifies any special precautions to be taken.
7. All personnel working, visiting or attending the site shall be made aware of locations where heavy equipment operations are being undertaken.
8. High-visibility vests are also required while working in and near traffic areas and in remote areas (e.g., working near and/or adjacent to hunting grounds).

Exception: Workers may be exempt from wearing high-visibility safety vests (if not mandated by federal or state regulations) if a hazard assessment prepared for a specific task determines that wearing such gear may introduce additional hazards (e.g., loose clothing/polyester materials). Examples of these tasks may include, but are not limited to, work involving rotating tools/equipment and open flame or spark-producing activities such as welding, cutting, or grinding.

3.13 Safety Equipment for Respiratory Protection, Elevated Work, Confined Space Entry, Electrical Safety, Work Over Water, Etc.

Please refer to the respective SH&E SOP(s) to review the PPE requirements.

4.0 STORAGE AND MAINTENANCE

4.1 Personal Items

The following PPE items will be obtained by the individual users, with costs reimbursed based on the condition and safe operating use of PPE. The employee's supervisor will approve new purchases of required PPE by the employee.

- Safety-toed boots (leather)¹
- Prescription Safety Glasses²

Employees are expected to maintain this equipment in a clean, ready-to-use condition, and to perform periodic inspections to ensure that equipment is undamaged and fully functional. Any equipment which becomes unserviceable shall be replaced by the employee, subject to reimbursement in accordance with Earth Tech's PPE Allowance criteria.

4.2 Individually Issued Items

The following PPE items will be issued individually to each worker, or will be obtained by each worker at Earth Tech expense for their personal use:

- Hard hat
- Non-Prescription Safety Glasses
- Safety-toed boots (rubber)

¹ Earth Tech has established a boot purchase program with RED WING Shoes that provides for a 15% price discount and company-direct billing up to a total cost of US\$100 (or as approved by Business Unit). Information about this program can be found on the SH&E Intranet website.

² Earth Tech has established a prescription safety eyewear program with Wal-Mart that provides for a price discount and company-direct billing up of approved eyewear frames and lenses. Information about this program can be found on the SH&E Intranet website.

- Respiratory Protection
- Ear Muffs/ear plugs
- Cold weather gear (NOTE: All items must be approved for purchase through the employees Section Manager prior to purchase.)

Employees are expected to maintain this equipment in a clean, ready-to-use condition, and to perform periodic inspections to ensure that equipment is undamaged and fully functional. Any problems should be identified to the site safety officer immediately so that replacements can be arranged.

Except for personal issue items, all other PPE will be stored on site and issued to workers as required for use. This includes:

- Work coveralls
- Chemically-protective outer coveralls
- Leather and chemically-protective gloves
- Face shields
- Fall protection equipment
- Specialized safety equipment

All central issue equipment will be maintained in a clean, dry condition.

4.3 Inspection

Prior to use of any safety equipment (individual issue or centrally stored) personnel must inspect each piece to ensure that it is in good working order. Equipment exhibiting any signs of wear or damage will be immediately placed out of service and repaired/replaced.

5.0 REFERENCES

SH&E 109 – Hearing Conservation Program
 SH&E 112 – Respiratory Protection Program
 SH&E 114 – Safety Training Programs
 SH&E 115 – Hazard Communication Program
 SH&E 120 – Fall Protection Program

6.0 ATTACHMENTS

Attachment 1 – PPE Hazard Assessment Template
 Attachment 2 – Table 1, Eye & Face Protection Selection Chart
 Attachment 3 – Table 2, Eye And Face Protector Selection Guide
 Attachment 4 – Table 3, Filter Lenses For Protection Against Radiant Energy
 Attachment 5 – Example PPE Hazard Assessment – Waste Water Plant

PERSONAL PROTECTIVE EQUIPMENT HAZARD ANALYSIS

1. **Job Title(s):** This hazard analysis describes the tasks and required personal protective equipment for the following job titles:

-
-
-
-
-

2. **Description of Tasks:** The tasks performed by personal in the above job titles include:

-
-
-
-
-

3. **Potential Hazards and PPE Selection.** (See List of Potential Hazards for assistance)

TASK	POTENTIAL HAZARDS (1)	PPE SELECTION

(1) Refer to attached list for a list of potential hazards to consider.

Signature of certifying Manager that tasks are accurately described.

Signature Date

Print Name: _____

LISTS OF POTENTIAL HAZARDS

	<i>POTENTIAL HAZARDS</i>
HEAD	Falling overhead objects
	Spark contact
	Chemical contamination
	Cold/heat
	Electrical (>600 volts)
HANDS	Cut, puncture, abrasions
	Burns
	Dermatitis
	Chemical absorption
	Cold
FEET	Falling or rolling objects
	Chemical absorption
	Dermatitis
	Burns
	Cold
	Slips, trips
FACE	Burns (chemical, spark, UV radiation)
	Chemical splashing
	Flying particulates
	Abrasions, cuts
EYES	Burns (gas, liquid, spark)
	Abrasions-flying particulates
	Absorption
	Retinal/corneal damage (UV/IR radiation)
EARS	Noise
	Cold
FULL BODY	Chemical splashing
	Burns (chemical, UV radiation)
	Absorption
	Spark contact
	cuts/abrasions/punctures
	Heat/cold stress
MISCELLANEOUS	Insects (ticks, spiders, mosquitoes, bees/wasps)
	Animals (dogs, bears, wild boars, raccoons)
	Reptiles (snakes)
	Poison plants (poison ivy, sumac, poison oak)
	Biological (fungus, bacteria, fungus, viral)

TABLE 1 – EYE & FACE PROTECTION SELECTION CHART

		ASSESSMENT	PROTECTOR TYPE (see Table 2)	PROTECTOR	LIMITATIONS	NOT RECOMMENDED
I M P A C T	Chipping, grinding, machining, masonry work, riveting, and sanding.	Flying fragments, objects, large chips, particles, sand, dirt, etc.	B, C, D, E, F, G, H, I, J, K, L, N	Spectacles, goggles, faceshields SEE NOTES (1) (3) (5) (6) (10) For severe exposure Add N	Protective devices do not provide unlimited protection. SEE NOTE (7)	Protectors that do not provide protection from side exposure. SEE NOTE (10) Filter or tinted lenses that restrict light transmittance, unless it is determined that a glare hazard exists. Refer to OPTICAL RADIATION.
H E A T	Furnace operation, pouring, casting, hot dipping, gas cutting, and welding.	Hot sparks	B, C, D, E, F, G, H, I, J, K, L, *N *N N	Faceshields, goggles, spectacles. *For severe exposure, add N SEE NOTE (2) (3) *Faceshields worn over goggles H, K SEE NOTE (2) (3) Screen faceshields. Reflective faceshields. SEE NOTE (2) (3)	Spectacles, cup and cover type goggles do not provide unlimited facial protection. SEE NOTE (2) SEE NOTE (3)	Protectors that do not provide protection from side exposure.
		Splash from molten metals				
		High temperature exposure				
C H E M I C A L	Acid and chemicals handling, degreasing, plating	Splash	G, H, K *N	Goggle, eyecup and cover types. *For severe exposure, add N	Ventilation should be adequate but well protected from splash entry	Spectacles, welding helmets, handshields
		Irritating mists	G	Special purpose goggles	SEE NOTE (3)	
D U S T	Woodworking, buffing, general dusty conditions.	Nuisance dust	G, H, K	Goggles, eyecup and cover types	Atmospheric conditions and the restricted ventilation of the protector can cause lenses to fog. Frequent cleaning may be required.	

TABLE 1 – EYE & FACE PROTECTION SELECTION CHART (cont.)

	ASSESSMENT	PROTECTOR TYPE	PROTECTOR	LIMITATIONS	NOT RECOMMENDED
OPTICAL RADIATION	WELDING: Electric Arc	O, P, Q	<u>TECTORS</u> <u>FILTER</u> <u>LENS PRO-</u> <u>SHADE</u> <u>TECTORS</u> SEE NOTE (9) 10-14 Welding Helmets or Welding Shields	Protection from optical radiation is directly related to filter lens density. SEE NOTE (4). Select the darkest shade that allows adequate task performance.	Protectors that do not provide protection from optical radiation. SEE NOTE (4)
	WELDING: Gas	J, K, L, M, N, O, P, Q	SEE NOTE (9) 4-8 Welding Goggles or Welding Faceshield 3-6		
	CUTTING TORCH BRAZING		3-4	SEE NOTE (3)	
	TORCH SOLDERING	B, C, D, E, F, N	1.5-3 Spectacles or Welding Faceshield		
	GLARE	A, B	Spectacle SEE NOTE (9) (10)	Shaded or Special Purpose lenses, as suitable. SEE NOTE (8)	

NOTES

- (1) Care shall 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 must be provided.
- (2) Operations involving heat may also involve optical radiation. Protection from both hazards shall be provided.
- (3) Faceshields shall only be worn over primary eye protection.
- (4) Filter lenses shall meet the requirements for shade designations in Table 9-2.
- (5) Persons whose vision requires the use of prescription (Rx) lenses shall wear either protective devices fitted with prescription (Rx) lenses or protective devices designated to be worn over regular prescription (Rx) eyewear.
- (6) Wearers of contact lenses shall also be required to wear appropriate covering 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) Caution should be exercised in the use of metal frame protection devices in electrical hazard areas.
- (8) Refer to Section 6.5, Special Purpose Lenses. (ANSI A87.1-1989)
- (9) Welding helmets or handshields shall be used only over primary eye protection.
- (10) Non-sideshield spectacles are available for frontal protection only.

TABLE 2 - EYE AND FACE PROTECTOR SELECTION GUIDE

- | | |
|---|---------------------------------------|
| A. SPECTACLE, No sideshield | I. WELDING HELMET, Lift front |
| B. CUP GOGGLE, Direct ventilation | J. COVER GOGGLE, Direct ventilation |
| C. CUP GOGGLE, Indirect ventilation | K. SPECTACLE, Half sideshield |
| D. SPECTACLE, Headband temple | L. SPECTACLE, Full sideshield |
| E. COVER WELDING-BURNING
GOGGLES, Indirect Ventilation | M. SPECTACLE, Detachable sideshield |
| F. FACESHIELD | N. SPECTACLE, Non-removable lens |
| G. WELDING HELMET, Hand held | O. SPECTACLE, Lift front |
| H. WELDING HELMET, Stationary window | P. COVER GOGGLE, No ventilation |
| | Q. COVER GOGGLE, Indirect ventilation |

TABLE 3. FILTER LENSES FOR PROTECTION AGAINST RADIANT ENERGY


OPERATIONS	ELECTRODE SIZE 1/32 INCH	ARC CURRENT	MINIMUM PROTECTIVE SHADE
Shielded metal-arc welding	Less than 3 More than 3-5 More than 5-8 More than 8	Less than 60 60-160 161-250 251-550	7 8 10 11
Gas metal arc welding and flux cored arc welding		Less than 60 60-160 161-250 251-500	7 10 10 10
Gas tungsten arc welding		Less than 50 50-150 151-500	8 8 10
Air carbon	(Light)	Less than 500	10
Air cutting	(Heavy)	500-1000	11
Plasma arc welding		Less than 20 20-100 101-400 401-800	6 8 10 11
Torch brazing			3
Torch soldering			2
Carbon arc welding			14
OPERATIONS	PLATE THICKNESS (INCHES)	(MM)	MINIMUM* PROTECTIVE SHADE
Gas welding: Light Medium Heavy	Under 1/8 1/8 to 1/2 Over 1/2	Under 3.2 3.2 to 12.7 Over 12.7	4 5 6
Oxygen cutting: Light Medium Heavy	Under 1 1 to 6 Over 6	Under 25 25 to 150 Over 151	3 4 5

Sample PPE Hazard Assessment - Wastewater Treatment Plant

PPE Procedure Number	Individual Task	Potential Hazards Associated with Job	Eye & Face				Head	Hand	Foot		Hearing		Other	
			Safety Glasses with side shields	Goggles	Face Shield	Welding Helmet/ Shield	Class A/B Helmet	Gloves	Safety Shoes/ boots	Specialty Boots	Ear Plugs	Ear Muffs	Fall Protect	
PPE-01	Daily Operations Rounds	Jobsite Conditions, Ergonomics, Falls, Hazardous Chemicals, Contact with Objects and Equipment, Environmental.	X				X		X					
PPE-02	Daily Sampling and Testing	Jobsite Conditions, Ergonomics, Falls, Hazardous Chemicals, Hand & Power Tools, Contact with Objects or Equipment, Environmental.	X				X	X latex	X					
PPE-03	Weekly Sampling and Testing	Jobsite Conditions, Ergonomics, Falls, Hazardous Chemicals, Hand & Power Tools, Contact with Objects or Equipment, Environmental.	X				X	X latex	X					
PPE-04	Bi-Annual Sampling and Testing	Jobsite Conditions, Ergonomics, Falls, Hazardous Chemicals, Hand & Power Tools, Contact with Objects or Equipment, Environmental.	X				X	X latex	X					
PPE-05	Making Lab Reagents	Hazardous Chemicals, Hand & Power Tools, Contact with Objects or Equipment		X	X			X	X					X
PPE-06	Checking Pump Stations	Jobsite Conditions, Confined Spaces, Ergonomics, Falls, Stored Energy, Hazardous Chemicals, Hand & Power Tools, Contact with Objects or Equipment, Environmental.	X				X	X leather	X					
PPE-07	Performing Flow Calibrations	Jobsite Conditions, Confined Spaces, Ergonomics, Falls, Stored Energy, Hazardous Chemicals, Hand & Power Tools, Contact with Objects or Equipment, Environmental.	X				X		X					

Sample PPE Hazard Assessment - Wastewater Treatment Plant (continued)

PPE Procedure Number	Individual Task	Potential Hazards Associated with Job	Eye & Face				Head	Hand	Foot		Hearing		Other	
			Safety Glasses with side shields	Goggles	Face Shield	Welding Helmet/ Shield	Class A/B Helmet	Gloves	Safety Shoes/ boots	Specialty Boots	Ear Plugs	Ear Muffs	Fall Protect	
PPE-08	Transferring Sodium Bisulfite	Jobsite Conditions, Confined Spaces, Ergonomics, Falls, Stored Energy, Hazardous Chemicals, Hand & Power Tools, Contact with Objects or Equipment, Environmental.		X	X		X	X	X					X
PPE-09	Transferring Sodium Hypochlorite	Jobsite Conditions, Ergonomics, Falls, Stored Energy, Hazardous Chemicals, Hand & Power Tools, Contact with Objects or Equipment, Environmental.		X	X		X	X	X					X
PPE-10	Screw Pump Gate Valve Operation	Jobsite Conditions, Ergonomics, Falls, Stored Energy, Hazardous Chemicals, Hand & Power Tools, Contact with Objects or Equipment, Environmental.	x				X	X leather	X					
PPE-11	Calcium Nitrate Handling	Jobsite Conditions, Ergonomics, Falls, Stored Energy, Hazardous Chemicals, Hand & Power Tools, Contact with Objects or Equipment, Environmental.		X	X		X	X	X					
PPE-12	Emptying Grit Trailer	Jobsite Conditions, Ergonomics, Falls, Stored Energy, Hand & Power Tools, Contact with Objects or Equipment, Environmental.	X				X	X leather	X					

	PROCEDURE NO. <u>SH&E 115</u>
	DATE <u>March 25, 2005</u>
Safety, Health & Environmental Procedure	REVISED <u>August 15, 2008</u>
Hazard Communication	PREVIOUSLY <u>EHS 302 / ENV 307</u>

This procedure applies to all U.S.-based personnel, projects, offices, business units and activities. Any exceptions to this procedure must be approved, in writing, by the responsible District/Business Unit Manager and Safety Manager.

1.0 PURPOSE

The purpose of this program is to ensure that the potential hazards posed by all hazardous substances in the workplace are communicated to Earth Tech employees and subcontractors. Additionally, this program will aid in complying with the OSHA Hazard Communication Standard.

2.0 SCOPE

The requirements defined in this program apply to all Earth Tech facilities, projects, employees, and subcontractors which receive, use, handle, store, transport, or distribute hazardous substances. This program does not apply to the following:

- Any hazardous waste as defined by the Solid Waste Disposal Act, as amended by RCRA, when subject to regulations issued by the USEPA
- Any hazardous substance as such term is defined by the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) (42 U.S.C. 9601 *et seq.*), when the hazardous substance is the focus of remedial or removal action being conducted under CERCLA in accordance with Environmental Protection Agency regulations.
- Tobacco or tobacco products
- Wood or wood products
- Articles
- Food, drugs, cosmetics, or alcoholic beverages packaged for sale to customers
- Food, drugs, or cosmetics intended for personal use
- Any consumer product or hazardous substance as defined by the Consumer Product Safety Act and Federal Hazardous Substance Act when used in the workplace in the same manner as normal consumer use
- Any drug, as defined by the Federal Food, Drug, and Cosmetic Act, when sold in final form for patient use

The labeling requirements defined in this program do not apply to the following when regulated by Federal requirements other than 29 CFR 1910.1200 (OSHA Hazard Communication Standard).

- Pesticides as defined by the Federal Insecticide, Fungicide, and Rodenticide Act.
- Food, drugs, cosmetics, or veterinary devices as defined by the Federal Food, Drug, and Cosmetic Act.
- Alcoholic beverages as defined by the Federal Alcohol Administration Act.
- Consumer products or hazardous substances defined by the Consumer Product Safety Act and Federal Hazardous Substance Act.

3.0 DEFINITIONS

"Article" means a manufactured item: (i) which is formed to a specific shape or design during manufacture; (ii) which has end use function(s) dependent in whole or in part upon its shape or design during end use; and (iii) which does not release, or otherwise result in exposure to, a hazardous substance, under normal conditions of use.

"Consumer Product" means any product intended for sale/use to the general public that is used in the same manner and frequency as a consumer. For example, motor oil purchased in quart containers used to service an Earth Tech vehicle will be considered a consumer product as long as it is used in the frequency (approx. once every 2-3 months) and manner (to change/add oil to a motor vehicle) as intended for consumer use. However, if the project/facility employees a mechanic that uses the motor oil on a more frequent basis (i.e. as part of her/his normal job) then the motor oil will NOT be considered a consumer product.

"Container" means any bag, barrel, bottle, box, can, cylinder, drum, reaction vessel, storage tank, or the like that contains a hazardous substance. For purposes of this procedure, pipes or piping systems, and engines, fuel tanks, or other operating systems in a vehicle, are not considered to be containers.

"Exposure" or "exposed" means that an employee is subjected to a hazardous substance in the course of employment through any route of entry (inhalation, ingestion, skin contact or absorption, etc.), and includes potential (e.g., accidental or possible) exposure.

"Foreseeable emergency" means any potential occurrence such as, but not limited to, equipment failure, rupture of containers, or failure of control equipment which could result in an uncontrolled release of a hazardous substance into the workplace.

"Hazardous substance" means any substance, not excluded by section 2.0 of this procedure, which is a physical hazard or a health hazard.

"Hazard warning" means any words, pictures, symbols, or combination thereof appearing on a label or other appropriate form of warning which convey the hazard(s) of the substance(s) in the container(s).

"Health hazard" means a substance for which there is statistically significant evidence based on at least one study conducted in accordance with established scientific principles that acute or chronic health effects may occur in exposed employees. The term "health hazard" includes substances which are carcinogens, toxic or highly toxic agents, reproductive toxins, irritants, corrosives, sensitizers, hepatotoxins, nephrotoxins, neurotoxins, agents which act on the hematopoietic system, and agents which damage the lungs, skin, eyes, or mucous membranes as defined at 29 CFR 1910.1200.

"Immediate use" means that the hazardous substance will be under the control of and used only by the person who transfers it from a labeled container and only within the work shift in which it is transferred.

"Label" means any written, printed, or graphic material, displayed on or affixed to containers of hazardous substances.

"Material Safety Data Sheets (MSDS)" means any technical data sheets which contain chemical identities, physical and chemical characteristics, physical hazards, health hazards, primary routes of entry, OSHA permissible exposure limits (whether chemical is listed as a carcinogen), precautions for safe handling and use, applicable control measures, emergency and first aid procedures, date of MSDS preparation, and name, address, and telephone number of manufacturer or importer. If no relevant information is found for any given section on the MSDS, that section shall not be left blank. It should be marked to indicate that it is not applicable or that no information was found.

"Physical hazard" means a substance for which there is scientifically valid evidence that it is a combustible liquid, a compressed gas, explosive, flammable, an organic peroxide, an oxidizer, pyrophoric, unstable (reactive) or water reactive.

"**Work area**" means a room or defined space in a workplace where hazardous substances are produced or used, and where employees are present.

"**Workplace**" means an establishment, job site, or project, at one geographical location containing one or more work areas.

4.0 PROCEDURE

4.1 Designation of a Responsible Person

Each Earth Tech office and project will have an identified *Responsible Person* who will implement the requirements of the Hazard Communication Program.

- For each office, the Section Manager will appoint the Responsible Person, in writing.
- For each project, the Project Manager (or designated subordinate) will be assigned the duties for the Responsible Person.

4.2 Hazardous Substance Inventory

All hazardous substances found in a particular workplace shall be listed on a Hazardous Substance Inventory (HSI). The HSI will be reviewed at least annually. New hazardous substances entering a workplace (e.g., project-specific materials) shall be added to the HSI upon receiving and reviewing the MSDS. The HSI includes the following information:

- Product name
- Chemical name (if different from product name)
- Manufacturer's name
- Approximate typical quantity
- Location of substance (i.e., work area)
- Description of use

An example HSI format is provided as Attachment 1. A copy of the most current HSI, along with the corresponding MSDS and a copy of this program (or site-specific program), will be available for review by all employees. The name of the material (product or chemical) on the HSI must be consistent with the MSDS for that material.

4.3 Material Safety Data Sheets

Earth Tech does not manufacture, package or distribute hazardous commodities. However, as an end user Earth Tech must maintain hazard documentation for each hazardous substance used on each job site. This documentation will take the form of a listing of all on-site hazardous substances, and copies of manufacturer-developed Materials Safety Data Sheets (MSDSs) for each listed item.

A MSDS shall be available for every hazardous substance used or stored on each job site (this does not include MSDSs for known or suspected environmental contaminants, the hazards of which are addressed on project-specific SH&E documentation). Copies of all MSDSs will be maintained on-site in either a dedicated folder/binder, or as part of the project-specific SH&E documentation. All site personnel will be briefed as to the location of the MSDSs, and will have immediate access to examine any MSDS at any time during their work shift.

MSDSs received for consumer products, articles and other materials not covered by this procedure will be maintained and made available to employees.

For on-going projects, each MSDS associated with a material no longer in use will be marked as obsolete and the date it was obsolete. At the completion of any project the accumulated MSDSs will be maintained as part of the project records. **NO MSDS ASSOCIATED WITH ANY PROJECT WILL BE DESTROYED.**

Employees are required to report any hazardous substance found at the project site that is not on the list of hazardous substances. The report is to be made to the project/site manager.

If no MSDS accompanies a hazardous substance, the manufacturer, distributor, or importer will be immediately notified and requested to provide one as soon as possible. The request will be documented in a letter or telephone log. If this request is not honored, the SH&E Department will be notified.

When purchasing hazardous substances, the verbal or written purchase order will request an MSDS be sent with the shipment. For each facility and/or project, the MSDS will be kept along with the HSI in a location that is readily accessible to all employees at all times during their work periods. Additionally, the MSDSs and HSI will be available to employees for review in such a way so that the assistance of a supervisor is not necessary.

4.3.1 New Information

Whenever a new or revised MSDS is received, such information shall be provided to employees on a timely basis not to exceed 30 days after receipt.

4.4 Training

4.4.1 Hazard Communication Course Content – General Training

Due to the nature of our business, the information and training provided to Earth Tech employees with regard to hazard communication will take two forms: general and specific. General training and information will include the following:

- The elements and requirements of the OSHA Hazard Communication standard (29 CFR 1910.1200) and applicable state regulations
- Tasks and operations where hazardous substances are present.
- The location and availability of the written Hazard Communication Program, including the list(s) of hazardous substances and MSDSs and how employees can obtain and use hazard information.
- The methods and observations that may be used to detect the presence or release of a hazardous substance, such as personal and area monitoring, continuous monitoring devices, visual appearance or odor of hazardous substances when being released, etc.
- The physical and health hazards of the substances in the work area,
- The measures they can take to protect themselves from these hazards, including specific procedures implemented for the project or shop to protect employees from exposure to hazardous substances, such as appropriate work practices, emergency procedures, and personal protective equipment to be used.
- The project- or shop-specific details of the Hazard Communication Program, including an explanation of the labeling system and the MSDSs, and how employees can obtain and use the appropriate hazard information.
- Information for their physician to receive regarding hazardous substances to which the employee may be exposed according to provisions of this section.
- Freedom from discharge or other discrimination due to the employee's exercise of the rights afforded pursuant to the provisions of the Hazardous Substances Information and Training Act.

4.4.2 Facility-Specific Hazard Communication Training

Specific information regarding safe handling and use of hazardous materials found on the HSI will be presented during site specific training programs. This training may be for specific hazardous materials or for groups of hazardous substances, including flammable/combustible liquids, compressed gases,

organic solvents, corrosives, and toxic metals. Additional specific training will be provided to the affected employees any time a new hazardous substance is introduced into the workplace (e.g., project specific substances) and/or when an employee is reassigned. All training conducted will be documented and copies of the documentation included in the permanent project files.

4.4.3 Training Records

The minimum required information required to be maintained at the jobsite or project is as follows:

- Training agenda
- Name of attendees
- Signature of attendees
- Date and duration of training
- List of any audio visual aids used
- Name & Signature of instructor
- Project or facility (specific training only)
- Copies of any tests and/or quizzes

4.5 Labels

4.5.1 General

- All hazardous substances received from outside suppliers will conform to legal requirements and display on each container, as a minimum, the following:
 - a. Identification of the hazardous substance(s);
 - b. Appropriate hazard warnings such as an HMIS and/or NFPA-type label (see 5.5.2 below).; and
 - c. Name and address of the manufacturer, importer, or other responsible party.

Any failure to have a label on the container at the time of receipt will be cause to refuse delivery of the product.

- Stationary process containers may have signs, placards, process sheets, batch tickets, operating procedures, or other written material in lieu of fixed labels on the containers, as long as the alternative method conveys hazard information. The written materials will be readily accessible to the employees in the work area.
- Although the practice is not recommended, if an employee will use the hazardous substance in a portable container immediately, the portable container need not be labeled when the substance is transferred from the labeled container. The term "immediate use" is intended to mean that the hazardous chemical will be exclusively under the control of and used by the person performing the transfer at all times, and work will be completed within the current work shift.
- Containers of hazardous substances transferred from labeled containers and not intended for the immediate use of the employee performing the transfer must be labeled in accordance with a hazardous materials identification system or an equivalent commercial system.
- Labels on incoming containers will not be removed or defaced.
- Labels or other forms of warning will be legible, in English, and prominently displayed on the containers, or readily available throughout each work shift.
- Container size is not the determining factor in deciding if a label is required; ALL containers of hazardous chemicals must be labeled.

4.5.2 NFPA Labeling System

The National Fire Protection Association (NFPA) and the Hazardous Material Identification System (HMIS) are two examples of a four-part, color-coded label for use with hazardous substances. NFPA labels use a four-section diamond shape while the HMIS uses or a four-line label to address the following conditions:

BLUE Section	~~~	Health Hazard Rating
RED Section	~~~	Fire Hazard Rating
YELLOW Section	~~~	Reactivity Hazard Rating
WHITE Section	~~~	Other specific hazards

Each of the three “rating” sections incorporates a numerical system for identification of the degree of hazard as follows:

- 0 - Minimal hazard
- 1 - Slight hazard
- 2 - Moderate hazard
- 3 - Serious hazard
- 4 - Severe hazard

Each of the systems utilize “pictograms” to communicate potential hazards in the WHITE or “OTHER” hazard section.

4.5.3 Pipes / Vessel Labeling

All pipes or piping systems in a treatment system, and all process vessels containing hazardous substances, must be labeled or color coded using facility specific color coding for which all affected employees have been trained. The Project Manager (PM) is responsible for ensuring that this is accomplished at each project site.

4.5.4 User

Each user shall ensure that each container of hazardous substances in the workplace is labeled, tagged, or marked with the following information:

- Identity of the hazardous substance(s) contained therein, and
- Appropriate hazard warnings.

4.5.5 Receiving

Employees receiving shipments of hazardous substances shall not accept the shipment, but return it to the shipper, if the containers are not properly labeled with the following information:

- Identity of the hazardous substance(s);
- Appropriate hazard warnings; and
- Name and address of the manufacturer, importer, or other responsible party.

4.5.6 Retention of DOT Markings, Placards, and Labels.

- Any employee who receives a package (including freight container, rail freight car, motor vehicle, or transport vehicle) of hazardous material which is required to be marked, labeled or placarded in accordance with the U. S. Department of Transportation’s Hazardous Materials Regulations (49 CFR Parts 171 through 180) shall retain those markings, labels and placards on the package until the packaging is sufficiently cleaned of residue and purged of vapors to remove any potential hazards.
- Markings, placards and labels shall be maintained in a manner that ensures that they are readily visible.

4.6 Trade Secrets

4.6.1 Non-Emergency Access to Trade Secret Information

Each Responsible Person who obtains an MSDS that claims trade secret information shall forward a copy of that MSDS to the SH&E Director. The SH&E Director will submit a written request to the supplier explaining that the information is needed for one or more of the following reasons, as applicable:

- To assess the hazards of the substances to which employees may be exposed;
- To guide appropriate sampling of the workplace atmosphere to determine employee exposure levels;
- To conduct pre-assignment or periodic medical surveillance of exposed employees;
- To provide medical treatment to exposed employees;
- To guide the selection of appropriate personal protective equipment for exposed employees;
- To guide the development of appropriate engineering controls or other protective measures for exposed employees; and
- To conduct studies to determine the health effects of exposure.

The request includes an agreement to protect the confidentiality of the disclosed information with assurance that the trade secret information will not be used for any purpose other than evaluating health hazards.

The SH&E Director will provide such information as necessary to coordinate an industrial hygiene evaluation of employee exposures. If this involves releasing trade secret information, the SH&E Director will sign a nondisclosure agreement before receiving such information.

Employees working with materials protected by a trade secret have access to the MSDS, which does not have protected information.

4.6.2 Emergency Access to Trade Secret Information

Emergency access to trade secret information is provided through the SH&E Director and Earth Tech's Occupational Physician. Where a physician or nurse determines that a medical emergency exists and the specific chemical identity of a hazardous substance is necessary for emergency or first-aid treatment, the SH&E Director shall request that the manufacturer, importer, or other supplier immediately disclose the specific chemical identity of a trade secret substance, regardless of the existence of a written statement of need or a confidentiality agreement. The manufacturer, importer, or other supplier may require a written statement of need and confidentiality agreement, in accordance with the provisions of OSHA's Hazard Communication standard, as soon as circumstances permit.

4.7 Visitors

4.7.1 Escorted Visitors

Visitors to the work area who have not received a Hazard Communication briefing on the substances present in the work area must be escorted the entire time they are in the work area to ensure that they do not contact and are not harmed by the hazardous substances.

4.7.2 Unescorted Visitors

The supervisor must ensure all visitors who enter the work area unescorted receive a Hazard Communication briefing before encountering any of the hazardous substances in the work area.

4.7.3 Subcontractors

All Earth Tech subcontractors will be required to provide a copy of their written hazard communication program and documentation of training to the Earth Tech project manager. This information will be maintained in the permanent project file. In the event that a subcontractor does not have a written program and/or the employees do not have the appropriate training, the situation must be rectified prior to allowing subcontractor employees to perform work activities in a work area containing a hazardous substance.

4.7.4 Multi-Employer Worksites

In order to inform contractors of the hazardous substances that their employee's may be exposed to which are under the control of Earth Tech, a copy of the HSI and applicable MSDSs will be made available to them. This may be accomplished by providing the contractor with direct access to the existing Earth Tech file or by providing them with copies of the necessary information. Additionally, the Earth Tech project manager will request a list of hazardous substances, with their location, and MSDSs for those items which Earth Tech employees may be exposed. This request will be made from the client, any Earth Tech subcontractors, and any other client contractors which may impact Earth Tech operations. The response to this request shall be covered in the project specific training and maintained along with the Earth Tech HSI and MSDSs.

4.8 Written Program

4.8.1 Hazard Communication in Health and Safety Plans

All Health and Safety Plans or equivalent documents written for projects will contain all the elements of the Hazard Communication Program. MSDSs for hazardous substances at the project site will also be included.

4.8.2 Location-Specific Hazard Communication Programs

Each Earth Tech location where hazardous substances are present shall develop a Hazard Communication Program in accordance with OSHA's Hazard Communication regulation, this procedure, and location-specific work rules. The location-specific Hazard Communication Program must address all elements outlined in Attachment 2 of this procedure and be in writing. In addition, certain state regulatory provisions require additional information to be included in a hazard communication program. These state-specific requirements must be identified by the project/office manager and included in the final program.

Attachment 2 is a template that can be used in developing facility specific Hazard Communication Programs. While the template is not mandatory, all elements addressed in Attachment 2 must be included in all final programs.

5.0 PROCUREMENT

No hazardous substance may be purchased for use on an Earth Tech-managed job site unless it:

- Is accompanied by a copy of the item's MSDS (unless already on file on the job site)
- Is packaged with proper hazardous commodity hazard warning labels affixed to each container.

All hazardous substances, even those purchased at local stores, must be accompanied with a MSDS. If a vendor cannot provide a MSDS at the time of procurement, the material should not be purchased.

6.0 REFERENCE

SH&E 002 – Corporate SH&E Structure and Responsibilities

SH&E 203 – Accident Prevention Program / Requirements for SH&E Documentation

7.0 ATTACHMENTS

Attachment 1 – Hazardous Material Inventory Template

Attachment 2 – Hazard Communication Program Template

Hazardous Material Inventory Template

Product Name	Chemical Name	Manufacturer	Quantity	Location	Usage ¹
OVM/HNu Calibration Gas (Isobutylene in Air)	100 ppm isobutylene in air	Varies (MSA, Scott Specialty Products, others)	≤300 ft ³	Varies (usually stored in site trailer or with other compressed gases)	D, B
LEL/O ₂ Calibration Gas (Pentane and Oxygen in Nitrogen)	0.75% pentane and 15% oxygen in balance nitrogen	Varies (MSA, Scott Specialty Products, others)	≤300 ft ³	Varies (usually stored in site trailer or with other compressed gases)	D, B
OVA Calibration Gas (Methane in Air)	100 ppm methane in air	Varies (MSA, Scott Specialty Products, others)	≤300 ft ³	Varies (usually stored in site trailer or with other compressed gases)	D, B
Hydrogen Gas	99.9999% hydrogen gas	Varies (check with Site Manager or HSSO)	≤300 ft ³	Varies (usually stored outside of site trailer with other compressed gas cylinders)	O, B

¹ Usage Legend

D = Daily	F = Field; I = In-House; B= Both; S = Storage	
O =Occasionally		

Hazard Communication Program Template

Site Name: _____

Location: _____

1. The individual with overall responsibility for the implementation of this Hazard Communication Program at this site is: _____
Responsibilities of key staff and employees with regards to Hazard Communication program at this will be as follows:

- a. Project Manager is responsible for:
- b. Operations Manager/Area Supervisors are responsible for:
- c. Individual employees are responsible for:

2. Inventory of hazardous substances is attached and is also located at:

3. Material Safety Data Sheets (MSDSs) for all hazardous substances are located at:

4. Employees may review MSDSs and the standard by following this procedure:

MSDSs not on hand, that are requested by employees, will be requested of suppliers within 7 days by letter.

5. The MSDS file is updated with new information and new hazards identified by: _____, every _____ weeks.

Out of date or missing MSDS are obtained and maintained in the files by: _____ within _____ days of the review.

6. Any new hazards will be reported immediately to: _____ and affected employees notified within 30 days.

7. Containers of hazardous materials entering the site will be checked by _____ to assure that they are properly labeled with the chemical name of the contents, the appropriate hazard warning, and the name and address of the supplier or manufacturer.

8. Onsite containers of hazardous materials will be labeled with the chemical name and hazard warning. Exceptions must be approved by _____

The following exceptions have been approved

-
-

Hazard Communication Program Template

- 9. Non-routine tasks at this location involving hazardous materials may include the following:
 -
 -

Procedures for complying with the Hazard Communication Standard for these jobs are the following:

- -
 -
- 10. Employee training is provided initially to all employees and for all new employees. This training covers the following areas:
 - a. The basic requirements of the Hazard Communication Standard and their right to information on chemical hazards.
 - b. Our company's program to comply with the standards and procedures to follow to see the standard, company program, and MSDSs.
 - c. How to interpret and use the labels on containers of hazardous materials.
 - d. The potential physical hazards and health effects of the hazardous substances and how to use MSDSs for more information.
 - e. How to handle the hazardous substances safely and other protective measures in place.
 - f. What to do in an emergency, release, or over-exposure to the chemicals.
 - g. How the presence of hazardous chemicals can be detected in the work area.

11. This training is documented in the following manner: _____

 Records are maintained at the following location: _____

12. Training concerning new hazards (new chemicals or new information on MSDSs) will be provided within 30 days and documented.

- 13. Periodic refresher training will be provided and documented as follows:
 -
 -

14. Outside employees (subcontractors and visitors) will be advised of chemical hazards at our site in the following manner: _____

This communication will include at a minimum information on:

- (i) On-site access to material safety data sheets for each hazardous chemical they may be exposed to while working at this site;
- (ii) Precautionary measures that need to be taken to protect them during the normal operating conditions and in foreseeable emergencies; and,

Hazard Communication Program Template

(iii) Labeling system used at this site.

Contractors will be required to provide information on any chemicals used at this site as a condition of their contract.

- 15. An internal review or audit of Hazard Communication program is conducted by _____ every _____ months and results of audit are maintained at _____ for review.

Our company relies on the information contained in MSDSs as permitted by the OSHA Hazard Communication Standard and does not perform independent hazard determinations.


Reviewed and approved:

SH&E Department

Date _____

Project Manager

Date _____

 Safety, Health & Environmental Procedure	PROCEDURE NO. <u>SH&E 118</u>
	DATE <u>March 25, 2005</u>
Confined Space Entry Program	REVISED <u>August 15, 2008</u>
	PREVIOUSLY <u>EHS 511 / ENV 113</u>

This procedure applies to all U.S.-based personnel, projects, offices, business units and activities. Any exceptions to this procedure must be approved, in writing, by the responsible District/Business Unit Manager and Safety Manager.

1.0 PURPOSE

Earth Tech personnel will not enter any confined space until it has been evaluated, classified, and (if necessary) has had a specific entry procedure developed. Personnel performing such entries will meet training requirements specified below.

2.0 DEFINITIONS

Confined Space - is a space which:

- Is large enough and so configured that an employee can physically enter and perform assigned work; and
- Has limited or restricted means for entry or exit; and
- Is not designed for continuous human occupancy.

There are two types of confined spaces:

Permit-Required Confined Space (PRCS) – a confined space that exhibits one or more of the following properties:

- Contains or has a potential to contain a hazardous atmosphere;
- Contains a material that has the potential for engulfing an entrant;
- Has an internal configuration such that an entrant could be trapped or asphyxiated by inwardly converging walls or by a floor which slopes downward and tapers to a smaller cross-section; or
- Contains any other recognized serious safety or health hazard.

Non-Permit Required Confined Spaces (NPRCS) - Spaces that do not contain or, with respect to atmospheric hazards, have the potential to contain any hazard capable of causing death or serious physical harm. These spaces do not require specific entry procedures.

Non-permit-required confined spaces can be designated only by a Certified Industrial Hygienist, Certified Safety Professional, Earth Tech Safety Manager or Professional Engineer after review of the space(s), historical monitoring data, and other factors (e.g., injuries that have occurred). Therefore, all confined spaces will be considered permit-required unless specifically designated as a non-permit space, in writing, on the approved confined space inventory listing.

Entry – The action by which a person passes through an opening into a confined space. Entry is considered to have occurred as soon as any part of the body breaks the opening of a confined space

3.0 CLASSIFICATION OF CONFINED SPACES

3.1 Identification of Confined Spaces

All confined spaces under the control of Earth Tech that may be entered will be identified, evaluated and classified on a Confined Space Inventory Listing (Attachment 1 or equivalent). The inventory listing shall be updated as required, at a minimum annually.

3.2 Labeling

1. All permit-required confined spaces will be labeled so that employees are adequately warned of the potential for hazardous conditions/atmospheres. Labeling is not required under the following circumstance:
 - a. The spaces are easily recognizable, numerous, and widely spaced (e.g., storm sewer manholes). Employees will be instructed that these constitute confined spaces during required training. However, these locations will be included on the inventory.
 - b. A complete inventory has been developed, all personnel have been trained in the use of the inventory, and the workers consult the inventory prior to performance of any work that may require entry into a confined space.
2. When non-permit-required confined spaces require the implementation of confined space entry procedures because of specific work operations (e.g., painting, welding), all entry points will be labeled so as to alert all employees of the existence of the hazardous conditions. These signs will be removed only when the hazard no longer exists (e.g., complete curing of the paint).

3.3 Classification of Confined Spaces

For each identified confined space, an evaluation to determine the nature and extent of all possible hazards to entrants must be conducted. Consideration will be given to the following types of hazards:

- The presence of possible airborne contaminants at concentrations exceeding established occupational exposure limits (OELs)
- The presence of any physical hazards (e.g., electrical shock, mechanical injury, etc.)
- The presence of flammable or explosive conditions
- The presence of any potential for rapid flooding or engulfment
- Configurations/positioning that may cause an entrant to become trapped
- Initial classification as either a PRCS or NPRCS

The evaluation will be documented using the *Confined Space Hazard Assessment* form found in Attachment 2.

Wherever the confined space is controlled by a client or third-party, the controlling entity should be contacted to provide the information necessary to complete the evaluation. However, if Earth Tech personnel are required to enter a confined space owned or controlled by others, the final evaluation will remain the responsibility of responsible Earth Tech manager.

4.0 CONFINED SPACE ENTRY DUTIES

4.1 Entry Supervisor

1. Understand the hazards that may be faced during entry, including information on the mode, signs or symptoms, and consequences of the exposure;
2. Verify following before signing the permit and allowing entry to begin;
 - a. Appropriate entries have been made on the entry permit;
 - b. All tests specified by the permit have been conducted;
 - c. All procedures and equipment specified by the permit are in place.
 - d. Means of communication are available and have been tested.

Terminate the entry and cancel the permit when entry operations are complete or when a prohibited condition arises.

Verify rescue services, when required, are available and the means for summoning them are operable.

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

Ensure that entry operations remain consistent with terms of the entry permit and that acceptable entry conditions are maintained.

Withdraw the entry permit and stop all entries if unsafe conditions are reported during any confined space entry. He/she will not permit same or any other entry until cause of unsafe conditions is thoroughly investigated and Confined Space program is reviewed to prevent reoccurrence.

4.2 Attendant

1. Understand the hazards that may be faced during entry, including information on the mode, signs or symptoms, and consequences of the exposure
2. Be aware of the possible behavioral effects of hazard exposure in the Authorized Entrants;
3. Maintain an accurate count of Authorized Entrants in the permit space and ensure the means used to identify Authorized Entrants accurately tracks who is in the permit space;
4. Remain outside the permit space during entry procedures until relieved by another Authorized Attendant;
5. Communicate with Authorized Entrants as necessary to monitor entrant status and to alert Entrants of the need to evacuate the space
6. Monitor activities inside and outside the space to determine if it is safe for Entrants to remain in the space. Orders the Authorized Entrants to evacuate the permit space under any of the following conditions:
 - a. The Attendant detects a problem.
 - b. The Attendant detects the behavioral effect of hazard exposure in an Entrant,
 - c. The Attendant detects a situation outside the space that could endanger the Entrant, and
 - d. If the Attendant cannot effectively and safely perform all of his/her assigned duties.
7. Summon rescue and other emergency services as soon as the Attendant determines that Entrants may need assistance to escape from permit space hazards;

8. Take the following actions when unauthorized persons approach or enter a permit space while entry is underway:
 - a. Warn the unauthorized persons they must stay away from the permit space;
 - b. Advise unauthorized persons they must exit immediately if they have entered the permit space; and
 - c. Inform the Authorized Entrants and the Entry Supervisor if unauthorized entrants have entered the permit space.
9. Perform non-entry rescues as specified within this program; and
10. Perform no other duties that might interfere with the Attendant's primary duty to monitor and protect the Authorized Entrants.

4.3 Authorized Entrant

1. Understand the hazards that may be faced during entry, including information on the mode, signs or symptoms, and consequences of the exposure
2. Properly use personal and facility equipment as required by the entry permit;
3. Communicate with the Attendant as necessary to enable the Attendant to monitor Entrant status and to enable the Attendant to alert Entrants of the need to evacuate the space;
4. Alert the Attendant whenever a recognized warning sign or symptom of exposure to a dangerous situation or a prohibited condition exists;
5. Exit from the permit space as quickly as possible whenever:
 - a. An order to evacuate is given by the Attendant or the Entry Supervisor; or
 - b. When the Entrant recognizes any warning sign or symptom of exposure to a dangerous situation; or
 - c. When the Entrant detects a prohibited condition; or
 - d. When an evacuation alarm is activated.

4.4 Rescue Service (if designating an outside service)

Prior to authorizing entry into any confined space, Site (Project) Manager should:

1. Evaluate a prospective rescuer's ability to respond to a rescue summons in a timely manner (within 3 minutes for life threatening situations or 15 minutes for non-life threatening injuries), considering the hazard(s) identified;
2. Evaluate a prospective rescue service's ability.
3. Select a rescue team or service from those evaluated that:
 - a. Has the capability to reach the victim(s) within a time frame that is appropriate for the permit space hazard(s) identified [as defined in 4.4 (1) above];
 - b. Is equipped for and proficient in performing the needed rescue services;
 - c. Inform each rescue team or service of the hazards they may confront when called on to perform rescue at the site; and
 - d. Provide the rescue team or service selected with access to all permit spaces from which rescue may be necessary so that the rescue service can develop appropriate rescue plans and practice rescue operations.

4.5 Rescue Service (if designating internal rescue team)

Prior to authorizing entry into any confined space, Site (Project) Manager should:

1. Provide affected employees the required personal protective equipment (PPE) and train them in its use;
2. Train affected employees to perform assigned rescue duties;
3. Train affected employees in basic first-aid and cardiopulmonary resuscitation (CPR) (at least one member shall hold a current certification in first aid and CPR); and
4. Ensure that affected employees practice making permit space rescues at least once every 12 months.

4.6 Facilitating Non-Entry Rescue

1. Retrieval systems or methods shall be used whenever an authorized entrant enters a permit space (unless the retrieval equipment would increase the overall risk of entry).
2. Retrieval systems shall meet the following requirements:
 - a. Each authorized entrant shall use a chest or full body harness with a retrieval line attached at the center of the entrant's back near shoulder level or other suitable locations as appropriate.
 - b. The other end of the retrieval line shall be attached to a mechanical device (mandatory for more than 5 feet deep rescue) or fixed point outside the permit space.

5.0 PRCS-Specific Entry Procedures

To protect employees during PRCS entries, and to meet the requirements of 29 CFR 1910.146, Earth Tech-specific PRCS entry procedures will be developed for each PRCS to be entered. Each entry procedure will detail:

- The identity of the PRCS(s) to which the procedure applies;
- Details concerning the potential hazards associated with the entry operation/PRCS;
- Pre-entry preparation:
 - Required air monitoring equipment;
 - PPE;
 - Required emergency response/extraction equipment;
 - Required ventilation procedures (as applicable);
 - Required isolation procedures (as applicable);
 - Rescue agency notification requirements (as applicable);
- Required pre-entry monitoring procedures and applicable at-entry re-classification criteria
- Air monitoring procedures during entry (if re-classification has not occurred);
- PPE requirements during entry (if re-classification has not occurred);

Specific entry procedures can be documented by following the procedures in sections 5.1 through 5.4 of this procedure and by completing a Task Hazard Analysis (NAC&E) or Work Plan (NACO) in combination with a completed Confined Space Hazard Analysis and Confined Space Permit.

5.1 PRCS Pre-Entry Procedure:

Prior to the start of the entry operation the Entry Supervisor will assign individuals on the entry team to the following jobs:

- Entrant – the person entering the PRCS
- Primary Attendant¹ - the person dedicated only to assisting the entrant, observing the entry operation and maintaining communications with the entrant throughout the entry procedure.
- Secondary Attendant for Rescue Procedures – an employee assigned either to specific support of the entry operation or working nearby who can assist with rescue operations in the event of an accident. This person can perform other duties unrelated to observing the entry.

The Entry Supervisor is responsible for ensuring that the individuals assigned to each job fully understand their duties and responsibilities prior to initiating the entry operation. The Entry Supervisor will review the complete entry procedure with all team members prior to the work. The Entry Supervisor will also verify the availability of rescue services.

Additional requirements for Pre-Entry Planning include the following:

- Select the appropriate equipment to measure the potential hazards. Select a multi-gas meter capable of measuring oxygen, combustible gas (%LEL), and other Hazardous Gases.
- Determine the acceptable values for the hazardous conditions being measured, based on the equipment in use and the field calibration method. The action levels are determined as follows:

▪ Oxygen	19.5% - 23.5%
▪ Lower explosion limit	10%
▪ Hydrogen sulfide	5 ppm
▪ Carbon monoxide	15 ppm
▪ Other toxic chemicals	Contact Health and Safety Department
- Ensure all the equipment selected is calibrated, and calibration is still valid.

Personnel trained in accordance with this procedure shall perform field verification of equipment as follows:

1. Calibrate combustible gas meters using appropriate span gas for the detectors to be used. (This span gas calibration shall be performed each time the instrument is turned on).
2. Check detector tube pumps for leakage using the manufacturer's procedures.
3. Calibrate Photo ionization detectors (PID) using isobutylene, or other material, in accordance with the manufacturer's directions.
4. Calibrate any other instrumentation to be used in accordance with manufacturer's directions.

Set up barricades around the space being entered as required.

¹ Note: The Entry Supervisor can serve as the Primary or Secondary Attendant, but cannot perform work as the PRCS Entrant.

Set up required rescue or retrieval systems.

Institute required lockout/tagout procedures (i.e. electrical, steam, liquid flow-pipe blanking)

Ensure that a second person (trained as entry attendant) is available, and assists in the set up procedures.

Agree upon a means of communication between the entrant and the attendant. (The attendant is not authorized to perform rescue involving entry into the space, unless he/she is trained for rescue and another entry attendant replaces him/her prior to the attempt to rescue).

Attendant must have a means to contact emergency rescue services for further assistance.

Complete Confined Space Entry Permit:

1. Have the attendant verify the completion of the required actions;
2. Entry supervisor shall sign the Permit upon verification of completed actions;
3. Maintain the Permit at all authorized entry sites until completion of the entry;

5.2 PRCS Entry Permits

A PRCS Entry Permit is required to be completed for each individual PRCS entry operation (Exception: Multiple entries of an *individual PRCS* during a single work shift can be covered by a single Permit). The Permit provides the means for documenting:

- The identities and roles of all individuals involved in the entry operation.
- Equipment used for performance of the entry (monitoring instruments, extraction equipment, etc.).
- Pre-entry and operational monitoring results.
- Other relevant workplace conditions or events related to the entry operation (e.g., vault isolation procedures).

The Permit also provides the documented basis for re-classification of any PRCS as non-permit required (for purposes of the particular entry operation) based upon pre-entry monitoring procedures. Each Permit will be signed and authorized by the Entry Supervisor. At the completion of the entry operation, the Permit will be filed as part of the project records.

A copy of Earth Tech's PRCS Entry Permit form is provided in Attachment 3 and an example of Earth Tech's Confined Space Entry Classification Guidance is provided in Attachment 4.

5.3 PRCS Entry Procedure

- Don any required PPE.
- Check the area around the seal to ensure that no flammable situations exist prior to door or cover removal. Note: ***Always check for oxygen levels first if the meter does not measure simultaneously. Low oxygen levels can cause LEL readings to be incorrect.***
- Carefully remove any access doors or covers.
- Upon removal of the access cover/door, check the immediate atmosphere using remote testing procedures to ensure the immediate atmosphere is safe. If any of the parameters being tested are outside the action level, do not enter.

- If necessary, use exhaust ventilation to either remove the contaminant(s) or to correct the oxygen-deficient atmosphere.
- If the initial test(s) are within allowable ranges, slowly enter the space, continually testing the atmosphere in front and to the sides.
- In stratified atmospheres (i.e., vertical entries), testing will be done 4 feet in advance of the direction of travel. Travel speed will allow for adequate instrument response time.
- The entire area where work is to be performed will be tested prior to performance of any work.
- While performing the work, place the direct read instruments in a location that will not interfere with the work, allow for continual monitoring, and allow for noting any alarms that may be activated.
- Upon work completion, pick up all equipment and leave the space.

5.4 PRCs Exit Procedure

- Replace all access covers.
- Ensure all signs are visible and legible.
- Remove all lockout/tagout equipment.
- Note on the Permit any problems encountered while in the space.
- Finish the Permit and turn it in to the Entrant Supervisor.
- The Entrant Supervisor will inspect the Permit for completion and investigate any noted problems. Actions taken to correct noted problems will be discussed with all authorized entrants and attendants for future implementation.
- The completed Permit will be maintained on file as required in this section.

6.0 NON-PERMIT REQUIRED CONFINED SPACE ENTRY PROCEDURE

DEFINITION: **NON – PERMIT CONFINED SPACE (NPCS)** is a confined space that:

1. Does not contain any hazard capable of causing death or serious physical harm.
2. With respect to atmospheric hazards, does not have the potential to contain any hazard capable of causing death or serious physical harm.

Persons entering this type of space only need to complete a confined space entry permit and remain vigilant about conditions in the space and remember that if any condition changes or if hazards are introduced into the space (e.g. welding/cutting operations), the classification and entry procedures in the space may change.

6.1 NPCS Entry Procedure

1. Check the atmosphere with the gas detector for Oxygen, LEL and other Hazardous gases (e.g. CH₄, H₂S, CO) in the same order prior to entry into the space.

2. Record the measured conditions on the permit and do not allow entry if detected levels are above action levels.
3. When entrance covers are removed, guard the opening to prevent an accidental fall through the opening and to protect each employee working in the space from foreign objects entering the space.
4. Proceed with entry and work with caution.

6.2 NPCS Post Entry Procedures

The following post-entry procedures must be followed after the completion of a non-permit required confined space entry:

1. Replace all access covers.
2. Ensure all signs are visible and legible.
3. Remove all lockout/tagout equipment, if applicable
4. Note any problems encountered while in the space on the Permit.
5. Finish the permit, and turn in to the entrant supervisor.
6. The entrant supervisor shall inspect the Permit for completion, and investigate any noted problems. Actions taken to correct noted problems shall be discussed with all authorized entrants and attendants for future implementation.
7. The completed Permit shall be maintained in record for annual review.

ALTERNATE ENTRY PROCEDURES

DEFINITION: An Alternate-Procedure Confined Space (APCS) is a confined space where:

1. The only hazard posed by the space is either an actual or potential hazardous atmosphere;
2. Continuous forced air ventilation alone can be used to maintain the space for entry; and
3. Monitoring and inspection data has been obtained to support this assertion.

Alternate entry procedures allow for entry into a confined space without the need for attendant or emergency extraction equipment. In addition, a full Confined Space Permit is not required to be completed; only documentation (e.g., logbook) as to who entered, when entered, and what the atmospheric measurements were prior to entry is required.

In order to use alternate entry procedures for a given space, the confined space will initially be designated as a permit-required confined space, and full entry procedures as required above will be implemented. After collection of sufficient data, a review of the air monitoring data will be performed. If the data shows all air sampling data is within acceptable ranges and/or below the substance action levels, and it is confirmed that there is no other anticipated hazard, then the space can be designated as Alternate-Procedure Confined Space (APCS) entry.

Entry into alternate-procedure confined spaces will still require the entrant to perform initial atmospheric testing prior to entry, as well as periodic measurements while inside the space.

If the measured atmospheric contaminant levels exceed established criteria, the employee will exit the space, and will not re-enter. Subsequent entry into that or similar confined spaces will only be permitted after completing following conditions:

- Thorough review of confined space program and the process of determining APCS to establish root-cause for the contaminant.
- Documentation and reporting of the incident as serious near-miss.
- Complete elimination of the root-cause that resulted into unsafe condition.
- Subsequent entry into the confined space to be done using full permit-required entry procedures until effectiveness of the control is established.

7.1 APCS PRE-ENTRY CERTIFICATION AND ENTRY PROCEDURE (8-STEP PROCESS)

1. Eliminate any conditions making it unsafe to remove an entrance cover.
2. When entrance covers are removed, guard the opening.
3. Before an employee enters the space, test the internal atmosphere with a calibrated direct-reading instrument, for oxygen content, for flammable gases and vapors, and for potential toxic air contaminants, in that order (if meter does not read simultaneously).
4. All employees who enter the space shall be provided an opportunity to observe this pre-entry testing.
5. Confirm there is no hazardous atmosphere within the space whenever any employee is inside the space.
6. Setup and manage the continuous forced air ventilation system as follows:
 - a. Do not allow entry into the space until the forced air ventilation has eliminated any hazardous atmosphere;
 - b. Direct the forced air ventilation to ventilate the immediate areas where an employee is or will be present within the space.
 - c. Continue ventilating the space until all employees have exited from the space; and
 - d. Obtain the air supply for the forced air ventilation from a clean source.
7. Periodically test the atmosphere in the space to make sure the continuous forced air ventilation is preventing the accumulation of a hazardous atmosphere.
8. If a hazardous atmosphere is detected during entry:
 - a. Instruct each employee to exit the space immediately and withdraw all confined space entry permits.
 - b. Evaluate the space to determine how the hazardous atmosphere developed;
 - c. Review Confined Space Program to ensure its continued effectiveness and do not authorize any new entries until program is evaluated to be still effective.
 - d. Implement measures to protect employees from the hazardous atmosphere before any subsequent entries are permitted.

Verify engulfment hazards are controlled by making sure that all pumps and lines and/or laterals that may reasonable cause water/wastewater to flow into the space have been disconnected, blinded, and locked out, or effectively isolated by other means to prevent the development of engulfment.

Verify all energy is controlled by making sure that all sources of electrical, hydraulic, pneumatic, and the potential for gravitational energy have been effectively identified and locked out or isolated.

Verify Communications have been established via radio, mobile phone, or other device prior to entry. The communications need to be with a central source such as Operations Manager or Supervisor.

Verify the space is safe for entry and the pre-entry measures listed above have been complete.

7.2 APCS Post Entry Procedures

The following post-entry procedures must be followed after the completion of a Alternate confined space entry procedure:

1. Replace all access covers.
2. Ensure all signs are visible and legible.
3. Remove all lockout/tagout equipment.
4. Note any problems encountered while in the space and record on Alternate Procedure Form.
5. The entrant supervisor shall inspect the Alternate Procedure Form for completion, and investigate any noted problems. Actions taken to correct noted problems shall be discussed with all authorized entrants and attendants for future implementation.
6. The completed Alternate Procedure Form shall be maintained for a period of one year or more.

8.0 MULTI-EMPLOYER ENTRY RESPONSIBILITIES

Earth Tech's Requirements - When using another employer to perform work involving confined spaces, Earth Tech must:

1. Inform the contractor that the workplace contains permit spaces and that permit space entry is allowed only through compliance with a permit space program meeting the requirements of CFR 1910.146;
2. Appraise the contractor of the elements, including the hazards identified and all past experiences with the space, that make the space in question a permit space;
3. Appraise the contractor of any precautions or procedures that have been implemented for the protection of employees in or near permit spaces where contractor personnel will be working;
4. Coordinate entry operations with the contractor, when both Town employees and contractor employees will be working in or near permit spaces so that employees of the Town and the contractor do not endanger each other; and
5. Debrief the contractor at the conclusion of the entry operations regarding the permit space program followed and regarding any hazards confronted or created in permit spaces during entry operations.

Contractor Requirements - In addition to complying with the permit space requirements that apply to all employers, each contractor who is retained to perform permit space entry operations must:

1. Obtain any available information regarding permit space hazards and entry operations from the plant superintendent (or Project Manager);

2. Coordinate entry operations with the plant superintendent (or Project Manager) when both Earth Tech personnel and contractor personnel will be jointly working in or near permit spaces; and
3. Inform Plant Superintendent (or Project Manager) of the permit space program that the contractor will be using and of any hazards confronted or created in permit spaces, either through debriefing or during entry operations.

9.0 CONFINED SPACE ENTRY TRAINING

Personnel participating in the entry of any confined space must first complete initial confined space entry training equivalent to their assigned duties. In addition, personnel will receive site-specific training covering confined space entry procedures associated with the work site.

9.1 Initial Training

Personnel will not be permitted to perform entry of any confined space prior to completing this training. The training will be administered or approved by the SH&E Department, and will consist of the following elements:

- Orientation regarding the differences between a confined space and a permit-required confined space (PRCS).
- Review of applicable regulatory requirements (29 CFR 1910.146).
- Review of this procedure
- Air monitoring instrumentation calibration and monitoring methods.
- Use of respiratory protection and PPE during PRCS operations.
- Entrant duties during NPRCS and PRCS entries.
- Attendant duties during PRCS entries:
Includes all the above plus:
 - Emergency notification requirements
 - Emergency response procedures
 - Maintaining the list of Authorized Entrants
 - Applicable state requirements for Attendants (i.e. Michigan-specific requirements)
- Entry Supervisor duties during PRCS entries:
Includes all of the above plus:
 - Accident and problem investigation techniques
 - Recordkeeping requirements

Initial training is intended only to qualify personnel to perform the duties of general confined space entry . This training must be supplemented by site/procedure-specific training prior to any new entry operation.

Refresher training is required any time there is a change in the overall program or procedures or when, based on observation or incident, a substantial non-compliance with this procedure is noted.

9.2 Site/Procedure-Specific Training

Because entry procedures will be specifically developed for individual PRCSSs, personnel will require training in the specific procedure(s) prior to on site implementation. Training must be conducted by an authorized supervisor, member of the SH&E Department, or an approved alternate and must be documented.

9.3 Annual Program Review

At least annually, (or whenever any incident or serious near miss occurs due to confined space entry) an independent authorized employee who is not involved in the procedure being inspected must conduct and document a review and inspection of the confined space entry program specific to the identified facility. The inspection should include a meeting with authorized employees and any other affected employees.

The inspection procedure must include the following elements.

- Discuss the entry supervisors, entry attendant, entrant, and rescuers (where applicable) responsibilities under the confined space entry program.
- Where confined space permit is used, discuss the entry attendant and entrant employee's responsibilities under the confined space entry program and the limitations of the program.
- If deficiencies are noted during the inspection, corrective actions and retraining of employees, as necessary, must be performed immediately.
- Review of all confined space permits filed during last 12 months. Review should be focused on any deficiencies recorded on the permit, with appropriate root-cause analysis and preventive and corrective actions.
- The inspector shall provide a copy of all inspection documentation to the applicable Earth Tech Manager for review and filing.

These inspections shall at least provide for a demonstration of the procedures and may be implemented through random audits and planned visual observations. These inspections are intended to ensure that the confined space program is being properly and consistently implemented.

10 RECORDKEEPING

- Inventories of confined spaces will be maintained until one year past project completion.
- Cancelled and completed Confined Space Entry Permits will be maintained for a minimum of one year.
- Any airborne measurements that represent employee exposure will be maintained in accordance with SH&E 111 Employee Exposure Monitoring Program.
- All Entry Permits will be reviewed annually by a trained entrant supervisor to determine if procedures are being followed and are adequate to protect employees. If necessary, the entry procedures will be modified to ensure personnel are protected when entering locations.

11.0 REFERENCES

SH&E 111 – Employee Exposure Monitoring Program
SH&E 211 – Walking–Working Surfaces Protection
SH&E 204 – Task Hazard Analyses

12.0 ATTACHMENTS

Attachment 1 – Confined Space Identification Log
Attachment 2 – Confined Space Hazard Assessment Form
Attachment 3 – Confined Space Entry Permit Form
Attachment 4 – Confined Space Entry Classification Guidance

Confined Space Hazard Assessment Form

PART 1. CONFINED SPACE IDENTIFICATION	
Confined Space Name:	
Dimensions:	
Description of Space:	
Is this space entered on a routine basis? <input type="checkbox"/> Yes <input type="checkbox"/> No	
Described Tasks and Frequency:	
PART II. NATURE OF THE HAZARDS – ASSUMPTIONS: Tanks are empty and clean, all energy sources identified and isolated, and no other hazards are introduced into the spaces. A more formal hazard assessment must be done at time of entry.	
<p><u>Potential Atmospheric Hazards</u></p> <p><input type="checkbox"/> O₂ Deficient /Enriched</p> <p><input type="checkbox"/> Combustibles/Flammables</p> <p><input type="checkbox"/> CO</p> <p><input type="checkbox"/> H₂S</p> <p><input type="checkbox"/> Other Toxics</p>	<p><u>Potential Non-Atmospheric Hazards</u></p> <p><input type="checkbox"/> Contains Material Which Could Engulf Entrant? _____</p> <p><input type="checkbox"/> Internal Config. Could Trap Entrant? _____</p> <p><input type="checkbox"/> Electrical (live circuits)? _____</p> <p><input type="checkbox"/> Mechanical (pipes, linkages)? _____</p> <p><input type="checkbox"/> Slick/Residue Covered Surfaces? _____</p> <p><input type="checkbox"/> Equipment Preventing Safe Exit? _____</p> <p><input type="checkbox"/> Low/Inadequate Lighting? _____</p> <p><input type="checkbox"/> Hazardous Chemicals Present? _____</p> <p><input type="checkbox"/> Fall Potential? _____</p> <p><input type="checkbox"/> Potential for Dropped Objects? _____</p> <p><input type="checkbox"/> Multiple Work Groups/Nature of Work _____</p> <p><input type="checkbox"/> Other _____</p>
Photo of Space Here...	

Earth Tech PRCS Entry Permit Form

1. Permit space to be entered: _____ Project Name & No.: _____
 2. Purpose of entry: _____
 3. Good on this date only: _____ From: _____ AM/PM To: _____

AM/PM

Authorized Entrants:	Authorized Attendants:	Entry Supervisor:
_____	_____	_____
_____	_____	_____
_____	_____	_____

5. Hazards within the permit space: _____

6. Permit Space Preparation

- | | | |
|---|-----------|----------|
| 1. Work area isolated with signs/barriers? | _____ Yes | _____ No |
| 2. All energy sources locked/tagged out? | _____ Yes | _____ No |
| 3. All input lines capped/blinded? | _____ Yes | _____ No |
| 4. Permit Space contents drained/flushed/neutralized? | _____ Yes | _____ No |
| 5. Permit Space cleaned/purged? | _____ Yes | _____ No |
| 6. Ventilation provided 30 minutes before entry? | _____ Yes | _____ No |

7. Initial atmospheric testing.

	<u>Reading</u>	<u>Time</u>	<u>Acceptable level</u>
Oxygen%	_____	_____	_____
LEL	_____	_____	_____
Other Contaminants	_____	_____	_____
Other Contaminants	_____	_____	_____
Other Contaminants	_____	_____	_____

8.

Test (s) To Be Taken	Permissible Entry Levels	Test 1	Test 2	Test 3	Test 4
A. Percent of Oxygen	19.5% to 23.5%				
B. Explosivity	<10% LEL				
C.					
D.					
E.					
Name of Tester					
Test Times					

9. Rescue Services (circle one) On Site Off Site

Phone # for Rescue Services or means of summoning:

10. Communication devices and procedures to be used during entry:

11. Safety Equipment required for entry:

PPE	N/A () YES ()	Specify _____
Testing Equipment	N/A () YES ()	Specify _____
Alarm System	N/A () YES ()	Specify _____
Rescue Equipment	N/A () YES ()	Specify _____
Other	N/A () YES ()	Specify _____

12. Additional Permits Required:

- Hot work: _____ Yes _____ No
 Other: _____ Yes _____ No

Earth Tech PRCS Entry Permit Form

13. Permit Authorization

I certify that I have inspected the work area for safety and reviewed all safety precautions recorded on this permit.

Permit Authorization by entry Supervisor (Signature): _____ Date/Time _____

14. Permit Conditions Verification:

Physical conditions at confined space checked and verified to be in accordance with the permit Yes No
 If no; please record the deviation observed and corrective action taken:

Verified by : _____
(Entry Supervisor) Date Time

15. Review & Close-out:

Please list problems encountered during entry:


Corrective / Preventive Action Taken:

Additional Precautions / Recommendation for Future Entry:

Based on this review, this confined space shall be considered:

- | | | |
|--------------------------------------|-----|----|
| - Permit Required Confined Space | Yes | No |
| - Non-Permit Required Confined Space | Yes | No |
| - Alternate Procedure Confined Space | Yes | No |

Reviewed By: _____
(Entry Supervisor) Date Time

 Safety, Health & Environmental Procedure	PROCEDURE NO. <u>SH&E 119</u>
	DATE <u>March 25, 2005</u>
LOCK-OUT / TAG-OUT PROGRAM	REVISED <u>August 15, 2008</u>
	PREVIOUSLY <u>ENV 518</u>

This procedure applies to all U.S.-based personnel, projects, offices, business units and activities. Any exceptions to this procedure must be approved, in writing, by the responsible District/Business Unit Manager and Safety Manager.

1.0 PURPOSE

To establish the minimum requirements for Earth Tech employees to perform equipment lockout and tagout (LO/TO) operations.

2.0 SCOPE

All Earth Tech facilities are regulated by this procedure when:

- Any employee (or contractor) is required to remove or bypass a guard or other safety device.
- Any employee (or contractor) is required to place any part of his body into the mechanism of a piece of equipment or path of hazardous energy.

3.0 DEFINITIONS

Affected employee: A person whose job requires him/her to operate or use a machine or piece of equipment on which servicing or maintenance is being performed under lock out or tag out, or whose job requires him/her to work in an area in which such servicing or maintenance is being performed

Authorized employee: A person who locks out or tags out a machine or piece of equipment in order to perform servicing or maintenance on that machine or equipment.

Cord and Plug connected equipment: Equipment where the only energy source is electrical power provided by a plug-in connection.

Energy Source: Any electrical, mechanical, hydraulic, pneumatic, chemical, radiation, thermal, or compressed gas energy source; energy stored in springs; and potential energy from suspended objects (gravity) that may injure personnel, cause property damage, and/or cause a release of hazardous substance to the environment.

Energized: Connected to an energy source or containing residual or stored energy.

Energy-isolating device: A mechanical device that physically prevents the transmission or release of energy. This includes locks, hairpins, tongs, lockable valves, clam shell devices for valves, blank flanges for piping systems, and restraining devices to prevent movement of parts.

Isolation: A physical activity using a device which prevents the transmission or release of energy. Examples of devices used to isolate equipment/systems include, but are not limited to: restraint blocks, electrical circuit breakers, disconnect switches, fuses, slip gates, slip blinds, or double valves. Control circuit devices, motor controllers, etc., are not acceptable isolation devices.

Locking Device: A device that utilizes a lock, key, and identification number to hold an energy isolation device in the safe position for the purpose of protecting personnel.

Lockout: The use of a locking device to ensure that an energy-isolating device and the equipment it controls cannot be operated until the lockout device is removed.

Lock Out/Tag Out specific procedure: A written procedure developed specifically for each piece of machinery or equipment capable of unexpectedly releasing energy. This procedure outlines in detail how lock out/tag out will be performed.

Normal production operations: The utilization of a machine or piece of equipment to perform its intended production function.

Servicing and/or maintenance: Workplace activities such as constructing, installing, setting up, adjusting, inspecting, modifying, and maintaining and/or servicing machines or equipment. These activities include lubrication, cleaning or unjamming of machines or equipment, and making adjustments or tool changes where employees could be exposed to the unexpected energization or start-up of the equipment or a release of hazardous energy.

Tagout: The use of a warning device to establish that an energy-isolating device and the equipment it controls may not be operated until the tagout device is removed.

4.0 GENERAL PROCEDURE

LO/TO of energy sources must be performed only by an Authorized Employee doing the work. If more than one employee is involved, either each individual Authorized Employee must use his/her own lock (multiple lockout), or a group lockout can be performed by the employees' supervisor/foreman. The locks, tags, and equipment shall not be tampered with by any employee. Only the person originally locking and tagging the equipment is authorized to remove the locks and tags. If the employee who placed the lockout/tagout device/sign subsequently no longer works for the company, or cannot be located, only the authorized supervisor/foreman can remove the locks and tags in accordance with the procedure outlined below for Removal of Unattended Lockout/Tagout Devices.

4.1 Authorized Employees

Only employees that have completed training for Lockout/Tagout Authorized Employees will be permitted to initiate and supervise work being performed under Lockout/Tagout procedures. Each Authorized Employee will also be responsible for reviewing any applicable equipment-specific Lockout/Tagout procedure prior to initiating work. Any problems identified with the equipment-specific procedure are to be immediately reported as an incident or near miss and should be brought to the attention of the SH&E Department and all work on affected equipment halted.

4.2 Shift Change Procedures

If ongoing work requires carryover from shift to shift, or transfer of responsibility between employees, the following procedure will be implemented:

- The employee(s) who originally performed the lockout shall walk through the lockout/isolation steps with the new worker.

- At each isolation point the original worker shall remove his/her lockout/tagout device(s), to be immediately replaced by the new worker's device(s).
- Upon transfer of the lockout/tagout equipment, the new employee shall verify that the equipment is still isolated prior to continuation of work.

Under no circumstances shall the original devices remain in place, and just the keys transferred. For supervisor/foreman and/or group lockouts, the same procedure shall be used with the oncoming supervisor/foreman.

4.3 Removal of Unattended Lockout/Tagout devices

Only the person(s) who placed the lockout/tagout devices on the system can remove the devices, unless:

- The site supervisor has verified that the employee(s) is not on site (or is no longer employed at the site).
- All reasonable efforts have been made to contact the employee (active employees only) to verify that the work is complete and the devices are about to be removed.
- The site manager (or Project Manager for NACO) inspects the locked-out/tagged-out device and ensures that the equipment is capable of being safely re-energized.

If all of the above apply, the locks and tags can be removed at the direction of the site supervisor. The site supervisor shall complete an Earth Tech Lock and Tag Removal Form (Attachment 1) to document the event prior to removing the lock and shall keep it in record for a period of 1 year.

UNAUTHORIZED REMOVAL OF A LOCKOUT/TAGOUT DEVICE WILL RESULT IN IMMEDIATE DISMISSAL

5.0 SPECIFIC LO/TO PROCEDURES

Written procedures will be developed for the lockout and tagout of each piece of equipment that has potentially hazardous energy sources (except as noted below). Each procedure must be reviewed and approved by the SH&E Department (or by Project Manager for NACO) prior to implementation.

Equipment-specific written lockout/tagout procedures are not required, if **ALL** of the following conditions are met:

1. The equipment's only potential energy source is electrical, **and**
2. The unexpected start up of the equipment is controlled by the unplugging of the equipment from the electrical source, **and**
3. The plug is under the exclusive control of the person performing the work.

Additionally, equipment-specific Lockout/Tagout procedures are not required if **ALL** of the following apply:

1. The machine has no potential for stored or residual energy, or re-accumulation of stored energy after shutdown (i.e. contains a capacitor to store electrical energy or pressurized tank to store air/gas), **and**.
2. The machine has a single energy source that can be readily identified and isolated (If more than one energy source is present (e.g., gas and electric), then written procedures shall be developed) **and**
3. The isolation and locking out of the energy source completely de-energizes and deactivates the equipment, **and**

4. Servicing of the machine requires that its energy source must previously have been locked out and tagged out in accordance with this section, **and**
5. A single lock-out device achieves a locked out condition.

5.1 Procedure Outline

All equipment-specific Lockout/Tagout procedures will be prepared to meet the following steps:

- Identify type and magnitude of energy. Discuss with all crew members prior to initiating procedures.
- Notify affected employees that the machine/equipment will be shut down and locked out for servicing. Shut down machine/equipment by normal stopping procedure.
- Identify all energy-isolating device(s) for the machine or equipment being serviced.
- Lock out each device with individual locks. Tag out only if a device is not capable of being locked out.
- Relieve or restrain stored and/or residual energy.
- Verify the isolation of equipment and its zero energy state.
- Complete the LOTO Verification Checklist (Attachment 2)
- Perform work.
- Check work area to remove non-essential items and ensure equipment components are intact.
- Check work area to ensure all personnel are removed from the area.
- Verify that the controls are in neutral (off).
- Remove lockout device(s).
- Notify affected employees that the machine/equipment is ready for use.
- Reenergize the machine or equipment

Attachment 3 is provided as a template for preparing equipment-specific Lockout/Tagout procedures.

5.2 Emergency Lock Removing Procedures

This procedure will **ONLY** be used in an emergency situation defined as:

- An event that may cause injury, fire, explosion, over exposure or other hazards to the general public, the environment or personnel.

In the event that a lock must be removed by a person other than the person who placed the LO/TO, the following lock removing procedure will be implemented by the facility manager:

- Investigate and verify that all equipment and material in relation to the work has been completed and/or put into a safe configuration.
- Ensure all personnel have been removed from the hazardous location.
- Attempt to contact the person that originally provided LO/TO to verify he or she is no longer in the hazardous location, or is aware that the LO/TO is being removed.

- Complete the Emergency LO/TO Removal Form (Attachment 4). The Emergency Lock Removal Forms will be kept at the facility for a period of one year and must be readily available.
- Whenever a LO/TO is removed for emergency purposes by anyone other than the employee who placed the LO/TO, that person and all affected personnel must be contacted prior to the start of their next shift to inform them that the equipment/system is no longer locked out/tagged out.

6.0 NON-SPECIFIC LO/TO PROCEDURES

In the absence of an equipment-specific LO/TO procedure, the following procedures, in combination with a completed Task Hazard Analysis or Work Plan, can be used as an acceptable substitute.

6.1 Process Equipment

- Determine what energy sources are present, such as electrical, gas, pressurized systems (e.g., steam, water, and hydraulics), heated fluids or gas (e.g., steam, hot water), and gravity (e.g., presses, elevated vehicles).
- Determine which of these sources requires isolation to perform the work.
- Determine the locations where each energy source for that piece of equipment can be turned off/isolated **AND** be locked out. For example, if a machine has an on/off button, pushing the button to the off position is not sufficient isolation, since the button cannot be locked out. You must then either unplug the equipment or find, close, and lock out the circuit breaker or electrical switch supplying the machine.
- Make sure anyone in the area knows you are about to turn off and lock out the equipment, and then close the isolation devices. Once closed, lock out the isolation devices so they cannot be inadvertently opened.
- Place an appropriate tag on each lock out device, with the appropriate warning (e.g., Do Not Open, Do Not Start) with date and time of isolation and a means of identifying who has performed the lockout.
- Once everything is locked out, verify that the isolation was successful by following manufacturers' directions or standard trade practice. Means of determining whether isolation was successful include:
 - Try to turn the equipment on.
 - Use pressure relief valves.
 - Try to ignite the pilot light.
- Complete the LOTO Verification Checklist (Attachment 2)
- Perform the necessary work.
- Ensure all tools and parts are removed from the work area.
- Remove the tags and locks used to isolate the various energy sources.
- Open up each isolation source. For fluid or gas systems, check for leaks at the area the work was performed as necessary.
- Inform personnel in the area that the lockout/tagout systems have been removed.

- If additional work is required (e.g., repair of leak, fine tuning of work), the lockout/tagout procedure must be re-established. Under no circumstances shall work be performed on the equipment without prior isolation of the energy sources.

6.2 Electrical Systems

In general, Earth Tech personnel will provide lockout/tagout services in low voltage situations only (voltage is below 600 volts). For high voltage situations (above 600 volts), Earth Tech will either subcontract operations to an electrical subcontractor or obtain approval of the equipment-specific Lockout/Tagout procedure from the VP-SH&E and business unit general manager. If an electrical subcontractor is utilized, they will be required to provide documentation of their high voltage certification.

6.3 General Low Voltage Procedure

- Make sure the equipment to be worked on is turned off.
- Locate the source of the electrical supply, and isolate the equipment. This can be accomplished by:
 - Turning the appropriate circuit breaker off.
 - Unplugging the equipment.
 - Disconnecting the source from the battery (e.g., pulling cables from automotive batteries).
- Lock the isolation circuit in the closed position using an appropriate locking device and a unique lock and key system.
- Tag the locked out circuit. The tag used shall warn against the hazard (e.g., Do Not Start), and include a means of identifying the employee who installed the tag and lock.
- Go back to the equipment and try to turn it on to ensure that the proper source has been isolated. If the machine turns on, reverse the above steps (b-d), and start again until the proper circuit is isolated. Report the incident to site safety coordinator as a serious near miss and do not perform the task until proper isolation is performed and verified. The site (project) manager is responsible for developing the written procedure for LOTO of this equipment prior to authorizing re-work on it.
- Complete the LOTO Verification Checklist (Attachment 2)
- Perform the required work.
- Upon completion of the work, inspect the area to ensure all tools and parts are removed. If tools or parts are noticed after the energy source is no longer locked out, steps (a-e) MUST be performed again prior to retrieval of the tools/parts. Under no circumstances shall the items be retrieved without the equipment being locked out.
- Inform anyone in the area that work has been completed and equipment is being energized.
- Remove the tag and lock.
- Turn on the closed circuit following the appropriate procedures (or reconnect the battery cables).
- Turn the equipment on to verify operation.

6.4 Pressurized Water or Air/Gas

- Turn the appropriate valve upstream from the area of work to the off position (closed). Note: if steam or water can enter the pipe from the normal downstream side, either verify that the check valve is operating properly, or ensure that all necessary valves have been closed to

stop all fluid or steam flow into the section to be worked. If this procedure is being used in preparation of Confined Space Entry, positive isolation (i.e. line break, blind plate, or double-block and bleed) must be established on both sides prior to authorizing confined space entry.

2. Using the appropriate device, lock the valve(s) in the closed position, using a unique lock and key.
3. Tag the locked-out valve(s). The tag shall warn against the hazard (Do Not Open) and include date and time of isolation and a means of identifying the employee who installed the lock and tag.
4. Allow the system to be worked to cool down (in the case of steam or hot water).
5. Relieve the pressure in the system, and then drain any fluid from the system. If the system is not equipped with a pressure relief or drain system, make sure the pipes are cool to the touch, and slowly open and drain in accordance with standard trade practice.
6. Once the system has been bled to atmospheric pressure, the pipes or lines shall be disconnected, blinded, or closed by a valve and locked out and/or tagged accordingly. Observe line entry procedures when first opening the line.
7. Complete the LOTO Verification Checklist (Attachment 2)
8. Perform the necessary work.
9. Ensure all sections are secure and closed.
10. Remove the tag and lock.
11. Slowly open the valve, stopping when water or steam flow has started. Observe the work performed to make sure no leaks are evident. If there are no leaks, then the valve can be completely opened. If leaks are observed, then re-close the valve, and follow steps 2-5 above to reapply the LO/TO to the system.

6.5 Natural Gas Lines

- Turn off the valve upstream from the area to be worked.
- Using the appropriate device, lock the valve in the closed position using a unique lock and key.
- Ensure all spark sources in the area have been isolated or removed.
- Using non-sparking tools, remove the remaining gas in the line using standard trade practice. If in an enclosed area, make sure appropriate ventilation is present. If the flow of gas does not stop, then shut down the next upstream valve, or the gas main valve. Each additional valve closed must be locked out and tagged out.
- Complete the LOTO Verification Checklist (Attachment 2)
- Perform the required work. If hot work is necessary (i.e. soldering, grinding, welding), make sure the line has been purged of gas, and that the hot work requirements of this manual are followed including explosivity check prior to authorizing work.
- Make sure that all connections are secure. Also, have a solution of soap and water for leak testing.
- Remove all tools and parts from the area.
- Remove the lock(s) and tag(s) from the valve(s).
- Slowly crack open the valve(s).
- Test the work area for leaks using the soap solution. If leaks are detected, the system must be locked out and tagged out following steps 1-4 above before additional repairs can be made.
- If no leaks are detected, gradually open the isolation valves to their normal position.

7.0 TRAINING AND REVIEW

7.1 Annual Program Review

At least annually (or whenever any incident or serious nearmiss occurs due to inadequate lockout/tagout) , an independent authorized employee who is not involved in the procedure being inspected must conduct and document a review and inspection of the Energy Control Program specific to the identified facility. The inspection should include a meeting with authorized employees and any other affected employees.

The inspection procedure must include the following elements.

- Where lockout is used, discuss the authorized employee's responsibilities under the lockout/tagout program with the inspector.
- Hold group meetings with the authorized employees who is performing the inspection and all authorized employees who implement the procedure.
- Where tagout is used, discuss the authorized employee's responsibilities under the lockout/tagout program and the limitations of the tagout system.
- Review of lockout/tagout verification checklists and other documentation to ensure procedure is being correctly followed and documented.
- If deficiencies are noted during the inspection, corrective actions and retraining of employees, as necessary, must be performed immediately.
- The inspector shall provide a copy of all inspection documentation to the applicable Earth Tech Manager for review and filing.

These inspections shall at least provide for a demonstration of the procedures and may be implemented through random audits and planned visual observations. These inspections are intended to ensure that the energy control procedures are being properly and consistently implemented.

7.2 Training

Authorized employees involved in, or affected by, lock out will be trained in the following areas before being allowed to work in the area:

- Recognition of hazardous energy sources;
- Types and magnitudes of energy sources located in the workplace;
- Procedures for energy isolation and control, including specific procedures developed for specific equipment and systems;
- Purpose and use of the energy-control (lock out/tag out) procedure, equipment, and devices;
- Prohibitions and penalties for attempting to restart or re-energize equipment which has been locked out/tagged out, or to work on equipment without following the lock out/tag out procedures.

Authorized Employees are limited to those departmental supervisors and managers, and those selected employees who have successfully completed all of the required training listed above

Affected employees will be trained in the purpose and use of the lock out/tag out procedure. All employees whose work operations may be in an area where lock out/tag out procedures may be utilized will be trained about the procedure and about the prohibition relating to attempts to restart or reenergize machines or equipment that are locked out/tagged out. These personnel are not required to be familiar with specific procedures for equipment and systems.

Retraining or refresher training for Authorized and/or Affected employees will be conducted annually or whenever one of the following exists:

- The employee has a change in job assignment;
- There has been a change in the equipment or process;
- There has been a change in the energy-control procedure;
- An inspection reveals deviations from the standard procedures or inadequacies in the employees knowledge or use of the lock out/tag out procedure;
- An incident occurs as a result of unexpected energy release.

All employee training, including annual refresher training will be documented in accordance with SHE 114 Safety Training Programs.. Employee training records will include type of training, date, and employee name. These records will be maintained for each employee for the duration of their employment.

Each facility shall maintain a current list of personnel trained in accordance with Authorized and Affected employees above. Attachment 5 is a suggested roster to be used for this purpose.

8.0 ATTACHMENTS

Attachment 1 - Lock and Tag Removal Form

Attachment 2 - LOTO Verification Checklist

Attachment 3 - Equipment-Specific LOTO Procedure Template

Attachment 4 - Emergency Lock Removal Form

Attachment 5 – Roster of Trained Authorized and Affected Employees

9.0 REFERENCES

SH&E 114 – Safety Training Program

SH&E 118 – Confined Space Entry Program

SH&E 121 – Electrical Safety Program

LOTO Verification Checklist

EQUIP ID (#) / LOTO LOCATION (S)- DEVICE TYPE & NUMBER:

 LOTO REFERENCE NUMBER:

DATE:

LOCKOUT-TAGOUT CHECKLIST	Yes	No	Initials
EMPLOYEE NOTIFICATION Have all affected employees been informed that a LOTO is necessary and the reason for the LOTO?			
ENERGY SOURCE IDENTIFICATION Has the type and magnitude of all energy sources and the respective method of control been identified?			
EQUIPMENT SHUTDOWN Has the machine/equipment been shut down by the normal stopping procedure (depressing the stop button, open switch, close valve, etc.)?			
DEACTIVATING ENERGY ISOLATING DEVICE Have all energy-isolating devices been deactivated so that the machine/equipment is isolated from all energy sources?			
LOCKOUT Has a lock been placed on all appropriate energy isolating devices with an assigned individual lock(s)?			
TAGOUT Has a tag been placed on all appropriate energy isolating devices?			
ENERGY DISSIPATION Has all stored/residual energy (such as in capacitors, springs, elevated machine members, rotating flywheels, hydraulic systems, air, gas, steam, or water pressure) been dissipated/restrained by methods such as grounding, repositioning, blocking, bleeding down, etc?			
ZERO ENERGY STATE VERIFICATION Has verification been made that the equipment is disconnected from all energy sources by first checking that no personnel are exposed, then verifying the isolation of the equipment by operating the push button or other normal operating controls?			
IF SO, THE EQUIPMENT IS NOW LOCKED OUT			
RESTORING EQUIPMENT TO SERVICE	DATE:		
JOB COMPLETION VERIFICATION Has the machine/equipment and immediate area been checked to make sure that nonessential items have been removed and the machine/equipment components are operationally intact?			
PERSONNEL VERIFICATION Have all personnel been safely positioned or removed from the area and all controls are in neutral?			
LOCKOUT REMOVAL AND EQUIPMENT STARTUP Has all lockout and tagout devices been removed and the machine reenergized?			
EMPLOYEE NOTIFICATION Have all affected been notified that the LOTO is complete and that the machine/equipment is ready for use?			

NOTES:

Equipment-Specific LOTO Procedure

PROCEDURE REFERENCE NUMBER:

EQUIPMENT:													
EQUIPMENT NO:	LOCATION:												
<p>PURPOSE</p> <p>This 7-step procedure establishes the minimum requirements for the lockout of energy isolating devices whenever servicing or maintenance is done on facility equipment. This procedure will be used to ensure that the equipment is stopped, isolated from all potentially hazardous energy sources and locked out before employees perform any maintenance where the unexpected energization or startup of the equipment or release of energy could cause injury.</p>													
<p>COMPLIANCE WITH THIS PROCEDURE</p> <p>All employees are required to comply with the restrictions and limitations imposed on them during the use of this procedure. The authorized employees are required to perform the lockout in accordance with this procedure. Other employees, upon observing a piece of equipment which is locked and/or tagged out, will not attempt to start, energize, or use said equipment.</p>													
<p>SEQUENCE OF LOCKOUT/TAGOUT</p> <p>1. All affected employees will be notified that the equipment must be shut down and locked out to perform servicing or maintenance.</p> <p style="margin-left: 20px;">Specific Instructions:</p> <p>2. The authorized employee will identify the type and magnitude of the energy that the equipment utilizes, will understand the hazards of the energy, and will know the methods to control the energy.</p>													
<p>ENERGY</p> <table style="width: 100%; border: none;"> <tr> <td style="width: 33%;"><input type="checkbox"/> Electrical (440V)</td> <td style="width: 33%;"><input type="checkbox"/> Natural Gas</td> <td style="width: 33%;"><input type="checkbox"/> Spring</td> </tr> <tr> <td><input type="checkbox"/> Hydraulic</td> <td><input type="checkbox"/> Gravity</td> <td><input type="checkbox"/> Steam</td> </tr> <tr> <td><input type="checkbox"/> Chemical</td> <td><input type="checkbox"/> Pneumatic</td> <td><input type="checkbox"/> Thermal</td> </tr> <tr> <td><input type="checkbox"/> Other:</td> <td></td> <td></td> </tr> </table>		<input type="checkbox"/> Electrical (440V)	<input type="checkbox"/> Natural Gas	<input type="checkbox"/> Spring	<input type="checkbox"/> Hydraulic	<input type="checkbox"/> Gravity	<input type="checkbox"/> Steam	<input type="checkbox"/> Chemical	<input type="checkbox"/> Pneumatic	<input type="checkbox"/> Thermal	<input type="checkbox"/> Other:		
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<input type="checkbox"/> Chemical	<input type="checkbox"/> Pneumatic	<input type="checkbox"/> Thermal											
<input type="checkbox"/> Other:													

Equipment-Specific LOTO Procedure

<p>3. Shut down operating equipment by the normal stopping procedures (depress stop button, open switch, close valve, etc.).</p> <p>Specific Instructions:</p>
<p>4. De-activate the energy isolating device(s) so that the equipment is isolated from the energy sources(s).</p> <p>Specific Instructions:</p>
<p>5. Lockout and tagout the energy isolating devices(s) with assigned individual locks and tags.</p> <p>Lockout Equipment Needed:</p>
<p>6. Dissipate any stored or residual energy (such as that in capacitors, springs, hydraulic systems, and air, steam, or water pressure, etc.) by methods such as grounding, repositioning, blocking, bleeding down, etc.</p> <p>Specific Instructions:</p>
<p>7. Ensure that the equipment is disconnected from the energy source(s) by first checking that no personnel are exposed, then verify the isolation of the equipment by operating the normal operating control(s) or by testing to make certain the equipment will not operate. <i>CAUTION: Return controls to "OFF" after verification. THE EQUIPMENT SHOULD NOW BE LOCKED OUT AT ZERO ENERGY STATE.</i></p> <p>Specific Instructions:</p>
<p>METHODS OF VERIFICATION</p>
<p>Verification should be determined via start-up attempts, visual observations and testing. For electrical verification, place local on/off switch to ON position and verify equipment will not operate. Return the switch to OFF position and commence work.</p>


Emergency Lock Removal Form

This form will only be used in an emergency situation. For this Form, an emergency is defined as: an event that may cause injury, fire, explosion, over exposure or other hazards to the general public, the environment or personnel.

1. NAME of personnel who's LO/TO is to be removed:			
2. METHOD(s) used to contact personnel who's LO/TO is to be removed:			
3. LOCATION of LO/TO:			
4. REQUIRED CONTACTS: Contact the following Earth Tech personnel to locate affected contractor personnel:			
Contact Name 1:			
Office Phone #	Home Phone #	Pager #	Cell #
Contact Name 2:			
Office Phone #	Home Phone #	Pager #	Cell #
Contact Name 3:			
Office Phone #	Home Phone #	Pager #	Cell #
Contact Name 4:			
Office Phone #	Home Phone #	Pager #	Cell #
5. NOTIFICATION:			
An Earth Tech representative has been contacted..... <input type="checkbox"/> Yes <input type="checkbox"/> No			
Notification Verified By: _____ (Initial) OR, the special conditions for not contacting Earth Tech are as follows: _____ _____			
6. WALK DOWN:			
A walk-down of the equipment / system has been performed to ensure all personnel are removed from hazardous locations. <input type="checkbox"/> Yes <input type="checkbox"/> No			
Notification Verified By: _____ (Initial)			

	Print Name	Signature	Date
Project Manager			
SH&E Representative			

AFTER COMPLETION OF THESE STEPS, THE LOCK AND TAG MAY BE REMOVED
 This form must be provided to the Earth Tech Project Management Team (PM and SSO) so the effected employee can be notified that his/her Look-Out /Tag-Out has been removed

	PROCEDURE NO. <u>SH&E 120</u>
	DATE <u>March 25, 2005</u>
Safety, Health & Environmental Procedure	REVISED <u>August 15, 2008</u>
Fall Protection Program	PREVIOUSLY <u>CP 410</u>

This procedure applies to all U.S.-based personnel, projects, offices, business units and activities. Any exceptions to this procedure must be approved, in writing, by the responsible District/Business Unit Manager and Safety Manager.

1.0 PURPOSE

This program sets forth the minimum requirements for continuous safety of personnel through the means of fall hazard elimination, fall prevention, and fall protection whenever working above ground level or above a recognized hazard.

2.0 SCOPE

This procedure applies, in its entirety, to all Earth Tech projects unless a variance from its requirements is granted by the SH&E Department. **Subcontractors working at Earth Tech projects will follow the appropriate OSHA, state, and/or local regulatory requirements.**

3.0 DEFINITIONS

Controlled Access Zone (CAZ): An area in which certain work (e.g., overhand brick laying) may take place without the use of guardrail systems, personal fall-arrest systems, or safety net systems; and access to the zone is controlled.

NOTE: Inspection activities conducted within the CAZ, directed at observation of overhand bricklaying, or other leading edge work conducted under a fall protection plan, is not included under the exemption for work in a CAZ; i.e., inspectors or engineers within a permitted CAZ must be protected from falling by a personal fall protection system.

Dangerous Equipment: Equipment (such as pickling or galvanizing tanks, degreasing units, machinery, electrical equipment, and other types) which, as a result of form or function, may be hazardous to employees who fall onto or into such equipment.

Fall Hazard Elimination Planning of work tasks and site layout leading to alternative approaches in which a fall hazard does not exist. Examples include location changes of equipment or procedural changes which do not require exposure to elevated work areas.

Fall Prevention Any means used to prevent a fall to a different level. Examples include use of guardrails, barriers, or physical travel restriction systems to prevent the worker from direct and unprotected exposure to a fall hazard.

Fall Protection The use of personal fall protection equipment designed to control the free fall hazard from the elevated work area. Personal fall protection equipment shall consist of an approved full body harness and lanyard with a locking type snap hook and an energy absorber or a vertical fall arrest system which meets the requirements of 29 CFR 1926.502(d). Fall protection also necessitates proper work place and work process assessment including all anchorage considerations.

Full-Body Harness: Straps secured about the employee in a manner that will distribute the fall-arrest forces over the thighs, pelvis, waist, chest and shoulders with means for attaching it to other components of a personal fall-arrest system.

Guardrail System: A barrier erected to prevent employees from falling to lower levels.

Low Pitched Roof A roof having a slope ratio less than or equal to 4 feet vertical rise for every 12 feet horizontal (15°).

Parapet: A low wall projecting from the edge of a platform, terrace, or roof.

Personal Fall Protection System: A system used to arrest an employee in a fall from a working level. It consists of an anchorage, connectors, a full-body harness and may include a lanyard, deceleration device, lifeline, or suitable combinations of these.

Qualified Person: One who is capable of identifying existing and predictable fall-related hazards in their surroundings or working conditions, and who has authorization to take prompt corrective measure to eliminate them.

Walking/Working Surface: 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 positioned to perform their job duties.

4.0 PROCEDURE

The requirements of this procedure shall be implemented whenever Earth Tech personnel are exposed to work conditions where in-use walking/working surfaces are located 4 or more feet above the immediate lower level.

4.1 Responsibilities

4.1.1 Project/Facility Managers

Each project manager/facility manager shall be responsible for ensuring the following items are completed:

- Each worksite is surveyed and all activities are reviewed to identify the hazards of personnel falling from elevations.
- Methods to address fall hazards are considered in the following order prior to beginning work and the hazards and control measures are addressed in a site specific health and safety plan:
 - Eliminate the need for elevated work.
 - Provide fall prevention to minimize the risk of a fall.
 - Provide fall protection to manage the risk of a fall.
- Audits of the worksite are performed to ensure compliance with this program.
- Appropriate inspections are performed on fall prevention equipment and fall protection systems.
- All fall protection equipment users have the knowledge and skills to properly use the equipment and understand this program.
- A competent person designs fall protection anchorage points and systems on all new and revised construction projects.

- Contractors are notified of the fall protection requirements during any pre bid conference and in the construction specifications of any project.

4.1.2 All Personnel

Individual employees shall assure that they:

- Never perform work in area where they are exposed to fall of 4 feet or greater without implementation of fall prevention/fall protection system.
- Know and understand the proper use and limitations of the fall protection equipment so as not to exceed those limitations.
- Inspect the fall protection equipment prior to each use and tag and destroy worn, frayed, or damaged equipment. All equipment subjected to an actual fall, or similar stress, shall be tagged as "out of service" until a final investigation is completed.

4.2 General Requirements

Each worksite and all activities shall be evaluated prior to the start of the job to identify the hazards of falling from any elevation. The result of this evaluation shall be described in either a site specific health and safety plan or site-specific fall protection program. Site specific fall protection programs shall identify the areas/activities requiring fall protection, the manner in which fall protection will be accomplished, a listing of qualified individuals for fall protection and a roster of personnel authorized to utilize specific fall protection equipment. As part of this evaluation, all applicable requirements of 29 CFR 1926 Subpart M shall be addressed.

- All Earth Tech employees and contracted employees on walking/working surfaces 4 feet or more above the immediate lower level shall be protected from falling by a guardrail system, safety net system, or personal fall-arrest system 100% of the time.
- All elevated work, regardless of the height, shall incorporate job planning to anticipate and mitigate the consequences of a fall. Job planning should include rescue after a fall.
- First consideration shall be given to the elimination of fall hazards. If a fall hazard cannot be practically eliminated, second consideration shall be implementing effective permanent or temporary means of fall prevention.
- Before using any equipment, pipelines, or trusses for elevated work, it must be determined by the project manager if they are suitable for climbing or walking. Not all pipelines, trusses, and hanger systems are designed to support individuals doing elevated work. For example, walking on pipelines may cause flanges to leak, damage insulation, damage tracing or deform piping.
- Weather must be a safety consideration whenever outdoor elevated work is to be done. The weather hazard must be addressed prior to and during the work.
- When fall protection is required, a personal fall arrest system must be utilized that complies with 29 CFR 1926.502(d) (full body harness with a fall arrest system).

The following are specific situations/work areas that require fall protection:

1. **Aerial life devices:** Personnel operating or working from an aerial lift platform shall wear fall protection equipment with the lanyard attached to a designated anchor point. When exiting or entering an aerial lift device at elevated heights, the use of continuous fall protection is required.
2. **Elevated work stations:** Working from elevated work stations of 4 feet or greater and not protected by fall prevention shall utilize fall protection.
3. **Scaffold erection/disassembly:** Personnel engaged in scaffold erection or disassembly shall use fall protection. These options include, but are not limited to, vertical and self retracting

lanyard lifeline attachments to associated structures and horizontal lifeline attachments when guardrails are not installed. Scaffolds shall be adequately secured if they are used as an anchorage point. Braces and/or couplers of scaffolds shall not be used as anchorage points.

4. **Ladders:**

- **Portable:** When working from a portable ladder and the work requires the use of both hands, fall protection shall be used whenever working at 6 feet or above, as measured from the ladder base to the bottom of the employee's feet unless a Safe Operating Procedure for the job is approved by the Project Manager.
- **Fixed:** Any fixed ladder 20 feet in height or greater must be equipped with a cage or fall arrest device. For fixed ladders less than 20 feet in height, ladder climbing devices shall be utilized whenever available, and are the preferred method of ladder travel. Personnel are allowed to climb or descend a fixed ladder less than 20 feet in height without fall protection or a cage only where if both hands are free for climbing.

5. **Crane suspended platforms:** Personnel working from or riding in any crane-suspended platform shall wear fall protection with a lanyard attached to the boom or basket. Work platforms shall not be used in winds in excess of 15 miles per hour or during electrical, snow, ice, and/or sleet storms, or other adverse weather conditions which could affect the safety of personnel.

6. **Designed access ways:** Personnel using designed access ways (cab accesses, crane accesses, trucks, railcars, etc.) may climb or descend the access way using a minimum of three points of contact (hands and feet).

7. **Working on a flat roof or low-pitched roof (> 15 degrees):** Personnel working within 6 feet of any unprotected roof edge or opening (i.e. not protected by a guardrail, or a parapet of at least 39 inches in height) are required to use fall protection. When working more than 6 feet from an unprotected roof edge/opening a warning line system shall be erected that is not less than 6 feet from the edge, unless some other means of fall prevention is in use. A safety observer is not an acceptable fall prevention system.

8. **Working on a sloped roof:** Personnel working on any sloped roof, other than low pitched roofs (>15 degrees slope) shall use fall protection at all times.

9. **Trucks, railcars, and large equipment:** Personnel working on top of trucks, railcars, and large equipment shall use fall prevention or protection systems.

10. **Pole access:** Pole climbing is the least preferred method of pole access. Alternatives include bucket trucks, pole sharks, etc. All pole climbing requires a Safe Operating Procedure approved by the project manager. Lineman belts are acceptable climbing devices for first up or last down when used by qualified personnel for access only. Approved fall protection equipment shall be used once the work station has been attained and by all subsequent climbers.

Use of body belts (safety belts) as part of personal fall-arrest systems is prohibited.

The area(s) onto which objects could fall shall be barricaded. Employees shall be prohibited from entering the barricaded area. Potential falling objects located on higher levels shall be kept far enough from the edge so that they would not go over the edge if they were accidentally displaced.

Inspection and test records for fall protection equipment shall be maintained in the project records at the site for at least 12 months.

4.3 Guardrail Systems

- When guardrail systems are used, they shall meet the requirements given in 29 CFR 1926.502(b).
- The top edge of the guard rail shall be from 39 inches to 45 inches above the walking/working surface. When employees are using stilts, the minimum height of the top rail shall be increased by the height of the stilts.

- Midrails, screen, or mesh shall be installed unless there is a wall or parapet wall at least 21 inches high outside of the guardrail.
- Guardrails shall be constructed to withstand a lateral or downward vertical force of 200 pounds without failure. Midrails, screen, mesh, or equivalent shall be constructed to withstand a lateral or downward vertical force of 150 pounds without failure. Guardrails constructed in accord with Appendix B to Subpart M of 29 CFR 1926, shall be considered adequate.
- Guardrail components shall be smooth and free of projections.
- Top rails and midrails shall be at least 1/4 inch in diameter or thickness. When wire rope is used for top rails, it shall be flagged with high visibility material at not more than 6-foot intervals.

4.4 Safety Net Systems

- When safety nets are used, they shall be installed as close as possible under the walking/working surface, but never more than 30 feet below the surface. The fall area between the working level to the net shall not be unobstructed.
- The perimeter of the net shall extend beyond the edge of the walking/working surface as follows:

Vertical distance from working level to horizontal plane of net	Minimum required horizontal distance of outer edge of net from the edge of the working surface
Up to 5 feet	8 feet
More than 5 feet up to 10 feet	10 feet
More than 10 feet	13 feet

- Nets shall be suspended above objects below the net so that the net does not contact lower objects when subjected to the drop test described in (4) below.
- Safety nets and all supporting components shall be subjected to a drop test after the initial installation of the net and before being placed into service, after being relocated, after major repair, and every 6 months if left in place for that period. The drop test shall be conducted using a 400-pound bag of sand, 30 ± 2 inches in diameter. The sand bag shall be dropped into the net from the highest point employees will occupy on the working level, but not less than 42 inches above the net.
- Instead of the drop test Earth Tech or the contractor, may certify that the safety net installation is in compliance with the requirements above. If certification is to be made, the certification shall be made in compliance with 29 CFR 1926.502(c)(4)(ii).
- Defective nets shall not be used. Safety nets and components shall be inspected at least weekly for wear, damage, and deterioration. Safety nets shall also be inspected following any fall into the net, and after any other incident that could affect the integrity of the net system. Any defective components discovered shall be replaced and removed from service.
- Materials, tools, scrap, etc., which have fallen into the net shall be removed as soon as possible, and at least before the next work shift.
- The maximum size of any opening in the net, and between net panels, shall be 6 inches. Mesh crossings shall be secured to prevent enlargement of the mesh openings.
- Each net and net section shall have a border rope for webbing. The minimum breaking strength of the border rope shall be 5,000 pounds.

4.5 Personal Fall Protection Systems

- Connectors shall be drop-forged, pressed or formed steel, or made of equivalent materials. Connectors shall have a corrosion-resistant finish, and all surfaces and edges shall be smooth to prevent damage to interfacing parts of the system.
- D-rings and snaphooks shall have a minimum tensile strength of 5,000 pounds. D-rings and snaphooks shall be proof-tested to a minimum tensile load of 3,600 pounds without cracking, breaking, or taking permanent damage.
- Snaphooks shall be the locking type, and designed and used to prevent disengagement of the keeper by the connected components.
- On platforms such as suspended scaffolds with horizontal lifelines, devices used to connect to the lifeline shall be capable of locking in both directions on the lifeline.
- Lifelines shall be protected against being cut or abraded. Horizontal lifelines shall be part of a complete system designed, installed, and used under the supervision of a qualified person.
- The system shall have a safety factor of at least two. Lanyards and vertical lifelines shall have a minimum breaking strength of 5,000 pounds.
- When vertical lifelines are used, each employee shall be attached to separate lifelines. For construction of elevator shafts, see 29 CFR 1926.502(d)(10)(ii).
- Lifelines and lanyards that limit free fall distance to 2 feet or less shall be capable of sustaining a minimum tensile load of 3,000 pounds applied with the lifeline or lanyard in the fully extended position. Lifelines and lanyards that do not limit free fall distance to 2 feet or less, ripstitch lanyards, and tearing and deforming lanyards shall be capable of sustaining a minimum tensile load of 5,000 pounds applied with the lifeline or lanyard in the fully extended position.
- Ropes and straps used in lanyards, lifelines, and strength components of body harnesses and belts must be made from synthetic fibers.
- Anchorages used for attachment of personal protective 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.
- Personal fall protection systems shall limit the maximum arresting force on an employee to 1,800 pounds when using a body harness; limit free fall distance to 6 feet (4 feet in California) (where this maximum distance will not cause the employee to contact any lower level); limit deceleration distance to 3.5 feet; and be able to withstand twice the potential impact energy of an employee falling 6 feet or the maximum free fall distance permitted by the system.
- Body harnesses and components shall not be used to hoist material or equipment.
- Personal fall protection systems subject to impact loading shall be immediately tagged and removed from service, and inspected by a competent person prior to reuse.
- Equipment and procedures to ensure a prompt rescue in the event of a fall shall be in place at work sites where elevated work locations exist.
- Personal fall-arrest systems shall be visually inspected prior to each use for wear, damage, and other deterioration; defective components shall be tagged and removed from service. A checklist provided by the manufacturer should be used to document these inspections. If one is not available, Attachment 2 provides a generic checklist.
- Weekly inspections of each personal fall-arrest system will be performed and documented by each organization located at Earth Tech-controlled project sites. The Harness/Lanyard Weekly Inspection Checklist (attached) or equivalent, as reviewed and accepted by Earth Tech will be used.
- Personal fall-arrest systems shall not be attached to guardrail systems.

4.6 Positioning Device Systems

- Positioning devices shall be rigged so that an employee cannot free fall more than 2 feet.
- Positioning devices shall be secured to an anchorage capable of supporting at least twice the potential impact load of an employee's fall, or 3,000 pounds, whichever is greater.
- Positioning device systems shall be inspected prior to each use for wear, damage, and other deterioration; defective components shall be removed from service.
- Body harnesses and components shall not be used to hoist material or equipment.

4.7 Warning Line Systems

- The warning line shall be erected around all sides of the roof work area.
- When mechanical equipment is being used, the warning line shall be erected not less than 6 feet from the roof edge parallel to the direction of mechanical equipment operation, and not less than 10 feet from the roof edge which is perpendicular to the direction of mechanical equipment operation.
- Points of access, material handling areas, storage areas, and hoisting areas shall be connected to the work area by an access path formed by two warning lines.
- When the path to a point of access is not in use, a rope, wire, chain, or other barricade, equivalent in strength and height to the warning line, shall be placed across the path at the point where the path intersects the warning line.
- Warning lines shall consist of ropes, wires, or chains, and supporting stanchions. The rope, wire, or chain shall have a minimum tensile strength of at least 500 pounds.
- The rope, wire, or chain shall be flagged at no more than 6-foot intervals with high visibility materials. The line shall be attached to stanchions so that pulling on the line between stanchions will not result in slack being taken up in adjacent sections.
- The lowest point (including sag) of the rigged warning line shall not be less than 34 inches, and the highest point not more than 39 inches, above the walking/working surface.
- Employees shall not be permitted in the area between a roof edge and warning line unless the employee is performing roofing work in that area.
- Mechanical equipment used on roofs shall be used or stored only in areas where employees are protected by a warning line system, guardrail system, or personal fall arrest system.

4.8 Controlled Access Zones (CAZ)

- When used to control access to leading edge work, the CAZ shall be defined by a control line, or other means.
- Control lines shall be erected not less than 6 feet nor more than 25 feet from the unprotected or leading edge, except when erecting precast concrete members. In this case, the control line shall be not more than 60 feet from the edge, or half the length of the member being erected, whichever is less.
- The control line shall extend along the entire length of the unprotected or leading edge, and shall be approximately parallel to the edge. The control line shall be connected on each side to a guardrail system or wall.
- The control line shall be flagged at no more than 6-foot intervals with high visibility materials.
- The line shall have a minimum breaking strength of 200 pounds.

4.9 Safety Monitoring Systems

- On leading edge operations, precast concrete erection work, or residential construction work, safety monitoring systems are permitted only for roofing operations on flat/low-slope roofs, and only where it is not feasible or would create a greater hazard to use a conventional fall protection system. Except for roofing work on flat or low-slope roofs, employees protected by a safety monitoring system shall also be covered by a fall protection plan (see Section 4.11 below).
- When safety monitoring systems are used, a competent person shall be designated to monitor the safety of other employees, and the monitor shall observe the following requirements:
 - The safety monitor shall be competent to recognize fall hazards.
 - The safety monitor shall warn employees when the employees are unaware of fall hazards, or when employees are acting in an unsafe manner.
 - The safety monitor shall be on the same walking/working surface and within sight of the employees being monitored.
 - The safety monitor shall be close enough to orally communicate with the employees being monitored.
 - The safety monitor shall not have other duties that interfere with the monitoring function.
- Mechanical equipment shall not be used or stored in areas where safety monitoring systems are being used on low-slope roofs.
- Employees not covered by a fall protection plan, or not performing roofing work on low-slope roofs, shall not be permitted in areas where employees are protected by a safety monitoring system.
- Employees protected by a safety monitoring system must promptly obey directions from the safety monitor.

4.10 Floor, Roof, and Other Walking/Working Surfaces

- Covers in roadways, and vehicular aisles shall be capable of supporting at least twice the maximum axle load of the largest vehicle expected to cross over the cover.
- All other covers shall be capable of supporting at least twice the weight of employees, equipment, and materials that may be imposed on the cover at any one time.
- All covers shall be secured when installed so as to prevent accidental displacement by the wind, equipment, or employees.
- All covers shall be color-coded, or marked with the word "Hole" or "Cover" to provide warning of the hazard. (This does not apply to cast manhole covers or steel grates used on streets or roadways.)

4.11 Protection From Falling Objects

- Toeboards used as falling object protection shall be erected along the edge of the overhead working level for a distance sufficient to protect employees below. Toeboards shall be capable of withstanding a 50-pound force outward or downward at any point on the toeboard.
- Toeboards shall be at least 3½ inches in height, and the gap between the working surface and bottom of the toeboard shall not be greater than ¼ inch. Toeboards shall be solid, or have openings less than 1 inch in greatest dimension. Where tools, material, or equipment exceed the height of the toeboard, paneling or screening shall be added to protect employees below.
- Guardrail systems used as falling object protection shall have openings small enough to prevent passage of potential falling objects.

- Falling object protection during overhand bricklaying work shall comply with 29 CFR 1926.502(j)(6).
- Canopies when used as falling object protection shall be strong enough to prevent collapse, and to prevent penetration by any objects which may fall onto the canopy.

4.12 Fall Protection Plan

- Fall protection plans shall be used only when it is not feasible to use conventional fall protection equipment, or when its use would create a greater hazard, and only for leading edge work, precast concrete erection work, or residential construction work.
- The plan shall be prepared by a qualified person, must be site-specific, and must be kept up to date. All changes to the plan must be approved by a qualified person. A current, approved copy of the plan shall be maintained at the site.
- A competent person shall supervise implementation of the plan. The plan shall include the reasons why conventional fall protection systems are not feasible, or would increase hazards to employees.
- The plan shall identify alternative measures taken to reduce fall hazards that cannot be handled with conventional fall protection (e.g., use of scaffolds, ladders, elevating work platforms, etc.).
- The plan shall identify each area where conventional fall protection methods cannot be used.
- These areas shall be classified as controlled access zones. A safety monitoring system shall be implemented for the controlled access zones.
- The plan must identify by name or other unique identifier all employees authorized to enter the controlled access zone. All other employees shall be prohibited from entering.
- All falls and near misses shall be investigated to evaluate the effectiveness of the plan.
- Deficiencies identified in the plan shall be corrected.

4.13 Employee Training

- All employees exposed to fall hazards shall be trained to recognize fall hazards, and on ways to minimize the hazards.
- Each employee shall be trained by a competent person qualified in the following areas:
 - The nature of fall hazards in the work area.
 - The correct procedures for installing, inspecting, and disassembling fall protection systems.
 - The use and operation of fall protection systems to be used.
 - Each employee's role in the safety monitoring system, if this system is used.
 - The limitations on the use of mechanical equipment on low-slope roofing jobs.
 - The correct procedures for the handling and storage of equipment and materials, and installation of overhead protection.
 - Each employee's role in the fall protection plan, if this option is used.
 - The OSHA fall protection standards.
- The employee training described above shall be certified in writing and include the name of the employee, the date of the training, and the signature of the employee and training instructor.
- Employees suspected of not having the understanding or skills required shall be retrained. Other circumstances that require retraining include: changes in the workplace that make earlier training obsolete; changes in the types of fall protection systems used; and observed inadequacies in an employee's use or understanding of fall protection systems.

- Employee training certifications shall be maintained at the site. Copies of certifications for ET employees shall be forwarded to their Environmental, Safety and Health Administrator (EHSA), for entry into the eTracking database.

5.0 ATTACHMENTS

Attachment 1 - Monthly Harness/Lanyard Inspection Checklist

Attachment 2 - Fall Protection System Safety Checklist

6.0 REFERENCES

SH&E 105 - Procedure Variance

SH&E 113 – Personal Protective Equipment

Monthly Harness/Lanyard Inspection Checklist

INSTRUCTIONS:

1. A qualified person as identified by the subcontractor must perform inspection of safety harnesses and lanyards.
2. All safety harnesses and lanyards used at Earth Tech-controlled project sites are required to be physically inspected prior to initial use.
3. Prior to initial use and monthly documentation of harness and lanyard inspections will be performed using this checklist.
4. Visual inspection of assigned harnesses and lanyards are to be performed prior to each use
5. Any harness or lanyard not meeting the criteria below is to be tagged and removed from service.

Attach additional checklists as necessary.

Safety Harness Manufacturer and Serial No. [Indicate type: Harness(H) – Lanyard (L)]		Safety Harness Manufacturer and Serial No. [Indicate type: Harness(H) – Lanyard (L)]	
1.	Pass <input type="checkbox"/> Yes <input type="checkbox"/> No	6.	Pass <input type="checkbox"/> Yes <input type="checkbox"/> No
2.	Pass <input type="checkbox"/> Yes <input type="checkbox"/> No	7.	Pass <input type="checkbox"/> Yes <input type="checkbox"/> No
3.	Pass <input type="checkbox"/> Yes <input type="checkbox"/> No	8.	Pass <input type="checkbox"/> Yes <input type="checkbox"/> No
4.	Pass <input type="checkbox"/> Yes <input type="checkbox"/> No	9.	Pass <input type="checkbox"/> Yes <input type="checkbox"/> No
5.	Pass <input type="checkbox"/> Yes <input type="checkbox"/> No	10.	Pass <input type="checkbox"/> Yes <input type="checkbox"/> No

Webbing

1. Surface of webbing inspected for damage (hold webbing in an inverted U, inspecting webbing at 6-inch intervals)? yes no n/a
2. Frayed edges, broken fibers, pulled stitches, cuts or chemical damage observed? yes no n/a
3. Tufts of worn webbing observed on surface of harness or lanyard? yes no n/a
4. Harness or lanyard condition evaluated according to manufacturer's requirements? yes no n/a

Snaps and "D" Rings

1. Surfaces inspected for cracks and other defects? yes no n/a
2. Ring is not at a 90 degree angle and does not move independent of the body pad or saddle? yes no n/a
3. Tool loops and belt sewing inspected for broken or stretched loops? yes no n/a
4. Loop rivets inspected for thread separation or rotting on both sides of body pad belt? yes no n/a
5. Snaps inspected for hook and eye distortions, cracks, corrosion, or pitted surfaces? yes no n/a
6. Latch seated in snap nose properly and does not bind? yes no n/a

Buckles

1. Grommets inspected and found to be unbroken, snug-fitting and free of distortions yes no n/a
2. No additional holes punched or cut to accommodate inadequate fit? yes no n/a
3. Buckle inspected for distortions or sharp edges? yes no n/a
4. Equipment not equipped with grommets inspected for torn or elongated holes? yes no n/a
5. Outer and center bars of buckles are straight? yes no n/a
6. Equipped rollers turn freely on the frame of the buckle? yes no n/a
7. Rivets are tight and do not move, are not bent and are flat against the material? yes no n/a
8. Rivets do not show signs of pitting, cracking or chemical erosion? yes no n/a

Rope and Straps

1. Rope inspected from end-to-end for fuzzy, worn, broken, or cut fibers? yes no n/a
2. Rope diameter uniform throughout entire length? yes no n/a
3. Straps inspected for cut fibers or damaged stitches(hold strap in an inverted U, inspecting at 1-inch intervals)? yes no n/a
4. Friction buckle inspected for slippage, sharp edges, or excessive wear? yes no n/a

Project Information

Project Name:	
Project/Contract Number:	ET Project Manager:
ET Site Safety Coordinator:	Subcontractor's Qualified Person:

Completed By:

_____	_____	_____	_____
Print Name	Signature	Title (PM, SSO, Etc.)	Date

Fall Protection System Safety Checklist

Inspection

Inspect all equipment visually before each use and periodically thereafter. The frequency of subsequent checks should be contingent upon the conditions where used. If defective conditions are found as described below, remove the item from service immediately, and get it properly repaired or destroyed. If conditions are found that are not included below, remove the item from service and contact safety engineer, distributor, or manufacturer for advice.

Webbing - Beginning at one end, bend a portion of the harness (6 to 8 inches) into a U-shape between your hands to reveal worn, cut, frayed, burnt, or damaged fibers. Check both sides of the harness and all straps along the entire length.

Buckle and D-ring attachment - Carefully check the buckles and D-rings attached to the webbing for excessive wear, cut, or torn fibers.

D-rings - Check for rough or sharp edges, corrosion, burrs, cracks, dents, or distortion.

Tongue buckle - Check for rough or sharp edges, corrosion, burrs, cracks, dents, or distortion. Buckle tongues should be free of distortion, move easily back and forth, and overlap the buckle frame. The frame roller should rotate freely.

Friction buckle - Check for rough or sharp edges, corrosion, burrs, cracks, dents, or distortion. All portions of the buckle should be straight.

Sliding bar buckle - Check for rough or sharp edges, corrosion, burrs, cracks, dents, or distortion. Sliding bar should move freely within the frame; ridges should be complete and not smooth. Carefully check the ends of the bar for distortion.

Grommets - Check for rough or sharp edges, corrosion, burrs, cracks, dents, or distortion. Grommets must be tight.

Labels - The manufacturer's labels should be on each piece of equipment and easily read. If missing, remove from service and contact purchasing, or distribution.

Rope - Rope lanyards should be inspected by bending the rope into a U-shape between the hands and untwisting the rope slightly to check the inside fibers as well. This helps to reveal frayed, worn, cut, broken, burnt, or damaged fibers. Check all sides of each strand along the entire length of the lanyard.

Locking-type snap hooks - All snap hooks must operate smoothly, and open and close completely. Check snap hook body for sharp edges, burrs, distortion, cracks, corroded, or pitted surfaces. Rivets should be checked for cracks, broken, or bent conditions. Gate and double-locking gate keepers should be free from distortion, bending, and seat properly against the snap hook nose and body. The gate keeper spring should be sufficient to completely and firmly close the snap hooks should freely rotate into the locked position when released.

Lanyard - If any part of the danger label is showing or if there is any broken stitching, remove from service.

Anchorage points inspection - Check all identified anchorage points for corrosion and adherence to minimum sizes and conditions.

Maintenance and Cleaning


Cleaning - Nylon or polyester; if lanyards or harnesses need to be cleaned, they may be wiped down with a wet sponge, then washed with a soapy sponge using a brisk back-and-forth motion. Rinse completely with clear water and hang up to air dry away from exposure to high heat, steam, or long durations of sunlight.

Storage - Lanyards or harnesses should be hung up or placed loosely (in a container) in a clean, dry area free from exposure to harmful fumes or corrosive agents.

Inspected by: _____

_____ Date

This checklist is recommended as documentation for the annual inspection. It should be retained until it can be replaced by documentation of the next annual inspection.

	PROCEDURE NO. <u>SH&E 124</u>
	DATE <u>March 25, 2005</u>
Safety, Health & Environmental Procedure	REVISED <u>August 15, 2008</u>
	PREVIOUSLY <u>ESH 506</u>
Heat Stress Prevention Program	

This procedure applies to all U.S.-based personnel, projects, offices, business units and activities. Any exceptions to this procedure must be approved, in writing, by the responsible District/Business Unit Manager and Safety Manager.

1.0 PURPOSE

Field supervisors are responsible for protecting their workers from heat stress conditions by incorporating protective measures into the work routine. The heat stress prevention procedures below will be implemented whenever the temperature exceeds 75 degrees Fahrenheit for workers in normal work clothing, or 65 degrees Fahrenheit for workers in chemically protective clothing.

2.0 SCOPE

This procedure applies to all Earth Tech projects and operations where personnel work in environments that may cause heat stress.

3.0 DEFINITIONS

Acclimated: Workers who have developed physiological adaptation to hot environments characterized by increased sweating efficiency, circulation stability, and tolerance of high temperatures without stress. Acclimatization occurs after 7 to 10 consecutive days of exposure to heat and much of its benefit may be lost if exposure to hot environments is discontinued for a week.

Chemical Protective Clothing (CPC): Apparel that is constructed of relatively impermeable materials intended to act as a barrier to physical contact of the worker with potentially hazardous materials in the workplace. Such materials include: Tyvek coveralls (all types) and polyvinyl chloride (PVC) coveralls and rain suits.

Un-acclimated: Workers who have not been exposed to hot work conditions for one week or more, or who have become heat-intolerant due to illness or other reasons.

Heat Stress: A common hazard to employees working on projects involving exposure to hazardous substances, most particularly when impermeable protective clothing is used. This problem can occur at ambient temperatures below what is normally considered "hot weather." The body normally sheds excess heat primarily through radiation (capillaries in the skin dilate, transferring heat from the body core to the surface), and evaporation of sweat. Heat stress results when the body's regulating mechanisms are inadequate to dispose of internally generated and externally supplied heat.

4.0 PROCEDURES

4.1 General Requirements

Heat stress can be a significant field site hazard, especially for workers wearing chemically protective clothing (CPC). Site personnel must be instructed in the recognition of heat stress symptoms, the first-aid treatment procedures for severe heat stress, and the prevention of heat stress injuries. Workers must be encouraged to immediately report any heat stress that they may experience or observe in fellow workers. Supervisors must use such information to adjust the work-rest schedule to accommodate such problems.

Wherever possible, a designated break area should be established in an air conditioned space, or in shaded areas where air conditioning is impractical. The break area should be equipped to allow workers to loosen or remove protective clothing, and sufficient seating should be available for all personnel. During breaks, workers must be encouraged to drink plenty of water or other liquids, even if not thirsty, to replace lost fluids and to help cool off. Cool water should be available at all times in the break area, and in the work area itself unless hygiene/chemical exposure issues prevent it.

Workers who exhibit ANY signs of significant heat stress (e.g., profuse sweating, confusion and irritability, pale, clammy skin), should be relieved of all duties at once, made to rest in a cool location, and provided with large amounts of cool water. Anyone exhibiting symptoms of heat stroke (red, dry skin, or unconsciousness) must be taken immediately to the nearest medical facility, taking steps to cool the person during transportation (clothing removal, wet the skin, air conditioning, etc.). Severe heat stress (heat stroke) is a life threatening condition that must be treated by competent medical authority.

4.2 Work-Rest Schedule

The prevention of heat stress is best performed through supervisor observation of employees and routine heat stress awareness training activities. However, it is also necessary to implement a work routine that incorporates adequate rest periods to allow workers to remove protective clothing, drink fluids (vital when extreme sweating is occurring), rest and recover. The frequency and length of work breaks must be determined by the work supervisor based upon the ambient temperature, amount of sunshine, humidity, the amount of physical labor being performed, the physical condition of the workers, and protective clothing being used. See Recommended Guidelines below for more details.

Establishing the Work-Rest Schedule

Earth Tech permits the use of either of two techniques to initially determine an appropriate daily work-rest schedule. These methods are:

- Wet Bulb Globe Thermometer (WBGT) Method – this method is preferred, if a WBGT meter is available.
- Adjusted Temperature Method – this method should be used only if WBGT data is not available.

Either procedure will provide the work supervisor with a recommended routine, however adjustments to this routine may be required to accommodate the specific daily conditions at the work site.

4.3 Guidelines

Table 1, the *Non-CPC Activities WBGT Chart*, is intended for use where personnel are not utilizing CPC. Where workers are required to utilize CPC, Table 2, the *CPC Activities WBGT Chart*, will be used.

WBGT readings (in degrees Fahrenheit - °F) are compared directly with the values the applicable WBGT Chart for the applicable work rate (where light work corresponds to minimal physical activity besides standing/watching, very heavy work corresponds to significant, continuous physical labor) to determine the work-rest frequency.

Table 1. Non-CPC Activities

Work-Rest Frequency	°F-WBGT			
	Light Work	Moderate Work	Heavy Work	Very Heavy Work
Continuous Work	85	81	78	
75% Work – 25% Rest	86	83	81	
50% Work – 50% Rest	88	85	83	81
25% Work – 75% Rest	90	87	86	85

Modified from ACGIH's 2002 Threshold Limit Values for Chemical Substances and Physical Agents, for acclimatized workers

Table 2. CPC Activities

Work-Rest Regimen	°F-WBGT			
	Light Work	Moderate Work	Heavy Work	Very Heavy Work
Continuous Work	74	70	67	
75% Work – 25% Rest	75	72	70	
50% Work – 50% Rest	77	74	72	70
25% Work – 75% Rest	79	76	75	74

Modified from ACGIH's 2002 Threshold Limit Values for Chemical Substances and Physical Agents, for acclimatized workers

4.4 Adjusted Temperature Method

This method can be utilized where WBGT data is not available, and requires only that the ambient temperature (in degrees Fahrenheit - °F) be known. Adjustment factors are applied to the ambient temperature to account for departures from ideal conditions (sunny conditions, light winds, moderate humidity and a fully acclimated work force). The adjustments should be made by addition or subtraction to the ambient temperature reading, or changes in table position, as indicated in Table 3. Adjustments are independent and cumulative, all applicable adjustments should be applied. The result is the *Adjusted Temperature*, which can be compared with the values in Table 4 for the applicable work rate (where light work corresponds to minimal physical activity besides standing/watching, very heavy work corresponds to significant, continuous physical labor) to determine the work-rest frequency.

Table 3. Temperature Adjustment Factors

Time of Day	
Before daily temperature peak ¹	+2°F
10 am – 2 pm (peak sunshine)	+2°F

Sunshine	
No clouds	+1°F
Partly Cloudy (3/8 – 5/8 cloud cover)	-3°F
Mostly Cloudy (5/8 – 7/8 cloud cover)	-5°F
Cloudy (>7/8 cloud cover)	-7°F
Indoor or nighttime work	-7°F

Wind (ignore if indoors or wearing CPC)	
Gusts greater than 5 miles per hour at least once per minute	-1°F
Gusts greater than 10 miles per hour at least once per minute	-2°F
Sustained greater than 5 miles per hour	-3°F
Sustained greater than 10 miles per hour	-5°F

Humidity (ignore if wearing CPC)	
Relative Humidity greater than 90%	+5°F
Relative humidity greater than 80%	+2°F
Relative Humidity less than 50%	-4°F

Chemical Protective Clothing (CPC)	
Modified Level D (coveralls, no respirator)	+5°F
Level C (coveralls w/o hood, full-face respirator)	+8°F
Level C (coveralls with hood, full-face respirator)	+10°F
Level B with airline system	+9°F
Level B with SCBA	+9°F and right one column ²
Level A	+14°F and right one column ²
Other	Specified in the HASP

Miscellaneous	
Unacclimated work force	+5°F
Partially acclimated work force	+2°F
Working in shade	-3°F
Breaks taken in air conditioned space	-3°F

¹ This adjustment accounts for temperature rise during the day. If the temperature has already reached its daytime peak it can be ignored.

² Locate the proper column based on work rate, then move one column to the right (next higher work rate) before locating the corresponding adjusted temperature.

Table 4. Work-Rest Schedule Based on Adjusted Temperature

Work-Rest Schedule	Adjusted Temperature (°F)			
	Light Work	Moderate Work	Heavy Work	Very Heavy Work
No specified requirements	< 80	< 75	< 70	< 65
15 minute break every 90 minutes of work	80 – 90	75 - 85	70 - 80	65 – 75
15 minute break every 60 minutes of work	>90 – 100	> 85 - 95	>80 - 85	>75 - 80
15 minute break every 45 minutes of work	>100 – 110	>95 - 100	>85 - 90	>80 - 85
15 minute break every 30 minutes of work	>110 - 115	>100 - 105	>90 - 95	>85 - 90
15 minute break every 15 minutes of work	>115 - 120	>105 - 110	>95 -100	>90 - 95
Stop Work	>120	>110	>100	>95

Note: Time spent performing decontamination or donning/doffing CPC should not be included in calculating work or break time lengths.

4.5 Evaluating the Work-Rest Schedule’s Effectiveness

Once a work-rest schedule is established, the work supervisor must continually evaluate its effectiveness through observation of workers for signs/symptoms of heart stress. Measurement of each worker’s pulse can provide additional information in determining if the schedule is adequate, and is accomplished as follows:

At the start of the workday each worker’s baseline pulse rate (in beats per minute – bpm) is determined by taking a pulse count for 15 seconds and multiplying the result by four. Worker pulse rates can then be measured at the beginning and end of each break period to determine if the rest period allows adequate cooling by applying the following criteria:

- Each worker’s maximum heart rate at the start of any break should be less than [180 minus workers age] bpm. If this value is exceeded for any worker, the duration of the following work period will be decreased by at least 10 minutes.
- At the end of each work period all workers’ heart rates must have returned to within +10% of the baseline pulse rate. If any worker’s pulse rate exceeds this value the break period will be extended for at least 5 minutes, at the end of which pulse rates will be re-measured and the end-of-break criteria again applied.

Measurements for each worker can be recorded and tracked throughout the work day using the *Heat/Cold Stress Monitoring Log (Attachment 1)*

Recommended Guidelines

The guidelines discussed in this section are intended to be used only as a means for initial establishment of a work/rest regimen.

- The on-site health and safety representative, in consultation with the SH&E Department, will evaluate the conditions at a specific operation and make final determinations of the work/rest regimen.

- Intake of fluid will be increased beyond that which satisfies thirst, and it is important to avoid "fluid debt," which will not be made up as long as the individual is sweating.
- Two 8-ounce glasses of water should be taken prior to beginning work, then up to 32 oz per hour during the work shift; fluid replacement at frequent intervals is most effective.
- The best fluid to drink is water; liquids like coffee or soda do not provide efficient hydration, and may increase loss of water.
- If commercial electrolyte drinks (e.g., Gatorade) are used, the drink should be diluted with water, or 8 ounces of water should be taken with each 8 ounces of electrolyte beverage.
- Additional salt is usually not needed and salt tablets should not be taken.
- Replacement fluids should be cool, but not cold.
- Breaks will be taken in a cool, shaded location, and any impermeable clothing should be removed.
- Dry clothing or towels will be available to minimize chills when taking breaks.
- Manual labor will not be performed during breaks, other than paperwork or similar light tasks.
- Other controls that may be used include:
 - Scheduling work at night or during the cooler parts of the day (6 am - 10 am, 3 pm - 7 pm)
 - Erecting a cover or partition to shade the work area
 - Use of cooling garments (this option is expensive and logistically difficult to implement).
- The health and safety representative will determine the potential for heat stress based on planned activities and weather forecasts.
- If the potential for heat stress exists:
 - All site workers will be informed of the potential for heat stress during the daily safety meeting.
 - The health and safety representative will determine if any workers are at particular risk for heat stress due to illness, etc.
 - The health and safety representative will ensure that sufficient quantities of potable water and electrolyte drinks are available in the decon area and that a shaded rest area is available at or immediately outside the decon area.
 - All workers will drink 16 ounces of water prior to beginning work and at least 16 ounces during each rest period.
- The initial work period and monitoring frequency is set according to the level of risk for heat stress.
- Within the first minute of each rest period, each worker's heart rate (pulse) will be measured, and compared to the following:
 - Initial heart rate: 110 beats/minute (28 beats/15 sec).

Each worker's heart rate will be measured again three minutes later, and compared to the following:

- Recovery heart rate: 80 beats/minute (20 beats/15 sec).
- If both heart rate criteria are met, the subsequent work period may be increased by one third, provided the temperature remains constant.
- If the initial heart rate is > 110 beats per minute, or the recovery rate is not less than 80 beats per minute, the subsequent work shift is decreased by one third.
- Additional means of prevention include:
 - Cooling devices such as vortex tubes or cooling vests can be worn beneath protective garments. If cooling devices are worn, only physiological monitoring will be used to determine work activity.
 - Employees will open or remove chemical protective garments during rest periods.
 - All employees will be informed of the importance of adequate rest and proper diet in the prevention of heat stress.
 - Employees will be informed of the harmful effects of excessive alcohol consumption in the prevention of heat stress.

4.6 Training

Those personnel potentially exposed to heat stress will receive training that is documented in accordance with SH&E 114 - Safety Training Programs.

Employees will be trained on:

- Sources of heat stress, influence of protective clothing, and importance of acclimatization
- How the body handles heat
- Heat-related illnesses
- Preventative/corrective measures
- First aid procedures for heat stress

Earth Tech health and safety representatives will be trained on measurement methods and calculations of heat stress indices and establishing work schedules.

5.0 REFERENCES

SH&E 114 Safety Training Programs

6.0 Attachment


Attachment 1 - Heat/Cold Stress Monitoring Log

Heat/Cold Stress Monitoring Log

The purpose of this form is to track entry into hot zones wearing chemically protective clothing and monitor employees for heat stress-related illness. It is the responsibility of the foreman or supervisor-in-charge to ensure that each person entering the hot zone completes the required information. Vital signs must be taken by a competent person.

Project Name:			Foreman/Supervisor:					Work/Rest Schedule¹: _____ IN (min) _____ OUT (min)								
Date:	Water Provided²		Acclimated³		Initial Vitals³	Vital Signs and Time In/Out⁴										
Employee Name	Yes	No	Yes	No	Vitals	In	Out	Vitals	In	Out	Vitals	In	Out	Vitals	In	Out
					P			P			P			P		
					BP			BP			BP			BP		
					Temp			Temp			Temp			Temp		
					P			P			P			P		
					BP			BP			BP			BP		
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					Temp			Temp			Temp			Temp		

1. Please refer to SH&E 124, *Heat Stress*. Section 4.4 provides specific details on how to develop a work-rest schedule.
2. Each employee should be provided a sufficient amount of water or sports drink before entering the hot zone. Drinks such as coffee and cola should be discouraged.
3. A worker is "acclimated" if he/she has worked in a hot environment for at least 7-10 consecutive days. If a worker is acclimated, check "Yes". If a worker is not acclimated, check "No" and reduce the "Min In" by 50% for that employee until the 7-10 day period is reached.
4. "Vitals" refers to employee vital signs (e.g., pulse [P], blood pressure [BP], body temperature [Temp], etc.). Initial vitals must be taken and recorded before the start of work operations in the hot zone. Each time the employee exits the hot zone, vitals must be taken and evaluated for heat stress criteria. Section 4.5 of SH&E 124, *Heat Stress* provides specific instructions for taking and evaluating employee vital signs. Body temperature vital signs will be recorded in °F.

 <p>Safety, Health & Environmental Procedure</p>	<p>PROCEDURE NO. <u>SH&E 125</u></p> <p>DATE <u>March 25, 2005</u></p> <p>REVISED <u>August 15, 2008</u></p>
<p>Cold Stress Prevention Program</p>	<p>PREVIOUSLY <u>ENV 529</u></p>

This procedure applies to all U.S.-based personnel, projects, offices, business units and activities. Any exceptions to this procedure must be approved, in writing, by the responsible District/Business Unit Manager and Safety Manager.

1.0 PURPOSE

This procedure is intended to protect workers from the severest effects of cold stress (hypothermia) and cold injury, and to describe exposures to cold working conditions under which it is believed nearly all workers can be repeatedly exposed without adverse health effects. The objective is to prevent the deep body temperature from falling below 96.8°F and to prevent cold injury to body extremities.

2.0 SCOPE

Fatal exposures to cold among workers have almost always resulted from accidental exposures involving failure to escape from low environmental air temperatures or from immersion in low temperature water. The single most important aspect of life-threatening hypothermia is the fall in the deep core temperature of the body. Workers should be protected from exposure to cold so that the deep core temperature does not fall below 96.8°F; lower body temperatures will very likely result in reduced mental alertness, reduction in rational decision making, or loss of consciousness with the threat of fatal consequences.

Pain in the extremities may be the first early warning of danger from cold stress. During exposure to cold, maximum severe shivering develops when the body temperature has fallen to 95°F. This must be taken as a sign of danger to the workers and exposure to cold should be immediately terminated for any workers when severe shivering becomes evident. Useful physical or mental work is limited when severe shivering occurs.

3.0 PROCEDURE

Since prolonged exposure to cold air, or to immersion in cold water, at temperatures even well above freezing can lead to dangerous hypothermia, whole-body protection must be provided.

3.1 General Requirements

- Adequate insulating dry clothing to maintain core temperatures above 96.8°F must be provided to workers if work is performed in air temperatures below 40°F. Wind chill cooling rate and the cooling power of air are critical factors. The higher the wind speed and the lower the temperature in the work area, the greater the insulation value of the protective clothing required. An equivalent chill temperature (ECT) chart relating the actual dry bulb air temperature and the wind velocity is presented in Attachment 1.

- Unless there are unusual or extenuating circumstances, cold injury to other than hands, feet, and head is not likely to occur without the development of the initial signs of hypothermia. Superficial or deep local tissue freezing will occur only at temperatures below 32°F regardless of wind speed. However, older workers or workers with circulatory problems require special precautionary protection against cold injury. The use of extra insulating clothing and/or a reduction in the duration of the exposure period are among the special precautions which should be considered.
- For exposed skin, continuous exposure should not be permitted when the air speed and temperature results in an equivalent chill temperature of -25°F or below.
- At air temperatures of 40°F or less, it is imperative that workers who become immersed in water or whose clothing becomes wet be immediately provided a change of clothing and be treated for hypothermia.
- If the air velocity at the job site is increased by wind, draft, or artificial ventilating equipment, the cooling effect of the wind should be reduced by shielding the work area or by wearing an easily removable windbreak garment.
- If the available clothing does not give adequate protection to prevent hypothermia or frostbite, work should be modified or suspended until adequate clothing is made available or until weather conditions improve.

A recommended work/warm-up schedule is discussed in Section 5.0.

4.0 HANDS

Special protection of the hands is required to maintain manual dexterity for the prevention of accidents:

- If fine work is to be performed with bare hands for more than 10 to 20 minutes in an environment below 60°F, special provisions should be established for keeping the workers' hands warm. For this purpose, warm air jets, radiant heaters (fuel burner or electric radiator), or contact warm plates may be utilized. Metal handles of tools and control bars should be covered by thermal insulating material at temperatures below 30°F.
- If the air temperature falls below 60°F for sedentary work, 40°F for light work, or 20°F for moderate work, and fine manual dexterity is not required, then gloves should be used by the workers.
- To prevent contact frostbite, the workers should wear anti-contact gloves:
 - When cold surfaces below 20°F are within reach, a warning should be given to each worker to prevent inadvertent contact by bare skin.
 - If the air temperature is 0°F or less, the hands should be protected by mittens. Machine controls and tools for use in cold conditions should be designed so that they can be handled without removing the mittens.
- Provisions for additional total body protection are required if work is performed in an environment at or below 40°F. The workers should wear cold protective clothing appropriate for the level of cold and physical activity.

5.0 WORK WARMING REGIMEN

If work is performed continuously in the cold at an equivalent chill temperature (ECT) at or below – 15°F, heated warming shelters (tents, cabins, rest rooms, etc.) should be made available nearby. The workers should be encouraged to use these shelters at regular intervals, the frequency depending on the severity of the environmental exposure. The onset of heavy shivering, minor frostbite (frostnip), the feeling of excessive fatigue, drowsiness, irritability, or euphoria are indications for immediate return to the shelter. When entering the heated shelter, the outer layer of clothing should be removed and the remainder of the clothing loosened to permit sweat evaporation or a change of dry work clothing provided. A change of dry work clothing should be provided as necessary to prevent workers from returning to work with wet clothing.

Attachment 2 provides guidelines for a work/warm-up schedule.

6.0 OTHER WORK PRACTICES

For work practices at or below 10°F ECT (see Attachment 1), the following should apply:

- The worker should be under constant protective observation (buddy system or supervision).
- The work rate should not be so high as to cause heavy sweating that will result in wet clothing; if heavy work must be done, rest periods should be taken in heated shelters and opportunity for changing into dry clothing should be provided.
- New employees should not be required to work fulltime in the cold during the first days of employment until they become accustomed to the working conditions and required protective clothing.
- The weight and bulkiness of clothing should be included in estimating the required work performance and weights to be lifted by the worker.
- The work should be arranged in such a way that sitting still or standing still for long periods is minimized. Unprotected metal chair seats should not be used. The worker should be protected from drafts to the greatest extent possible.
- The workers should be instructed in safety and health procedures, which should address:
 - Proper re-warming procedures and appropriate first aid treatment.
 - Proper clothing practices.
 - Proper eating and drinking habits.
 - Recognition of impending frostbite.
 - Recognition of signs and symptoms of impending hypothermia or excessive cooling of the body even when shivering does not occur.
 - Safe work practices.
- Eye protection for workers employed outdoors in a snow and/or ice-covered terrain should be supplied. Special safety goggles to protect against ultraviolet light and glare (which can produce temporary conjunctivitis and/or temporary loss of vision) and blowing ice crystals should be required when there is an expanse of snow coverage causing a potential eye exposure hazard.
- Workers handling evaporative liquid (gasoline, alcohol or cleaning fluids) at air temperatures below 40°F should take special precautions to avoid soaking of clothing or gloves with the liquids because of the added danger of cold injury due to evaporative cooling. Special note should be taken of the particularly acute effects of splashes of

“cryogenic fluids” or those liquids with a boiling point that is just above ambient temperature.

- Trauma sustained in freezing or subzero conditions requires special attention because an injured worker is predisposed to cold injury. Special provisions should be made to prevent hypothermia and freezing of damaged tissue in addition to providing for first aid treatment.

7.0 COLD RELATED ILLNESS AND TREATMENT

7.1 Frostbite

If exposure occurs in temperatures that are below freezing (30 degrees F or below), frostbite or trench foot (immersion foot) may accompany or complicate the symptoms of hypothermia. Frostbite is the freezing of living tissues with a resultant breakdown of cell structure. Injury due to frostbite may range from superficial redness of the skin, slight numbness, and blisters, to the obstruction of blood flow (ischemia), blood clots (thrombosis), or skin discoloration due to insufficient oxygen in the blood (cyanosis). Frostbite may occur if the skin comes into contact with objects with a surface temperature below freezing, such as metal tool handles. Trench foot is caused by continuous exposure to cold combined with persistent dampness or immersion in water. Injuries in this case include permanent tissue damage due to oxygen deficiency, damage to capillary walls, severe pain, blistering, tissue death, and ulceration. Additionally, cold exposures may either induce or intensify vascular abnormalities. These include chilblain (a swelling or sore), Raynaud's disease, acrocyanosis (blueness of hands and feet) and thromboangiitis (inflammation of the innermost walls of blood vessels with accompanying clot formation). Workers suffering from these ailments should take particular precautions to avoid chilling.

Treatment

1. Wrap the victim in woolen cloth and keep dry until he or she can be brought inside.
2. Do not rub, chafe, or manipulate frozen parts.
3. Bring the victim indoors.
4. Place the victim in warm water (102 degrees to 105 degrees F) and make sure the water remains warm. Test the water by pouring it on the inner surface of your forearm. Never thaw affected body parts if the victim has to go back out into the cold. The affected area may be refrozen.
5. Do not use hot water bottles or a heat lamp, and do not place the victim near a hot stove.
6. Do not allow the victim to walk if his or her feet are affected.
7. Have the victim gently exercise the affected parts once they are thawed.
8. Seek medical aid for thawing of serious frostbite.

7.2 Hypothermia

Hypothermia damages both the body's internal temperature mechanisms (hypothalamus) and the peripheral mechanisms to prevent heat loss (vasoconstriction and perspiration.) These effects may last up to three years.

Treatment

1. Give artificial respiration and stop any bleeding, if necessary.
2. Bring the victim into a warm room or shelter as quickly as possible.
3. If the victim cannot be moved (spinal injury, etc.), carefully place newspapers, blankets or some other insulation between the victim and the ground.
4. Remove all wet clothing.
5. Provide an external heat source since the body cannot generate its own heat. Wrap the victim in prewarmed blankets, place him or her in the liner of a portable hypothermia treatment unit, put the torso (not the extremities) into a tub of warm water or use body-to-body contact to rewarm the body core. These measures will slowly reopen the peripheral circulation, minimizing the possibility of after-shock or after-drop (the flowing of cooled, stagnated blood from the limbs to the heart), which may cause ventricular fibrillation, cardiac arrest, or death.
6. Do not allow the victim to sleep.
7. Give warm, sweet drinks, no alcohol or pain relievers.
8. Keep the victim still. Do not try to walk.
9. Do not rub numb skin.
10. Get medical help as soon as possible.

8.0 REFERENCES

SH&E 113 – Personal Protective Equipment

9.0 ATTACHMENTS

Attachment 1 – Estimation of Equivalent Chill Temperature

Attachment 2 – Work/Warm-up Schedule Guidelines

Estimation of Equivalent Chill Temperature

Estimated Wind Speed (mph)	Actual Temperature Reading (°F)									
	50	40	30	20	10	0	-10	-20	-30	-40
	Equivalent Chill Temperature (°F)									
Calm	50	40	30	20	10	0	-10	-20	-30	-20
5	48	37	27	16	6	-5	-15	-26	-36	-47
10	40	28	16	4	-9	-24	-33	-46	-58	-70
15	36	22	9	-5	18	-32	-45	-58	-72	-85
20	32	18	4	-10	-25	-39	-53	-67	-82	-96
25	30	16	0	-15	-29	-44	-59	-75	-88	-104
30	28	13	-2	-18	-33	-48	-63	-79	-94	-109
35	27	11	-4	-20	35	-51	-67	-82	-98	-113
40	26	10	-6	-21	-37	-53	-69	-85	-100	-116
Wind speeds above 40 mph have little additional effect	LITTLE DANGER			INCREASING DANGER			GREAT DANGER			
	Trenchfoot and immersion foot may occur at any point on this chart.									

Work/Warm-up Schedule Guidelines

Air Temp. (Sunny Sky) °F	No Noticeable Wind		5 mph Wind		10 mph Wind		15 mph Wind		20 mph Wind		25 mph Wind	
	Max. Work Period	Breaks	Max. Work Period	Breaks	Max. Work Period	Breaks	Max. Work Period	Breaks	Max. Work Period	Breaks	Max. Work Period	Breaks
above 5°	Normal Work Sched.		Normal Work Sched.		Normal Work Sched.		Normal Work Sched.		Normal Work Sched.		Normal Work Sched.	
5° to -1°											100 min	2
0° to -4°											75 min	2
-5° to -9°											55 min	3
-10° to -14°											40 min	4
-15° to -19°	30 min	5	100 min	2	75 min	2	55 min	3	40 min	4	30 min	5
-20° to -24°	100 min	2	75 min	2	55 min	3	40 min	4	30 min	5	Cease Work	
-25° to -29°	75 min	2	55 min	3	40 min	4	30 min	5				
-30° to -34°	55 min	3	40 min	4	30 min	5	Cease Work					
-35° to -39°	40 min	4	30 min	5								
-40° to -44°	30 min	5	Cease Work									
-44° & below	Cease Work				Cease Work							


Modified from ACGIH's 2002 Threshold Limit Values for Chemical Substances and Physical Agents.

Note 1: Schedule describes the maximum continuous duration of work and number of 10-15 minute breaks to be observed during any 4-hour work period, and assumes that period will be followed by an extended warm-up period (e.g., lunch). Allowed breaks should be taken in a warm environment.

Note 2: Schedule applies to moderate to heavy work performed by acclimated workers wearing appropriate layered clothing. For light to moderate work apply the schedule for conditions 1 step lower. For unacclimated workers apply the schedule for conditions 2 steps lower. These modifications are additive.

Note 3: For work under 25% - 50% overcast/clouds apply the schedule for conditions 1 step lower. For work at night or under greater than 50% overcast/clouds apply the schedule for conditions 2 steps lower. These modifications are additive with any applicable modifications from Note 2.

Note 4: For wind speeds in excess of 25 mph cease all non-emergency work when temperatures fall below 5°F.

	PROCEDURE NO. <u>SH&E 126</u>
	DATE <u>March 25, 2005</u>
Safety, Health & Environmental Procedure	REVISED <u>August 15, 2008</u>
	PREVIOUSLY <u>Corp 901-905</u>
Radiation Safety Program	

This procedure applies to all U.S.-based personnel, projects, offices, business units and activities. Any exceptions to this procedure must be approved, in writing, by the Corporate Radiation Safety Officer (Corporate RSO).

1.0 PURPOSE

Earth Tech operations will meet or exceed all applicable federal, state, and local safety and health regulations pertaining to occupational and public exposure to ionizing and non-ionizing radiation. Earth Tech's Corporate Radiological Protection Program basic framework consists of the following:

- The primary aim of radiological protection is to provide an appropriate standard of protection for man without unduly limiting the beneficial practices that result in radiation exposure.
- The Radiation Safety Program is intended to prevent the occurrence of deterministic effects, by keeping doses below the relevant thresholds, and to ensure that all reasonable steps are taken to reduce the probability of stochastic effects.

2.0 DEFINITIONS

Absorbed dose means the energy imparted by ionizing radiation per unit mass of irradiated material. The units of absorbed dose are the rad and the gray (Gy). 1 Gy = 100 rad.

Activity means the rate of disintegration or transformation or decay of radioactive material. The units of activity are "disintegrations per second (or minute)" (dps or dpm), curie (Ci) and the becquerel (Bq).

$$1 \text{ Ci} = 37,000,000,000 \text{ dps} (3.7 \times 10^{10} \text{ dps})$$

$$1 \text{ Ci} = 2,220,000,000,000 \text{ dpm} (2.22 \times 10^{12} \text{ dpm})$$

$$1 \text{ Bq} = 1 \text{ dps}$$

Adult means an individual 18 or more years of age.

Agreement State means a state that has executed an agreement with the U.S. Nuclear Regulatory Commission transferring to the state the responsibility for regulating uses of certain radioactive materials within its borders. .

Airborne radioactive material means any radioactive material dispersed in the air in the form of dusts, fumes, particles, mists, vapors, or gases.

Airborne radioactivity area means a room, enclosure, or area in which airborne radioactive materials exist in concentrations:

- in excess of the derived air concentrations (DACs) specified in 10 CFR 20 Appendix B, Table I, Column 1; or

- to such a degree that an individual present in the area without respiratory protective equipment could exceed, during the hours an individual is present in a week, an intake of 0.6 percent of the annual limit on intake (ALI) or 12 DAC-hours.

Annual Limit on Intake (ALI) means the derived limit for the amount of radioactive material taken into the body of an adult worker by inhalation or ingestion in a year.

As low as is reasonably achievable (ALARA) means making every reasonable effort to maintain exposures to radiation as far below regulatory dose limits as is practical, consistent with the purpose for which the licensed or registered activity is undertaken, taking into account the state of technology, the economics of improvements in relation to benefits to public health and safety, and other societal and socioeconomic considerations, and in relation to utilization of ionizing radiation and licensed sources of radiation in the public interest.

Background radiation means radiation from cosmic sources; non-technologically enhanced naturally occurring radioactive material, including radon, except as a decay product of source or special nuclear material, and including global fallout as it exists in the environment from the testing of nuclear explosive devices.

Becquerel (Bq) means the System International (SI) unit of activity. One becquerel is equal to 1 disintegration or transformation per second (dps).

Bioassay means the determination of kinds, quantities, or concentrations, and, in some cases, the locations of radioactive material in the human body, whether by direct measurement, *in vivo* counting, or by analysis and evaluation of materials excreted or removed from the human body.

Byproduct material means:

- any radioactive material (except special nuclear material) yielded in or made radioactive by exposure to the radiation incident to the process of producing or utilizing special nuclear material; and
- the tailings or wastes produced by or resulting from the extraction or concentration of uranium or thorium from any ore processed primarily for its source material content, including discrete surface wastes resulting from uranium solution extraction processes, and other tailings (or wastes) having similar radiological characteristics.

CFR means Code of Federal Regulations.

Committed dose equivalent ($H_{T,50}$ or CDE) means the dose equivalent to organs or tissues of reference (T) that will be received from an intake of radioactive material by an individual during the 50-year period following the intake.

Committed effective dose equivalent ($H_{E,50}$ or CEDE) means the sum of the products of the weighting factors applicable to each of the body organs or tissues that are irradiated and the committed dose equivalent to each of these organs or tissues ($H_{E,50} = \sum W_T H_{T,50}$).

Curie (Ci) means a unit of measurement of activity. One curie (Ci) is that quantity of radioactive material that decays at the rate of 3.7×10^{10} disintegrations per second (dps). Commonly used sub-multiples of the curie are the millicurie and the microcurie. One millicurie (mCi) = 1×10^{-3} curie = 3.7×10^7 dps. One microcurie (μ Ci) = 1×10^{-6} curie = 3.7×10^4 dps. One nanocurie (nCi) = 1×10^{-9} curie = 3.7×10^1 dps. One picocurie (pCi) = 1×10^{-12} curie = 3.7×10^{-2} dps.

Corporate Radiation Safety Officer (Corporate RSO) – The member of the SH&E Department designated by the Executive VP of Earth Tech and reports to the VP of SH&E to manage all Earth Tech radiation issues related to ionizing radiation and/or radioactive materials.

Declared Pregnant Woman means a woman who voluntarily informed her employer, in writing, of her pregnancy and the estimated date of conception.

Deep dose equivalent (H_d or DDE), which applies to external whole body exposure, means the dose equivalent at a tissue depth of 1 centimeter (1000 mg/cm^2).

Deterministic Effects means health effects, the severity of which varies with the dose and for which a threshold is believed to exist.

Derived Air Concentration (DAC) means the concentration of a given radionuclide in air which, if breathed by Reference Man (1.2 cubic meters of air per hour) for a working year of 2,000 hours under conditions of light work, results in an intake of one ALI.

Dose is a generic term that means absorbed dose, dose equivalent, effective dose equivalent, committed dose equivalent, committed effective dose equivalent, total organ dose equivalent, or total effective dose equivalent.

Dose equivalent (H_T) means the product of the absorbed dose in tissue, quality factor, and all other necessary modifying factors at the location of interest. The units of dose equivalent are the sievert (Sv) and rem. $1 \text{ Sv} = 100 \text{ rem}$.

Dosimeter means devices designed to be worn by a single individual for the assessment of dose equivalent. Examples of individual monitoring devices are film badges, thermoluminescent dosimeters (TLDs), and pocket ionization chambers.

Effective dose equivalent (H_E) means the sum of the products of the dose equivalent to each organ or tissue (H_T) and the weighting factor (W_T) applicable to each of the body organs or tissues that are irradiated ($H_E = \sum W_T H_T$).

Embryo/fetus means the developing human organism from conception until the time of birth.

Entrance or access point means any opening through which an individual or extremity of an individual could gain access to radiation areas or to licensed or registered sources of radiation. This includes portals of sufficient size to permit human access, irrespective of their intended use.

Exposure A measure of ionization produced in air by X- or gamma radiation. The unit of exposure is the coulomb per kilogram (C/kg) or the roentgen (R). $1 \text{ R} = 2.58 \times 10^{-4} \text{ C/kg}$.

Exposure rate means the exposure per unit of time, typically milliroentgen per hour (mR/h).

External dose means that portion of the dose equivalent received from any source of radiation outside the body.

Extremity means hand, elbow, arm below the elbow, foot, knee, and leg below the knee. The arm above the elbow and the leg above the knee are considered part of the whole body.

Eye dose equivalent (LDE) means the external dose equivalent to the lens of the eye at a tissue depth of 0.3 centimeter (300 mg/cm^2).

Gray (Gy) means the System International (SI) unit of absorbed dose. One gray is equal to an absorbed dose of 1 joule per kilogram (100 rad).

High radiation area means an area, accessible to individuals, in which radiation levels could result in an individual receiving a dose equivalent in excess of 0.1 rem (1 millisievert) in 1 hour at 30 centimeters from any source of radiation or from any surface that the radiation penetrates.

Internal dose means that portion of the dose equivalent received from radioactive material taken into the body.

Ionizing radiation means any electromagnetic or particulate radiation capable of producing ions, directly or indirectly, in its passage through matter. Ionizing radiation includes gamma rays and x rays, alpha and beta particles, high-speed electrons, neutrons, and other nuclear particles.

License means a form of permission given by an Agreement State, or the U.S. Nuclear Regulatory Commission to an applicant who has met the requirements for licensing set out by that Agency (Agreement State or U.S. NRC)

Licensed material means radioactive material received, possessed, used, or transferred under a license issued by the Agreement State or the U.S. Nuclear Regulatory Commission.

Licensee means any person or organization who is licensed by the Agreement State or the U.S. Nuclear Regulatory Commission.

Member of the public means any individual, except an individual who is performing assigned duties for a licensee or registrant involving exposure to sources of radiation.

Minor means an individual less than 18 years of age.

Natural radioactivity means radioactivity of naturally occurring nuclides whose location and chemical and physical form have not been altered by man.

Non-ionizing Protection Plan (NIPP) - A written set of procedures and requirements developed to ensure the safety of personnel exposed to non-ionizing radiation. See also SH&E 130 – Non-ionizing Radiation.

Occupational dose means the dose received by an individual in the course of employment in which the individual's assigned duties involve exposure to sources of radiation. Occupational dose does not include dose received from background radiation, as a patient from medical practices, from voluntary participation in medical research programs, or as a member of the public.

Quality factor (Q) means the modifying factor that is used to derive dose equivalent from absorbed dose.

<u>Radiation</u>	<u>Quality Factor</u>
beta	1
gamma	1
x-ray	1
alpha	20
neutron	varies from 3 - 10

Rad means the special unit of absorbed dose. One rad is equal to an absorbed dose of 100 erg per gram or 0.01 joule per kilogram (0.01 gray).

Radiation means one or more of the following:

- gamma and x rays; alpha and beta particles and other atomic or nuclear particles or rays;
- stimulated emission of radiation from any electronic device to such energy density levels as to reasonably cause bodily harm; or

- sonic, ultrasonic, or infrasonic waves from any electronic device or resulting from the operation of an electronic circuit in an electronic device in the energy range to reasonably cause detectable bodily harm.

Radiation area means any area, accessible to individuals, in which radiation levels could result in an individual receiving a dose equivalent in excess of 0.005 rem (0.05 millisievert) in 1 hour at 30 centimeters from the source of radiation or from any surface that the radiation penetrates.

Radiation machine means any device capable of producing ionizing radiation except those devices with radioactive material as the only source of radiation.

Radiation Protection Plan (RPP) – A written set of procedures and requirements developed to ensure the safety of personnel handling radioactive material or assigned to work in known or suspected radiation areas. See also SH&E 127 – Radiation Protection Plans.

Radiation Safety Officer (RSO) – The person appointed to oversee and manage the specific radiation safety issues associated with a particular use or contact with radioactive material or exposure to ionizing radiation, in accordance with an established RPP.

Radioactive material means any material (solid, liquid, or gas) that emits ionizing radiation spontaneously.

Radioactivity means the disintegration of unstable atomic nuclei with the emission of radiation.

Radiobioassay (See “Bioassay”).

Rem means the special unit of any the quantities expressed as dose equivalent. The dose equivalent in rem is equal to the absorbed dose in rad multiplied by the quality factor (1 rem = 0.01 sievert).

Restricted area means an area, access to which is limited by the licensee or registrant for the purpose of protecting individuals against undue risks from exposure to sources of radiation. Restricted area does not include areas used as residential quarters, but separate rooms in a residential building may be set apart as a restricted area.

Roentgen (R) means the special unit of exposure. One roentgen (R) equals 2.58×10^{-4} coulombs/kilogram of air. (See “Exposure”).

Sealed source means radioactive material that is permanently bonded or fixed in a capsule or matrix designed to prevent release and dispersal of the radioactive material under the most severe conditions that are likely to be encountered in normal use and handling.

Shallow dose equivalent (H_s or SDE), which applies to the external exposure of the skin or an extremity, means the dose equivalent at a tissue depth of 0.007 centimeter (7 mg/cm²) averaged over an area of 1 square centimeter.

Sievert means the System International (SI) unit of any of the quantities expressed as dose equivalent. The dose equivalent in sievert is equal to the absorbed dose in gray multiplied by the quality factor (1 Sv = 100 rem).

Source material means:

- uranium or thorium, or any combination thereof, in any physical or chemical form; or
- ores that contain by weight 0.05 percent or more of:
 - (i) uranium,
 - (ii) thorium, or

(iii) any combination thereof.

- Source material does not include special nuclear material.

Special nuclear material means:

- plutonium, uranium-233, uranium enriched in the isotope 233 or in the isotope 235, but does not include source material; or
- any material artificially enriched by any of the foregoing, but does not include source material.

Stochastic Effects: means health effects that occur randomly and for which the probability of the effect occurring, rather than its severity, is assumed to be a linear function of dose without threshold. Hereditary effects and cancer incidence are examples of stochastic effects.

Survey means an evaluation of the radiological conditions and potential hazards incident to the production, use, transfer, release, disposal, and/or presence of sources of radiation. When appropriate, such evaluation includes, but is not limited to, tests, physical examination of location of materials and equipment, and measurements of levels of radiation or concentration of radioactive material present.

Total effective dose equivalent (TEDE) means the sum of the deep dose equivalent for external exposures and the committed effective dose equivalent for internal exposures.

TEDE = DDE + CEDE

Total organ dose equivalent (TODE) means the sum of the deep dose equivalent and the committed dose equivalent to the organ receiving the highest dose. TODE = DDE + CDE

Unrestricted area means an area, access to which is neither limited nor controlled by the licensee.

Whole body means for purposes of external exposure, head, trunk (including male gonads), arms above the elbow, or legs above the knees.

Worker means an individual engaged in work under a license or a Permit.

3.0 RESPONSIBILITIES

3.1 Corporate Radiation Safety Officer (Corporate RSO)

The Corporate RSO will manage all of Earth Tech's radiation safety issues related to ionizing radiation and/or radioactive materials. Duties include:

- Provide technical assistance in the identification and safe handling of radioactive materials as requested by management personnel.
- Provide technical and procedural assistance in radiological safety when personnel enter any radiation area.
- Provide technical assistance in the preparation of any radioactive material/special nuclear material license applications/renewals. Review and approve all applications prior to submittal.
- Select and manage Earth Tech's dosimetry service provider, and perform an annual review of all dosimetry program results.

- Prepare/approve all RPPs (see SH&E 127 – Radiation Protection Plans) and NIPPS (see SH&E 130 – Non-ionizing Radiation).
- Approve the appointment of each Radiation Safety Officer (RSO).
- Approve all ALARA Level 1 dose assessment investigations (see SH&E 129 – ALARA) and lost dosimeter investigations (see SH&E 128 – Radiological Exposure Assessment) performed by RSOs.
- Conduct and document all ALARA Level 2 dose assessment investigations (see SH&E 129 – ALARA).

3.3 Section Managers

Section managers are responsible for identifying to the Corporate RSO any radiological issues related to their section's work activities, such as:

- Possession of or intent to acquire radioactive material under any general or specific radioactive material license.
- Designation of any specialty business group pursuing/performing work activities which will likely involve routine exposure to radioactive material or ionizing radiation (e.g., a radioactive facilities survey/decontamination group).
- Assignment to personnel of work that may involve radiological exposures.

3.4 Project Managers

Project managers are responsible for ensuring that all radiation safety issues associated with their projects are properly addressed, and worker safety is ensured through development of appropriate radiological safety requirements and procedures. Responsibilities include:

- Ensure that the presence of radioactive materials, ionizing radiation sources, radiologically controlled areas, contamination areas, airborne radioactivity areas, and radiation areas at project work sites are identified (where reasonably possible) prior to commencing field activities, and that possible radiological hazards are assessed and controlled through development of a Category 2 RPP (SH&E SOP 127).
- Ensure that employees working with radioactive material or ionizing radiation sources have received all necessary safety-related training, certifications and licenses, and are participating in the applicable dose assessment program (as required).

3.5 Radiation Safety Officers

An RSO is appointed to oversee and manage the radiation safety issues associated with each RPP/NIPP. Each RSO will:

- Manage all radiation safety procedures as specified in the RPP/NIPP.
- Manage any RPP/NIPP-mandated dosimetry program, including distribution and collection of dosimeters, review of dosimetry results, and identification of ALARA Level 1 and Level 2 discrepancies (see SH&E 129 - ALARA).
- Conduct and document all ALARA Level 1 dose assessment investigations (see SH&E 129 - ALARA) and lost dosimeter investigations (see SH&E 129 - ALARA)
- For radioactive material license RSOs, maintain administrative and operational compliance with all license conditions and requirements.

3.6 All Earth Tech Employees

- Will not disturb or handle any radioactive material or work in any identified radiation area without appropriate training and safety procedures.
- Will work in accordance with all established RPP/NIPP requirements.
- Will immediately notify the Project Manager of the presence or suspected presence of previously unidentified radioactive material or ionizing/non-ionizing radiation sources in the workplace, and cease all work activities involving potential exposure to ionizing/non-ionizing radiation until further direction is received.

4.0 ADMINISTRATIVE PROGRAM

4.1 Internal Program Assessment

Earth Tech shall conduct internal assessments of the Radiation Safety Program at least annually to identify its strengths and weaknesses, areas of vulnerability, and noncompliance. The audits shall include examination of the radiological protection program content and implementation.

4.2 ALARA Approach

It is Earth Tech's policy to plan and conduct its radiological activities safely and in such a fashion as to protect the health and safety of its employees, subcontractors, members of the public, and the environment.

4.3 ALARA Practices

During normal, routine operations, engineering and administrative controls are implemented to ensure that exposures are maintained ALARA. The legal and administrative dose limits are provided in SH&E SOP 128.

5.0 RADIATION PROTECTION STANDARDS

5.1 Occupational Dose Limits

SH&E SOP 128 provides the legal and administrative dose limits. Note that doses from background radiation, therapeutic and diagnostic medical and dental exposures, and those resulting from participation as a subject in medical research programs are not included in dose records or when assessing compliance with the occupational dose limits.

5.2 Occupationally Exposed Minors

The Corporate RSO shall evaluate all radiological work that is to be performed by minors. Minors shall only be permitted to perform tasks that will not result in receiving an annual accumulated exposure greater than 0.1 rem.

5.3 Embryo/Fetus of a General Employee

A special situation arises when a Radiation Site Worker becomes pregnant. Under these conditions, radiation exposure could also involve exposure to the embryo or fetus. A number of studies have indicated that the embryo or fetus is more sensitive than the adult, especially during the first trimester of pregnancy. This can be a concern since many users are unaware of their pregnancy during the first month or two of gestation. Hence, the NRC requires that all occupationally exposed workers be instructed in the potential health risks associated with prenatal radiation exposure.

As defined in 10 CFR 20.1003, a “declared pregnant woman” means a woman who has voluntarily informed her employer, in writing, of her pregnancy and the estimated date of conception. The maximum permissible exposure to the fetus of a declared pregnant worker during the gestation period is 10% of the NRC’s annual limits or 500 mrem. An effort should be made to avoid substantial variation of uniform monthly exposure rate. There are very few locations at the site where radiation levels are high enough that a fetus could potentially receive a dose that approaches these limits. The National Council on Radiation Protection and Measurements (NCRP) Report No. 116 recommends a monthly equivalent dose limit of 0.05 rem (0.5 mSv) to the embryo/fetus once the pregnancy is known. In view of the NCRP recommendation, any monthly dose of less than 0.1 rem (1 mSv) is not a substantial variation above a uniform monthly dose rate and as such will not require justification (specified in NRC Regulatory Guide 8.13).; however, a monthly dose greater than 0.1 rem (1 mSv) should be justified (specified in NRC Regulatory Guide 8.13)

If a Radiation Site Worker becomes pregnant, she is advised to declare her pregnancy in writing. This can be done by email or by letter to the Corporate RSO. A member of the Health Physics staff to assess her potential radiation exposure and measures to keep her exposures ALARA. Early declaration of a pregnancy is encouraged and confidentiality is maintained at all times.

If notification of a pregnancy is not made in writing, the radiation exposure limits remain at the occupational limits of 5,000 mrem per year. An individual may also “un-declare” her pregnancy in writing at any time.

5.4 Planned Special Exposures

Planned special exposures (PSE) are exposures received by occupationally exposed individuals that are in addition to and separate from routine occupational doses and in general, are not practiced at Earth Tech. If a PSE is expected, then the Corporate ROS is to be informed in writing so that appropriate planning can be conducted.

5.5 Emergency Exposure Situations

Provisions for exceeding the normal occupational dose limits in response to an emergency exposure situation are described by the Protective Action Guides (PAGs) of the Environmental Protection Agency (EPA) and the Department of Homeland Security (DHS). Contact the Corporate RSO for additional information on PAGs.

6.0 SURVEYS, POSTINGS, AND INSTRUMENTATION

Radiation surveys are used to identify and quantify radiological hazards and to document regulatory compliance. The Site/Program RSO and all field personnel must work

together to ensure safety in the workplace and to protect both the public and the environment from the harmful effects of radiation.

The Site/Program RSO is responsible to make or cause to be made, surveys that—

- May be necessary for the licensee to comply with the regulations in this part; and
- Are reasonable under the circumstances to evaluate—
 - The magnitude and extent of radiation levels; and
 - Concentrations or quantities of radioactive material; and
 - The potential radiological hazards.
- The Site/Program RSO shall ensure that instruments and equipment used for quantitative radiation measurements (e.g., dose rate and effluent monitoring) are calibrated periodically for the radiation measured.
- All personnel dosimeters (except for direct and indirect reading pocket ionization chambers and those dosimeters used to measure the dose to the extremities) that require processing to determine the radiation dose and that are used to comply with applicable regulations must be processed and evaluated by a dosimetry processor—
 - Holding current personnel dosimetry accreditation from the National Voluntary Laboratory Accreditation Program (NVLAP) of the National Institute of Standards and Technology; and
 - Approved in this accreditation process for the type of radiation or radiations included in the NVLAP program that most closely approximates the type of radiation or radiations for which the individual wearing the dosimeter is monitored.

6.1 Types of Surveys

- Radiation surveys - may be performed to measure exposure or dose rates from sources of radiation that are in buildings, soil, or water. Surveys shall be conducted as necessary to prevent exposures from exceeding limits outlined in Section 6.2.
- Exposure and dose rate calculations may be substituted for actual radiation surveys if based on reliable scientific, peer-reviewed assumptions/historical data.
- Contamination surveys may be performed to monitor the magnitude and extent of loose surface and/or fixed contamination on building floors/walls/surfaces, equipment, materials, supplies, or personnel. The contamination limits for building floors/walls/surfaces, equipment, materials, and supplies, are found in Section 6.2 below.

6.2. Limits

- **Radiation Area:** *Radiation area* means an area, accessible to individuals, in which radiation levels could result in an individual receiving a dose equivalent in excess of 0.005 rem (0.05 mSv) in 1 hour at 30 centimeters from the radiation source or from any surface that the radiation penetrates.
- **High Radiation Area:** *High radiation area* means an area, accessible to individuals, in which radiation levels from radiation sources external to the body could result in an individual receiving a dose equivalent in excess of 0.1 rem (1 mSv) in 1 hour at 30 centimeters from the radiation source or 30 centimeters from any surface that the radiation penetrates.
- **Very High Radiation Area:** *Very high radiation area* means an area, accessible to individuals, in which radiation levels from radiation sources external to the body could

result in an individual receiving an absorbed dose in excess of 500 rads (5 grays) in 1 hour at 1 meter from a radiation source or 1 meter from any surface that the radiation penetrates.

- **Airborne Radioactivity Area:** Airborne radioactivity area means a room, enclosure, or area in which airborne radioactive materials, composed wholly or partly of licensed material, exist in concentrations—
 - In excess of the derived air concentrations (DACs) specified in appendix B, to 10 CFR 20.1001-20.2401, 10 CFR 835 or
 - To such a degree that an individual present in the area without respiratory protective equipment could exceed, during the hours an individual is present in a week, an intake of 0.6 percent of the annual limit on intake (ALI) or 12 DAC-hours.
- **Contaminated Areas** (table listed below)

SURFACE CONTAMINATION VALUES¹ IN DPM/100 CM²

Radionuclide	Removable ² 4	Total (Fixed + Removable) ² , 3
U-nat, U-235, U-238, and associated decay products	7,000	75,000
Transuranics, Ra-226, Ra-228, Th-230, Th-228, Pa-231, Ac-227, I-125, I-129	20	500
Th-nat, Th-232, Sr-90, Ra-223, Ra-224, U-232, I-126, I-131, I-133	200	1,000
Beta-gamma emitters (nuclides with decay modes other than alpha emission or spontaneous fission) except Sr-90 and others noted above ⁵	1,000	5,000
Tritium and tritiated compounds ⁶	10,000	N/A

¹ The values in this appendix, with the exception noted in footnote 5, apply to radioactive contamination deposited on, but not incorporated into the interior or matrix of, the contaminated item. Where surface contamination by both alpha and beta-gamma-emitting nuclides exists, the limits established for alpha and beta-gamma-emitting nuclides apply independently.

² As used in this table, dpm (disintegrations per minute) means the rate of emission by radioactive material as determined by correcting the counts per minute observed by an appropriate detector for background, efficiency, and geometric factors associated with the instrumentation.

³ The levels may be averaged over one square meter provided the maximum surface activity in any area of 100 cm² is less than three times the value specified. For purposes of averaging, any square meter of surface shall be considered to be above the surface contamination value if: (1) From measurements of a representative number of sections it is determined that the average contamination level exceeds the applicable value; or (2) it is determined that the sum of the activity of all isolated spots or particles in any 100 cm² area exceeds three times the applicable value.

⁴ The amount of removable radioactive material per 100 cm² of surface area should be determined by swiping the area with dry filter or soft absorbent paper, applying moderate pressure, and then assessing the amount of radioactive material on the swipe with an appropriate instrument of known efficiency. (Note—The use of dry material may not be appropriate for tritium.) When removable contamination on objects of surface area less than 100 cm² is determined, the activity per unit area shall be based on the actual area and the entire surface shall be wiped. It is not necessary to use swiping techniques to measure removable contamination levels if direct scan surveys indicate that the total residual surface contamination levels are within the limits for removable contamination.

⁵ This category of radionuclides includes mixed fission products, including the Sr-90 which is present in them. It does not apply to Sr-90 which has been separated from the other fission products or mixtures where the Sr-90 has been enriched.

⁶ Tritium contamination may diffuse into the volume or matrix of materials. Evaluation of surface contamination shall consider the extent to which such contamination may migrate to the surface in order to ensure the surface contamination value provided in this appendix is not exceeded. Once this contamination migrates to the surface, it may be removable, not fixed; therefore, a "Total" value does not apply.

⁷ (alpha)

6.3. Postings

- **Caution (or Danger) Radiation Area** - any area, accessible to individuals, in which radiation levels could result in an individual receiving a dose equivalent in excess of 5 mrem in 1 hour at 30 centimeters from the source of radiation or from any surface that the radiation penetrates.
- **Caution (or Danger) High Radiation Area** - any area, accessible to individuals, in which radiation levels could result in an individual receiving a dose equivalent in excess of 100 mrem in 1 hour at 30 centimeters from the source of radiation or from any surface that the radiation penetrates.

- **Caution (or Danger) Airborne Radioactivity Area** – any area, accessible to individuals in which airborne radioactivity levels could result in an individual being exposed to a concentration in excess of 0.1 of the applicable DAC
- Signs and postings listed in 1 through 4 above should be removed when conditions no longer warrant that posting.
- Signs and postings listed in 1 through 4 above shall conform to regulatory specifications on wording, symbol, and colors.

6.4. Labeling

The licensee shall ensure that each container of licensed material bears a durable, clearly visible label bearing the radiation symbol and the words “CAUTION, RADIOACTIVE MATERIAL” or “DANGER, RADIOACTIVE MATERIAL.” The label must also provide sufficient information (such as the radionuclide(s) present, an estimate of the quantity of the radioactivity, the date for which the activity is estimated, radiation levels, contamination levels, kinds of material, and mass enrichment) to permit individuals handling or using the containers, or working in the vicinity of the containers, to take precautions to avoid or minimize exposures.

6.5. Requirements on Maintaining Radiation Detection Instrumentation

- Earth Tech must use radiation detection equipment that is appropriate for detecting the types of radiations emitted and the quantities present by the sources being monitored.
- Portable radiation detectors shall be response checked at least daily when in use, or as appropriate for the instrument being used. Further, portable radiation monitoring equipment shall be calibrated at least annually or after repair of the instrument. Battery replacement is not cause for performing a calibration. The Site/Program RSO will perform daily response checks.

7.0 TRAINING

7.1 Training is required under the following circumstances:

- Before being permitted unescorted access to radiologically controlled areas (i.e., areas posted with the radiation trefoil symbol).
- Before receiving occupational dose during access to radiologically controlled areas (i.e., areas posted with the radiation trefoil symbol).
- When there is a significant change to radiation protection policies and procedures that may affect the individual.

7.2 Training Topics:

Radiation safety training shall include the following topics to the extent appropriate to each individual's prior training, work assignments, and degree of exposure to potential radiological hazards:

- Risk of exposure to radiation and radioactive materials, including prenatal radiation exposure.
- Basic radiation fundamentals and radiation protection concepts.
- Controls for both routine and emergency actions implemented at the local level to manage and maintain doses as low as reasonably achievable (e.g., physical design features, administrative controls, limits, policies, procedures, alarms, and other measures).

- The individual's rights and responsibilities for implementing the facility's radiological protection program.
- The individual's responsibilities for implementing ALARA measures.
- Reports the individual may request.

7.3 Training Courses. Training shall include three different levels. They are listed and described below:

- **Radiological Worker I (RWI):** This course contains the core academics and the appropriate practical factors. This training is for radiological workers whose job assignments require access to Radiological Buffer Areas and Radiation Areas. RW I training is also suggested for unescorted entry into Radioactive Material Areas containing either sealed radioactive sources or radioactive material labeled in accordance with 10 CFR 20, 10 CFR 835, or applicable Agreement State regulations..

RW I training alone does not prepare the worker to work around higher radiation levels or with contaminated materials. It is suggested that RW I tasks be limited to inspections, tours, and activities that involve work on non-radiological systems.

- **Radiological Worker I Training with High/Very High Radiation Area Training:** This course contains the core academics, the High/Very High Radiation Area (HR/VHR) module, and the appropriate practical factors. The HR/VHR Area lesson plan may be added to the RW I course to give personnel unescorted entry into High Radiation Areas where contamination is not a concern.
- **Radiological Worker II Training (RW II):** This course consists of the core academics, the High/Very High Radiation Area module, the Contamination Control module, and the appropriate practical factors. This training is recommended for the radiological worker whose job assignments involve unescorted entry into High Radiation Areas, Contamination Areas, High Contamination Areas, and Airborne Radioactivity Areas. Further, workers who have potential contact with hot particles or use gloveboxes with high contamination levels should complete RW II training.

RW II training prepares the worker to work around higher radiation levels and with contaminated materials normally associated with radiological facilities/activities.

7.4 Records. Records shall be maintained to demonstrate compliance with the training requirements in this section.

8.0 RADIOLOGICAL INVESTIGATION ACTIVITIES

Where the presence of radioactive material is the subject of the planned work operations (e.g., facility characterization), the following requirements must be observed:

- The site-specific health and safety plan (HASP) must provide a specific analysis of the radiological exposure hazard for each task involving the disturbance, handling or contact with radioactive material and for all operations occurring within a radiation area. A Category 2 Radiation Protection Plan (RPP) (SH&E SOP 127) must be developed for the work activity and included as a supplement to the HASP. The Corporate RSO will approve of the Category 2 RPP (SH&E SOP 127).

- All workers performing specific radiological investigation activities must complete radiological worker training.

8.1. HAZWOPER Activities

Radioactive material may be present at HAZWOPER sites as a soil or groundwater contaminant. If such contamination is noted the following requirements must be observed:

- The site-specific health and safety plan (HASP) must provide a specific analysis of the radiological exposure hazard for each task involving the disturbance or handling of radioactive material.
- If any potential is identified for worker radiological exposures, then a Category 2 RPP (SH&E SOP 127) must be developed for the work activity and included as a supplement to the HASP. The Corporate RSO will approve of the Category 2 RPP (SH&E SOP 127).
- All workers performing specific radiological investigation activities must complete radiological worker training.

8.2 Demolition Or Renovation Activities

Radiological materials may have been used in some buildings as part of previous operational activities, and if present can represent as a significant exposure hazard for personnel performing demolition and renovation activities. Accordingly, the following requirements will be observed:

- If past use of radioactive material is identified through historical assessment or existing data, then a sampling program will be completed throughout the demolition area to identify the presence of radioactive material.
- Where feasible, radioactive material will be removed prior to commencement of general work activities.
- The hazards of any remaining radioactive material will be analyzed and a Category 2 RPP developed (SH&E SOP 127) to minimize worker exposures and keep them ALARA. The RPP must be approved by the Corporate RSO (SH&E SOP 127) prior to implementation.
- A demolition or renovation notification must be filed with and approved by the EPA and any local construction regulatory agencies prior to commencing demolition activities.
- All workers performing specific radiological investigation activities must complete radiological worker training.

8.3 Other Activities

If the presence of radioactive material is identified or suspected at any work location, and there is the potential for this material to become disturbed during planned work activities, then the following requirements must be observed:

- An exposure assessment will be completed for each task in which radioactive material may be disturbed.
- The site-specific health and safety plan (HASP) must provide a specific analysis of the radiological exposure hazard for each task involving the disturbance or handling of radioactive material.

- If any potential is identified for worker radiological exposures, then a Category 2 RPP (SH&E SOP 127) must be developed for the work activity and included as a supplement to the HASP. The Corporate RSO will approve of the Category 2 RPP (SH&E SOP 127).
- All workers performing specific radiological investigation activities must complete radiological worker training.

9.0 RECORD KEEPING

Record keeping requirements vary and are maintained along with actual records by the Site/Program RSO.

9.1 General Record-Keeping Requirements

All Earth Tech employees involved in work that is off-site from the corporate office shall maintain the following records in a clear, concise and orderly format and forward copies to the Site/Program RSO at job completion. Retention periods are included in parentheses.

Record to Retain	Retention Preiod
Provisions of the Program	Until License is Terminated by Agency
Audits of Program	3 years
Radiation, Contamination, and Airborne Surveys	3 years
Instrument Calibrations	3 years
Surveys used to perform dose estimates and no instrument data are present	Until License is terminated by Agency
Measurements and calculations to determine intake of radionuclides	Until License is terminated by Agency
Results of air samples, surveys, and bioassays used to determine intake of radionuclides	Until License is terminated by Agency
Measurements of calculations and measurements used to evaluate the release of radioactive effluents to the environment	Until License is terminated by Agency
Records of internal and external dose	Until License is terminated by Agency
Records for PSEs	Until License is terminated by Agency
Records of Individual monitoring results	Until License is terminated by Agency
Records of doses to individual members of the public	Until License is terminated by Agency
Records of Waste Disposal	Until License is terminated by Agency

9.2 Information Required on Specific Records


Radiation surveys:

- Records shall be in units of dpm, becquerels (Bq), μCi , mR/h, mrem/h, etc., as appropriate. Units of “cpm” or “counts” are not acceptable for quantitative surveys records,

- Records shall uniquely identify the source of the radiation,
- Records shall clearly indicate the areas surveyed (include a map),
- Records shall indicate the person performing the survey and date of survey, and
- Records shall uniquely identify the survey instrument used, i.e., serial number, or other unique description

10.0 REFERENCES

- 10 CFR 20
- 10 CFR 835
- SH&E 128 - Radiation Protection Plans
- SH&E 129 - Radiological Exposure Assessment
- SH&E 130 - ALARA
- SH&E 131 - Non-Ionizing Radiation

 <p>Safety, Health & Environmental Procedure</p>	<p>PROCEDURE NO. <u>SH&E 128</u></p> <p>DATE <u>March 25, 2005</u></p> <p>REVISED <u>August 15, 2008</u></p>
<p>Radiation Exposure Assessment</p>	<p>PREVIOUSLY <u>ESH 903</u></p>

This procedure applies to all U.S.-based personnel, projects, offices, business units and activities. Any exceptions to this procedure must be approved, in writing, by the Corporate RSO.

1.0 PURPOSE

Earth Tech will implement radiological exposure assessment activities whenever personnel are working with ionizing radiation or radioactive materials.

2.0 RESPONSIBILITIES

2.1 Corporate Radiation Safety Officer (Corporate RSO)

- Provide technical assistance in the identification of work requiring radiological exposure assessment.
- Select and manage Earth Tech's dosimetry service provider.
- Review all annual dosimetry and bioassay summary reports.

2.2 Section Managers/Project Managers

- Section/Project Managers are responsible for implementing any required radiological exposure assessment procedures in their work activities.
- The Project Manager (PM) is responsible for verifying that all personnel assigned the task of working with radioactive materials are familiar with this procedure, have access to a copy of this procedure and have completed all required bioassays prior to being allowed into a radiologically controlled areas.
- The PM shall notify the Corporate RSO of any suspect personnel exposures requiring bioassay or whole body counts.

2.3 Radiation Safety Officers (RSO)

- Manage the RPP-specified radiological assessment procedures (dosimetry, bioassay, real-time monitoring, etc.), including distribution and collection of dosimeters.
- Ensure that all personnel assigned to the dosimetry program or other radiological assessment program are properly trained in their responsibilities (e.g., proper wear, handling, and storage of dosimeters).
- Review real-time monitoring results each day to determine compliance with the RPP-specified requirements.
- Review dosimetry and bioassay results for each monitoring period and determine compliance with the RPP-specified limitations and ALARA conditions.

- The RSO is responsible for verifying all employees requiring bioassay sampling have had their pre-job bioassay specimens completed before they are allowed to work at the site.
- The RSO is also responsible for scheduling employees to have their exit bioassay specimens collected upon completion of the project.
- The RSO will review and submit annual dosimetry and bioassay summary reports to the Corporate RSO for review and to Earth Tech's occupational medicine provider for inclusion in the employees medical record.
- The RSO will ensure that all employees are provided with their annual dose summaries.

2.4 All Earth Tech Employees

- Employees are responsible for complying with all the bioassay requirements established by this SOP. They shall not enter a radiologically controlled area without completing the required bioassay baseline requirement. They shall report any situations where they believe that they or another employee may have had an internal deposition of radioactive material.
- Will properly wear, handle, and store any dosimeter or other dose assessment device issued to them.
- Will provide bioassay samples as required by radiological monitoring procedures for programs/projects to which they are assigned.

3.0 Control and Limitation of Radiation Exposures The Federal Government has established limits on annual radiation exposure for occupationally exposed workers (Ref 10CFR20, 29CFR1926). These limits have been shown to prevent deterministic effects of radiation exposure while limiting the probability of stochastic effects. Additionally Earth Tech has established its own set of administrative limits to ensure compliance with Federal regulations and to implement the Earth Tech ALARA philosophy.

3.1 Regulatory Dose Limits for Occupationally Exposed Adults:

- Total Effective Dose Equivalent (TEDE) – 5 rem/yr (5,000 mrem/yr)
- Total Organ Dose Equivalent (TODE) – 50 rem/yr (50,000 mrem/yr)
- Shallow Dose Equivalent (SDE) – 50 rem/yr (50,000 mrem/yr)
- Extremity Dose Equivalent – 50 rem/yr (50,000 mrem/yr)
- Lens (of Eye) Dose Equivalent – 15 rem/yr (15,000 mrem/yr)
- Individual Members of the Public
 - 2 mrem in any one hour
 - Total Effective Dose Equivalent (TEDE) - 0.1 rem/y (100 mrem/y)
- Occupational Dose Limits for Minors¹ (under 18 years of age)
 - Ten percent (1/10) of any dose limit above
- Dose to an Embryo/Fetus of a Declared Pregnant Woman²

¹ Persons under 18 years of age must receive special approval from the RSO and the Human Resources Department to be allowed in any radiation area. This is to ensure conformance to radiation regulations.

² Accommodations for Declared Pregnant should be made when possible to reduce doses to the unborn. Contact the Corporate RSO for assistance.

- Total Effective Dose Equivalent (TEDE) - 500 mrem over entire pregnancy (monthly doses greater than 100 mrem should be avoided)

3.2 Earth Tech Administrative Dose Limits for Occupationally Exposed Adults.

Planned exceedance of this limits will not be allowed without an ALARA review and written concurrence from the Corporate RSO and the VP SH&E.

- Whole Body Deep Dose Equivalent (for a given quarter)
 - Level 1 – 500 mrem
 - Level 2 – 875 mrem
- Whole Body Deep Dose Equivalent (for the given year)
 - Level 1 – 2000 mrem
 - Level 2 – 3500 mrem
- Lens of the Eye Dose Equivalent (for a given quarter)
 - Level 1 – 1500 mrem
 - Level 2 – 2625 mrem
- Lens of the Eye Dose Equivalent (cumulative for the year)
 - Level 1 – 6000 mrem
 - Level 2 – 10500 mrem
- Shallow Dose Equivalent (for a given quarter)
 - Level 1 – 5000 mrem
 - Level 2 – 8750 mrem
- Shallow Dose Equivalent (cumulative for the year)
 - Level 1 – 20,000 mrem
 - Level 2 – 35,000 mrem
- Extremity Dose Equivalent (for a given quarter)
 - Level 1 – 5000 mrem
 - Level 2 – 8750 mrem
- Extremity Dose Equivalent (cumulative for the year)
 - Level 1 – 20,000 mrem
 - Level 2 – 35,000 mrem
- Organ Dose Equivalent (for a given quarter)
 - Level 1 – 5000 mrem
 - Level 2 – 8750 mrem
- Organ Dose Equivalent (for the given year)

- Level 1 – 20,000 mrem
- Level 2 – 35,000 mrem

3.3 Means of Exposure Control

Common external exposure controls include the use of time, distance, and shielding to minimize radiation doses. These concepts are thoroughly presented in Earth Tech radiation safety training courses but should also be continuously reinforced through daily or weekly radiation safety briefings.

Visitor escorts must point out any hazardous area that a visitor may be entering and must ensure that all Earth Tech radiation safety rules and precautions are observed.

4.0 REQUIREMENTS

RPPs will be used as the basis for specifying the operation-specific implementation of these elements, and will be prepared for all operations involving the potential for radiological exposure. The following operation-specific requirements pertain to activities where the on-site presence of ionizing radiation or radioactive material is identified, suspected or is recognized as a significant operational occurrence.

4.1 Hazards Associated with Radiological Operations

Radiological operations could result in internal or external dose to workers; contamination of workers, work areas, equipment, or facility systems; or release of radioactive material to the environment. The risk from occupational radiation dose depends on the amount of radiation dose received, the time over which the dose is received, and the parts of the body exposed. Contamination of workers, areas, or equipment does not necessarily result in a measurable or recordable radiation dose, but does significantly increase the cost of conducting business. Implementation of this document and its associated documents ensures general employees, visitors, subcontractors, and Earth Tech are adequately protected and that Earth Tech achieves compliance with applicable federal, state, and local rules.

5.0 Radiation Protection Standards

5.1 External Radiation Dosimetry

- Radiation dosimeters appropriate for the radiations to be monitored shall be issued by the Site/Program RSO to the individual and shall be required to be worn by:
 - Adults, minors and declared pregnant women likely to receive, in one year from sources external to the body, a dose in excess of 10% of the **administrative dose limits**, or
 - Individuals entering a High Radiation Area or a Very High Radiation Area, or
 - Individuals, who are likely to exceed 10% of the applicable extremity absorbed dose limit must wear ring dosimeters.
 - Individuals responding to emergencies involving radioactive material or ionizing radiation.

- The Site/Program RSO shall determine the “likely to exceed 10%” status of an individual, the dosimeter type, the wear period, etc.
- Any Earth Tech employee shall immediately notify the Site/Program RSO and Corporate RSO of changes in radiation producing device procedures that could significantly increase or decrease radiation doses to personnel or which could otherwise affect the need for external dosimetry.
- Radiation dosimeters shall not be issued for wear periods greater than 3 months.
- Radiation dosimeters shall not be deceptively exposed.
 - Dosimeters are issued to only one person. Dosimeters shall not be shared.
 - Dosimeters in storage and not being worn shall not be stored near sources of radiation.
 - Dosimeters should not be exposed to high heat, chemical or physical insults, or washed in a washing machine.
 - No person shall wear dosimeters issued by Earth Tech while working for another employer or institution without prior approval from the Corporate RSO. Employees shall notify the Corporate RSO if they are concurrently working for another (non-Earth Tech) employer and working with sources of ionizing radiation or radioactive material.
 - Dosimeters shall not be worn during medical or dental x-ray examinations.
 - Dosimeters shall not be worn after medical administration of radioactive materials (thyroid ablation therapy, cardiac stress tests, diagnostic nuclear medicine tests, etc.) until approved by the Corporate RSO.
 - Employees shall notify the Site/Program RSO immediately upon learning of possible deceptive exposures of dosimeters.
 - Intentional deceptive exposures of dosimeters are forbidden and may result in enforcement actions.
- Lost or damaged dosimeters shall be reported to the RSO as soon as possible.
- Persons who have lost or damaged their dosimeters shall be required to provide documentation of work activities and radioactive material uses as necessary for the Site/Program RSO to assess doses.
- Where to wear Dosimeters
 - Whole body dosimeters shall be worn at the location on the whole body likely to receive the highest dose. Normally this is the mid-section of the torso unless otherwise specified.
 - **For fetal monitoring for declared pregnant females**, whole body dosimeters should be worn on the abdomen. If a leaded apron is worn (as in radiology), the dosimeter should normally be placed on the abdomen, under the apron, and
 - If a leaded apron is worn, workers should wear whole body dosimeters underneath any leaded apron.
- Employees of Earth Tech that are assigned dosimetry badges, shall collect and return used dosimeters to the Site/Program RSO promptly after receiving replacement dosimeters at the beginning of a new wear period.
- Any person who works with any source of radiation or radioactive material on behalf of Earth Tech (or did so in the past) may make a written request to obtain a copy of his/her dose records at any time. These records are maintained by and are available from the RSO upon written request. All contact with the radiation badge service company is to be made through the Corporate RSO.
- After termination of employment, a dose report (termination report) shall be provided to all persons who received doses exceeding 10% of any radiation dose limit in the applicable reporting period.

5.2 Internal Radiation Monitoring Requirements

This section identifies a methodology to be followed to determine if employees inhaled, ingested, or absorbed radioactive materials and to establish the level of radioactive materials in their bodies prior to and after operations involving work with radioactive materials. This procedure helps verify that the implemented radioactive material controls maintain internal employee exposures As Low As Reasonably Achievable, ALARA.

This section applies to Earth Tech operations and should be used as guidelines for sub-contractors who perform radiological investigation, characterization and remediation work for Earth Tech. The term employee refers only to Earth Tech personnel and the requirements established in this SOP apply only to them and not to sub-contractor personnel.

5.2.1 Bioassay Policy

5.2.1.1 Initial Employment

- New employees beginning work with Earth Tech who will work with radioactive materials, shall inform the RSO of their previous radiation exposure history, if any. NRC Form 4 or equivalent may be used.
- Employees with a previous radiation exposure history who can not provide documentation of their previous internal exposure shall submit a urine specimen for radiological analysis, if requested by the RSO, and/or submit to having a whole body radiation count accomplished.
- Employees without previous radiological exposure experience shall be required to initially submit a urine specimen or have a whole body count accomplished prior to beginning work with radioactive materials.
 - NOTE:** Baseline bioassay analysis documents previous radioactive material intake to establish a point of reference at the start of employment at Earth Tech.
- Also, note that **ALL** urine specimens are collected continuously over a 24-hour period. Since the Reference Person excretes 1.4L of urine during a 24-hour period and not every person is a Reference Person, then specific excretion rates must be determined to avoid errors in calculating internal dose. Therefore, when a urine specimen is collected, the RSO will furnish a suitable plastic container to collect a urine specimen continuously over a 24-hour period.

5.2.1.2 Initiation of a Project

Employees assigned to work in a radiologically controlled area where there is the potential for internal deposition of radionuclides, shall submit either a 24-hour urine specimen for radiological analysis or submit to a whole body count prior to being permitted in the radiologically controlled area. This policy requirement establishes the individuals internal radionuclide deposition baseline.

No employee shall be permitted in an area where there is the potential for internal deposition of radioactive material without having a baseline bioassay established.

5.2.1.3 During the Project

The normal periodic sampling frequencies are provided below to determine the magnitude and extent of a potential intake with subsequent uptake:

- **Weekly to Monthly**, a specimen will be collected for Class D (Absorption Type F) radionuclides. A change in sampling frequency may be performed if the RSO determines that more sampling is necessary.
- **Monthly to Quarterly**, a specimen will be collected for Class W (Absorption Type M) radionuclides. A change in sampling frequency may be performed if the RSO determines that more sampling is necessary.
- **Quarterly to Annually**, a specimen will be collected for Class Y (Absorption Type S) radionuclides.. A change in sampling frequency may be performed if the RSO determines that more sampling is necessary.

Any employee who has reason to believe that he/she may have had an internal deposition of radioactive material shall note the time of the suspected intake and promptly notify the site radiation safety officer (Site RSO) and/or project manager (PM) as soon as possible. When an investigation by the PM and Site RSO establishes that internal deposition could have occurred, the employee shall provide a urine specimen for radiological analysis or agree to undergo a whole body count as determined by the Site RSO.

5.2.1.4 Termination of a Project

5.2.1.4.1 Determination of Exit Bioassay

At the completion of the project or upon demobilization from the radiologically controlled area, or at a time determined by the RSO, each employee who was potentially exposed to radioactive material during the project shall submit either a urine specimen for radiological analysis or submit to a whole body count as determined by the RSO.

NOTE: The result of this bioassay will be compared with the baseline established before work commenced to determine if any radioactive material has entered the body and to evaluate the effectiveness of the controls established during the project.

5.2.1.4.2 Exceptions to Exit Bioassay

The RSO may request from the Corporate RSO, an exception to the above requirement be made. At a minimum, the request for exception should include measurements and/or calculations that demonstrate that no legal or administrative dose limit was exceeded. The Corporate RSO will approve or disapprove of the request for exception and provide the decision in writing to the RSO.

5.2.1.5 Emergency Response Projects

- Some projects, by their nature, require emergency response personnel to assist in mitigating and/or removing conditions that exist outside normal operating parameters. These responses usually require immediate attention.
- Bioassay requirements for emergency response projects shall comply with the requirements of Section 5.2.1 of this SOP.

- Exceptions to exit bioassays shall be conducted according to the requirements of section 5.2.1.4.2 of this SOP.
- Applicable procedures for emergency response bioassays are found in Section 5.2.2 of this SOP.

5.2.2 Bioassay Procedures

5.2.2.1 Routine Bioassays

5.2.2.1.1 Determine each employee's previous radiation exposure history using NRC Form 4 or equivalent and file the information in the employee's master file.

5.2.2.1.2 Routine whole body counts or urine analysis are conducted on personnel who will work with radioactive materials in order to verify that radiation protection program controls protect individuals working with radioactive materials.

5.2.2.1.3 Urine specimens shall be required for all occupationally exposed workers entering radiologically controlled areas that have a potential for intake of radionuclides.

5.2.2.1.4 Urine specimens shall normally consist of a 24-hour collection period, but may be changed if only a spot check sample is required by the RSO. Specimens for the purpose of this procedure shall be taken only for the determination of internal radioactive or materials deposition.

5.2.2.1.5 Urine specimens shall be labeled on the bottle with the following as a minimum:

- the project name and number
- indicate an baseline, routine, or exit specimen
- the date of sampling
- the name of the employee providing the specimen
- the social security account number (SSAN) of the employee
- the date of birth of the employee.

The following is an example of the label to be affixed to the specimen container. The label shall be sized to fit the container in which the specimen is stored and shipped. Affix the label so that it will not easily become detached from the specimen container.

Employee Name: Specimen Date:	
SSAN/IDN:	DOB:
Type of Sample: <input type="radio"/> Baseline <input type="radio"/> Routine <input type="radio"/> Exit	Project Name/#
Project Manager:	Send Results To:

Example Bioassay Label

Use the Sample Chain of Custody procedures to record the required information to establish control and subsequent tracking of the required radiological analysis of the specimen(s).

Whole body counts shall be required when working with gamma emitters for which urine specimen analysis is a poor indicator of exposure.

Whole body counts shall be conducted with particular concern to the gamma energy range of interest for radionuclides encountered at the project site.

Documentation of body count results shall include a written review by the Corporate RSO.

5.2.2.2 Bioassays Resulting from High Airborne Radioactivity

If air monitoring identifies radionuclide concentrations that exceed, during the hours an individual is present in a week, an intake of 0.6 percent of the annual limit on intake (ALI) or 12 DAC-hours and respiratory protection is not in use, then initiate emergency bioassay procedures in the section that follows..

5.2.2.3 Emergency Bioassay Procedures

5.2.2.3.1 If radioactive material is discovered on or around the face, nose or mouth of an employee, perform a spot urine sample to assist in determining the likelihood of an intake of radioactive material.

5.2.2.3.2 Send the spot sample to a NVLAP/DOELAP certified radioanalytical lab for appropriate radionuclide analysis on a 3-day turn-around time. Note that 3 days is the quickest an analysis can be done for alpha emitting radionuclides, but gamma spectroscopy results can be obtained overnight in many cases.

5.2.2.3.3 If the results of the spot sample indicate that an intake of radioactive material has occurred, then immediately collect a 24-hour urine specimen for additional analysis. The 24-hour collection period is needed to determine the biologically specific excretion rate of the individual(s) so that better assessments of internal dose can be made.

5.2.2.3.4 Send the urine specimen to a NVLAP or DOELAP certified radioanalytical lab for analysis. If alpha emitters are present, then request a 3-day turn around time for results. If beta/gamma emitters are present, then ask for a single day turn around time. If only a pure beta emitter is present, then ask for a three day turn around time for results.

5.2.2.3.5 Record the bioassay data to facilitate an internal dose assessment. The information shall be as accurate as possible. The following information shall be collected as a minimum:

- Time and date of the event.
- A discussion of the events leading to the situation, the results of initial and subsequent surveys of the employee(s) involved.
- The initial levels of contamination, radiation dose rates, airborne radioactivity concentrations, chemical exposure, weather and/or ventilation conditions, wind velocities, air flow rates, aerosol particle sizes, and other information that may be available.


5.2.2.3.6 When bioassay results are received, forward this information and the information collected required by Section 5.2.2.3.5 to the Corporate RSO for evaluation.

6.0 Records

Records of internal and external dose shall be maintained according to the requirements of SH&E SOP 126

7.0 References

- SH&E 129 - *ALARA*
- NRC Regulatory Guide 8.9, *Acceptable Concepts, Models, Equations, and Assumptions for a Bioassay Program*
- NRC Regulatory Guide 8.10, *Operating Philosophy for Maintaining Occupational Radiation exposures As Low As is Reasonably Achievable*
- NRC Regulatory Guide 8.13, *Instruction Concerning Prenatal Exposure*

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<p>ALARA</p>	<p>PREVIOUSLY <u>ESH 904</u></p>

This procedure applies to all U.S.-based personnel, projects, offices, business units and activities. Any exceptions to this procedure must be approved, in writing, by the Corporate RSO.

1.0 PURPOSE

Earth Tech will actively seek to minimize total ionizing radiation exposures to both individual employees and to our collective workforce. This principal, known as ALARA (As Low As Reasonably Achievable) will be incorporated into all safe work procedures pertaining to employee use of radioactive materials or exposure to sources of ionizing radiation (see SH&E 127 - Radiation Protection Plans).

2.0 RESPONSIBILITIES

2.1 Corporate Radiation Safety Officer (RSO)

- Ensuring that ALARA goals are established,
- Ensuring that engineering and administrative controls are optimized.
- Ensuring that ALARA evaluations are conducted and documented,
- Ensuring that recommended ALARA dose reduction measures are evaluated, optimized, and implemented, as appropriate.
- Maintaining records of ALARA evaluations and design reviews, and other information needed to support optimization decisions.

2.2 Radiation Safety Officers

- Conducting and documenting ALARA evaluations
- Ensuring that hazards are adequately analyzed during the pre-start job review and that the required safety controls and hold points are integrated into the operation and the work plans.
- Involving the Site/Program RSO in the planning phase of radiological work to be accomplished,
- Reviewing radiological operations with the Site/Program RSO prior to initiating work and periodically thereafter.
- Coordinating and participating in pre-start briefings, as appropriate.
- With the support of the Site/Program RSO, identifying individuals or work groups containing individual who are likely to receive doses exceeding 0.1 rem/year and recommending appropriate ALARA goals.
- Notifying the worker if he or she is likely to exceed their ALARA goal and discussing options for managing the situation.

2.3 Section/Project Managers

- Involving the Site/Program RSO in the planning phase of radiological work to be accomplished.
- Ensuring individuals who are designated as Site/Program RSOs are aware of his/her responsibilities of this SOP.
- Ensuring that engineering and administrative controls are optimized.
- Issuing annual ALARA goals.

2.4 Occupational Workers

- Being generally aware of their current, annual, dose-to-date based on reports provided by the Dosimetry Service Provider. (Note: reports are only issued if an individual receives a positive dose.)
- Participating in ALARA evaluations, as requested.
- Implementing the ALARA controls specified in plans and procedures.

3.0 PROCEDURE

Even though current occupational exposure limits provide a very low risk of injury, it is prudent to avoid unnecessary exposure to radiation. The objective is thus to reduce occupational exposures as far below the specified limits as is reasonably achievable by means of good radiation protection planning and practice, as well as commitment to policies that foster vigilance against departures from good practice.

In addition to maintaining doses to individuals as far below the limits as is reasonably achievable, the sum of the doses received by all exposed individuals should also be maintained at the lowest practicable level. It would not be desirable, for example, to hold the highest doses to individuals to some fraction of the applicable limit if this involved exposing additional people and significantly increasing the sum of radiation doses received by all involved individuals.

Two basic assumptions are considered necessary in this program for keeping occupational exposures as far below the specified limits as is reasonably achievable. Those two conditions are management commitment to maintaining exposures as low as is reasonably achievable, and the personnel responsible for radiation protection should be continuously vigilant for means to reduce exposure.

3.1 ALARA Policy Statement and Implementation

It is Earth Tech's policy to plan and conduct its radiological activities safely and in such a fashion as to protect the health and safety of its employees, subcontractors, members of the public, and the environment. To achieve this, Earth Tech shall ensure that efforts are taken to reduce radiological exposures and releases to the environment as low as is reasonably achievable, taking into account social, technical, economic, practical and public policy considerations. Earth Tech is committed to implementing a radiological control program that reflects this policy.

To implement this policy, Earth Tech shall:

- Review radiological operations and analyze the hazards.
 - Develop and implement controls that reduce or eliminate unnecessary dose and keep the necessary doses low.

- Document the controls in the Health and safety Plan, Radiation Protection Plan, or other work document.
 - Document areas surveyed for radioactive material and retain the records according to SH&E SOP 126.
- Establish ALARA goals for individuals or work groups (SH&E SOP 128).
 - Provide feedback to workers and managers by tracking an individual's dose (from all operations) relative to their ALARA goal.
 - Reevaluate the situation if it appears an individual is likely to exceed their ALARA goal.

3.2 Readiness Reviews

During routine operations, the combination of engineered design features, workplace monitoring, administrative controls, and personnel protection equipment (PPE) shall be implemented to ensure that doses are maintained below established criteria (SH&E SOP 128). Engineering design controls (e.g., confinement, ventilation, remote handling, and shielding) shall be the primary means to maintain radiation exposures as low as reasonably achievable. To maintain these specifications, routine monitoring is paramount to the success of all ALARA programs.

Administrative controls (e.g., plans, procedures, training, and signs) shall be used only where engineering methods require supplemental assistance. Where engineering controls are not practicable, then administrative controls may be implemented. To maintain exposures ALARA.

Lastly, Personal Protective Equipment (PPE) provides a third tier of exposure minimization.

3.3 ALARA Reviews (prior to beginning work)

3.3.1 Periodic ALARA Reviews

When developing work and/or radiation protection documents, a graded approach should be used. The work plans should:

- Ensure that radiological hazards are adequately addressed and that lessons learned are incorporated from previous experiences to help maintain exposures ALARA.
- Identify the proper engineering and administrative controls required to minimize the spread of contamination, maintain exposures ALARA, considering existing work load and near-by operations that may affect the performance of radiological duties.

3.3.2 Consideration of Non-Radiological Hazards

Implementation of a radiation safety control may introduce unintended consequences that may negatively impact the overall safety of the operation. For example:

- Excessive protective clothing or equipment used to control dose or personnel contamination events may have deleterious consequences, such as heat stress and ergonomic impacts.
- Respirators used to reduce intakes of radionuclides may impair visual acuity and communications capabilities among workers.

- Protective clothing and equipment used to protect workers from chemical hazards may slow down work, leading to increased worker dose.

3.4 ALARA Goals and Evaluations

3.4.1 Requirements

ALARA goals shall be established for individuals who may be involved in operations that could result in exposures greater than 0.1 rem from all operations. The ALARA goals should:

- Be based on historical values for this type of work or on estimations of dose and should be modified either up or down depending upon the nature of the work involved.
- Be periodically evaluated relative to accrued dose received by the worker.

Management shall normally issue ALARA goals.

An ALARA evaluation is required for individuals or workgroups who have an ALARA goal of 0.5 rem or more for a given calendar year. As part of the evaluation, the Site/Program RSO is responsible to the Corporate RSO to provide names of individuals who have ALARA goals greater than 0.5 rem.

3.4.2 Providing and Responding to Feedback

Periodically (e.g. every 3 months) each Site/Program RSO is required to submit a trending graph to the Corporate RSO that displays a person's dose received during the course of a year. The trending is conducted to observe whether an individual is approaching 0.1 rem for the year and no ALARA goal has been established.

If it is observed that an individual is approaching 0.1 rem for the year and no ALARA goal has been established, then the Site/Program RSO will notify the Corporate RSO of this and provide an ALARA goal.

Annually, the Site/Program RSO will provide a report to the Corporate RSO that includes a summary of:

- Doses received including maximum individual and collective doses,
- Notable trends or ALARA issues.

The Site/Program RSO shall:

- Notify the worker if a worker is approaching his/her ALARA goal,
- Complete an ALARA re-evaluation prior to allowing a worker to exceed an ALARA goal or raising an ALARA goal,
- Inform the Corporate RSO of any increased ALARA goals
- Evaluate and respond (as appropriate) to increasing dose, airborne, or contamination trends and other indicators that could be precursors to unnecessary dose,
- Conduct and document a post-job review/critique if an ALARA goal of 0.5 rem or 40 DAC-hours in a year is exceeded.

3.4.3 Requirements of ALARA Evaluations

If an individual or group of workers is expected to exceed 0.5 rem in a year or 40 DAC-hours in a year, then an ALARA evaluation is required. The contents of the ALARA evaluation are provided in Appendix A of this SOP.

4.0 Records

The Site/Program RSO shall maintain records of periodic ALARA trending, annual summary reports, and ALARA evaluations for a period of 5 years.

5.0 References

National Council on Radiological Protection and Measurements (NCRP), Publication 127, "Operational Radiation Safety Program" (1998).

U.S. Department of Energy, "Occupational ALARA Program," *10 CFR 835 Implementation Guide*, DOE G 441.2-1 (December 1998) (Formerly G-10 CFR 835/B2-Rev 1).

U.S. Nuclear Regulatory Commission, "Operating Philosophy for Maintaining Occupational Radiation exposures As Low As is Reasonably Achievable," Regulatory Guide 8.10, Rev. 1 issued May 1977.

6.0 Attachments

Attachment 1 – ALARA Evaluation

ALARA Evaluation

This appendix contains a form for documenting an ALARA evaluation and instructions for its use. Alternate forms that contain equivalent information are acceptable. The text below are instructions for filling out the forms found below.

Title

Replace the 'xxx' with identifying information such as the name of the work group or the operation being evaluated.

1. Operation or work activity covered by this ALARA evaluation.

Provide the requested information. Add additional 'responsible people', as desired. If the ALARA Evaluation is being done for an individual (as opposed to a Work Group), mark 'Work Group' as NA.

2. Reason for ALARA Evaluation:

Check all the boxes that apply. If using an electronic form, double-click on the box to 'check' it.

Identify the work group (as applicable) or the individual workers, and the annual ALARA goal.

3. Methods used to conduct this ALARA Evaluation:

Check all the boxes that apply. If 'other' is checked, provide amplifying information.

4. Overview of work activities covered by this ALARA evaluation.

Provide a brief description of the work to be conducted. Verbiage found in the Work Plans is often appropriate to 'copy and paste' here. If more than one work control document is included, identify which document is associated with which operation. The 'starter sentence' is provided as a guide; it may be replaced by a more appropriate verbiage.

5. Work activities and major projects that contribute(d) significantly to dose.

'5a, b, and c' are provided as example statements that would be appropriate in this section. Replace the 'xxx' with a description of work activities that produce significant proportions of the worker's dose, or replace the sentences with more appropriate text. Use bullets, if desired.

6. Dose profile for workers involved in this operation.

The dose profile should include information such as the neutron to gamma ratio, the photon energy, the rate of dose accrual (if not uniform), and the collective dose for the work group. Use applicable historical information when possible.

Indicate if significant changes (e.g., greater than about 30%) are anticipated in collective dose and indicate the reasons for anticipated changes in collective dose.

7. Administrative and engineered ALARA dose reduction measures currently in place.

Provide specific dose reduction measures currently in place (e.g., “Shielded transfer carts are used when moving material from one room to another.”) Indicate ALARA measures that are already planned, but not implemented (e.g., “A shielded drum-opening section is being fabricated and will be installed in March.”) Do not include general statements (e.g., “Minimize time in the higher dose rate areas.”)

8. Possible additional administrative and engineered ALARA dose reduction measures.

The purpose of this section is to identify additional dose reduction measures and areas where the biggest gains in dose reduction can be achieved.

In the table, replace the ‘xxx’ with appropriate, but specific, verbiage. Rate each control (High, Medium, Low (H/M/L)) relative to its importance in reducing current dose, and its importance in further reducing dose.

9. Recommended additional ALARA dose reduction measures.

In this section, identify the conclusions of the ALARA evaluation, including results from any optimization analyses. Be specific enough so that readers (who have not been involved in the evaluation) fully understand the scope of the recommendation.

10. Site/Program RSO evaluation

The Site/Program RSO participating in the evaluation should document their assessment of the evaluation. The Site/Program RSO’s signature means they agree with their comments made in this specific section.

11. Review/concurrence:

The Corporate RSO (or other designee) must sign the ALARA evaluation. Additional signature lines may be added such as for the Section Manager.

12. ALARA re-evaluation:

The Section/Project Manager should fill out this section if the criteria are met. The Site/Program RSO should use ‘Site/Program RSO comment’ to provide any alternate opinions or viewpoints. The Site/Program RSO signature mean either 1) concurrence with the information provided by the Section/Project Manager (if the ‘Site/Program RSO comment’ is blank) or 2) concurrence with the ‘Site/Program RSO’s comment’ if a comment is provided.

Operational ALARA Evaluation for xxx.

1. Operation or work activity covered by this ALARA evaluation:

Work/HASP/RPP (or other work control document) name(s)/ number(s):	
Operation:	
Date of initial evaluation:	
Section/Project Manager:	
Site/Program RSO:	
Corporate RSO:	
Work Group or name and employee number of individuals evaluated:	

2. Reason for ALARA Evaluation:

- Prospective dose evaluation.

Estimate the highest individual whole-body dose from this operation assuming normal operations and currently existing ALARA dose reduction measures:

- <0.1 rem (No further documentation required)
- ≥0.1 rem - 0.5 rem (ALARA goals required)
- >0.5 rem – 0.99 rem (ALARA goals and ALARA evaluation required)
- 1.0 rem – 2.0 rem (ALARA goals and ALARA evaluation required)
- >2 rem and <5 rem (ALARA goals and ALARA evaluation required)

Method used to estimate individual dose:

- Calculations based on anticipated amounts of material and stay times
- Extrapolation from existing or previous work to anticipated work
- Previous years' dose(s)
- Time-motion studies
- Other (describe):
- An ALARA goal exceeds 0.5 rem/y. Specify in the table below:

Work Group/Individual Workers	ALARA Goal

- Predicted individual exposure to airborne radioactivity is expected to exceed 40 DAC-h in a year.
- Other:

3. Methods used to conduct this ALARA Evaluation:

- Review of applicable HASP/RPP/Work control documents
- Review of completed work and projected work
- Personnel interviews with supervisor and staff
- Workplace walkthroughs
- Work observations
- Work simulation
- Review of dose histories for members of the work group
- Review of dose profiles for members of the work group
- Review of workplace monitoring records
- Other:

4. Overview of work activities covered by this ALARA evaluation.

The following Safety Plans (SPs) are used for routine work activities:

- a. SP xxx covers work activities.....

5. Work activities and major projects that contribute(d) significantly to dose.

Identify work activities and major projects that contribute(d) significantly to dose.

- a. The primary routine work activities that contribute to dose are xxx...
- b. Major projects that can or have contributed to dose are xxx...
- c. Upcoming major projects that will likely require an increased ALARA goal (applicable only if the new goal is greater than 0.5 rem/y):

6. Dose profile for workers involved in this operation or Work Group.

Identify the dose profile for workers involved in this operation or Work Group.

Note: This form must be handled as privacy protected information (i.e., For Official Use Only) if actual individual doses are identified.

- a. Review of individual dose records from the preceding calendar year(s) (CYxxxx) identified the following information:

Number of workers in dose range:	CY 200x	CY 200x
<0.1 rem		
0.1 – 0.5 rem		
0.5 – 1.0 rem		
1.0 – 1.5 rem		
1.5 - 2.0 rem		

- Dose from gamma radiation represents approximately xxx% of the total whole body dose.
- The energy of the gamma radiation is relatively (low/high), averaging about xxx keV.
- Dose from neutron radiation represents the remaining xxx% of the whole body dose.
- The collective dose for this work group was xxx person-rem.

- b. Based on anticipated work and workload, the collective dose for the upcoming year (CY200x) is
- Expected to stay about the same. (Go to #7.)
 - Expected to decrease significantly (e.g., by more than about 30%).
 - Expected to increase significantly (e.g., by more than about 30%).
- c. The magnitude and reasons for the anticipated (increase/decrease) are as follows:
- The collective dose is likely to (increase/decrease) by about xxx person-rem. The anticipated collective dose range for the upcoming year is about xxx– yyy person-rem.
 - The collective dose is likely to (increase/decrease) because xxxx....

7. Administrative and engineered ALARA dose reduction measures currently in place.

- a. In the table below, identify administrative and engineered ALARA dose reduction measures currently in place. Then, use “H”, “M”, or “L” (High, Medium, or Low) to identify its importance in reducing whole body dose for current operations, and the potential to further reduce dose. Add more rows for additional dose control measures, if needed.

ALARA Dose Reduction Measures	Importance in reducing current doses? (H/M/L)	Potential for further dose reduction? (H/M/L)
1. Dosimetry appropriate for work conducted. <i>Describe: xxx</i>		
2. Work conducted in a low-background area. <i>Describe: xxx</i>		
3. Shielding of material or work area. <i>Describe: xxx</i>		
4. Use of devices that increase distance between worker and material. <i>Describe: xxx</i>		
5. Limiting stay-times. <i>Describe: xxx</i>		
6. Hold points. <i>Describe: xxx</i>		
7. Pre-job planning / briefings, feedback, improvement. <i>Describe: xxx</i>		
8. Other:		

- b. Identify future anticipated ALARA efforts (i.e., those currently planned but not yet implemented):

- xxx

8. Possible additional administrative and engineered ALARA dose reduction measures.

Identify possible additional administrative and engineered ALARA dose reduction measures and categorize the potential impact (high/medium/low) on dose savings. Do not consider cost when identifying potential measures.

- a. xxx
- b. xxx

9. Recommended additional ALARA dose reduction measures.

Based on this evaluation, identify recommended additional ALARA dose reduction measures (if any).

Note: The cost of dose control measures and the cost per person-rem saved should be calculated over the life of the facility or operation as described in Appendix C and need to be included only if the protective measure will NOT be implemented. A more detailed review (e.g., one involving cost-benefit analysis) does not need to be conducted if the cost, together with the cost of documentation, outweighs the potential value of the benefits.

- a. xxx
- b. xxx

10. Site/Program RSO evaluation. Check all that apply:

- I concur with the recommendations of this ALARA evaluation.
- I recommend a detailed cost-benefit analysis be conducted.
- I recommend the following:
- Comments:

Site/Program RSO Date (Printed name/initials)

Date:

11. Review/concurrence:

The signatures below mean,

“I have reviewed this report and understand the ALARA recommendations. This report will be reviewed or reevaluated prior to an individual exceeding their ALARA goal or raising an individual worker’s ALARA goal.”

	Name/Initials	Date
Section/Project Manager:		
Corporate RSO:		

12. ALARA re-evaluation:

Fill out this section prior to any worker exceeding their annual ALARA goal or prior to raising a worker’s ALARA goal. In cases where the ALARA goal is established for the work group, and the


ALARA goal is generally appropriate for the majority of workers, management may choose to allow an individual or individuals to exceed the ALARA goal established for the work group. Regardless of whether the ALARA goal is raised or knowingly exceeded, management attention is required.

Note: On the rare occasion that a worker unexpectedly exceeds their ALARA goal, minimize additional dose to the worker until this section is filled out. Under normal circumstances, this section should be filled out within one week of the Section/Project Manager being informed of the situation.

- a. Explain why an individual or one or more individuals in this work group are likely to exceed their annual ALARA goal (as stated in #2, above).
- b. Identify actions, if any, that will be taken to minimize additional dose to the individual(s).
- c. The current annual ALARA goal (see paragraph 2):
 - Is appropriate and should not be changed..
 - Should be changed to _____ rem.
 - May be exceeded by this individual because:
- d. Other comments:
- e. Site/Program RSO comments:

Concurrence:

	Signature	Date
Site/Program RSO:		
Section/Project Manager:		
Corporate RSO:		

 Safety, Health & Environmental Procedure	PROCEDURE NO. <u>SH&E 201</u>
	DATE <u>March 25, 2005</u>
General Safety Rules	REVISED <u>August 15, 2008</u>
	PREVIOUSLY <u>ENV 201</u>

This procedure applies to all U.S.-based personnel, projects, offices, business units and activities. Any exceptions to this procedure must be approved, in writing, by the responsible District/Business Unit Manager and Safety Manager.

1.0 PURPOSE

This procedure will provide general guidelines that are to implement when executing work in the field. Additionally, it provides references to other applicable procedures that are to be implemented.

2.0 SCOPE

This procedure applies in its entirety to all Earth Tech projects and operations, and personnel working on these projects and operations.

General Guidelines

- Each office/project site where full-time Earth Tech staff are assigned or Earth Tech has established a full-time presence will have the appropriate labor posters (contact you human resource and SH&E representative or professionals for specifics). Ensure local and state posting are included. At a minimum ensure OSHA's Occupational Safety Health and Act Poster (OSHA 3165) is prominently posted. A source for these forms can be found on the SH&E website at: http://etconnect.earthtech.com/sites/SHE_United_States/SHE_US_Resources/Shared%20Documents/US_Resources_Links.aspx, or directly from gNeil at www.gneil.com, or from OSHA at www.osha.gov.
- Legible and understandable precautionary labels will be prominently affixed to all containers of chemical raw materials, intermediates, products, by-products, mixtures, scrap, waste, debris, and contaminated clothing, per DOT, EPA, OSHA, or other applicable regulations.
- At least one person qualified in the administration of first aid and cardiopulmonary resuscitation (CPR) will be present at all times at each Earth Tech work site unless exempted by the SH&E Department (Safety Manager). **Recognized agencies providing training and qualification in First Aid/CPR are the American Red Cross and the American Heart Association.**
- Adequate first aid kits will be provided at each project site. Each kit will be stored in a durable water resistant storage case equipped with handles, and have a means for mounting in place.
- As appropriate, equipment on site will be bonded and grounded, spark proof, and explosion resistant. Ground fault interrupters will be utilized for all electrical equipment.
- Hazards from protruding objects, careless movements, or placement of materials on paths or foot traffic areas present a problem with regard to slips, trips, falls, and puncture wounds. Personnel will use a reasonable amount of effort to keep slip, trip and fall hazards to a minimum.

3.0 EMPLOYEE PERFORMANCE RULES

- Each employee, as a condition of employment, is required to comply with the health and safety procedures and the site safety plan governing in each area the employee is required to work. Project Managers are to review records of each employee to ensure that all requirements are in compliance.
- No one will initiate work on a project involving hazardous materials until appropriate training as required by regulation, contract and/or SH&E procedures have been implemented.
- All employees are directed to immediately bring to the attention of the Site Supervisor or Site Safety Officer any unsafe condition, practice or circumstance.
- The following practices are expressly forbidden during operations on work sites:
 - Smoking, eating, or drinking while on site except in designated areas;
 - Ignition of flammable or reactive materials;
 - Entry on site without proper safety equipment;
 - Conduct of operations on site without backup personnel.
- Employees must report every incident/accident to their supervisor immediately, whether or not anyone is injured. Directions regarding first aid, medical treatment, etc. will be provided by the supervisor.
- Employees may not alter or attempt to repair or service safety equipment unless specifically authorized and qualified.
- An employee must not attempt to move (push, tilt etc.) or lift heavy or bulky objects beyond his capacity. No employee will move or lift more than 49 pounds without aid.
- Possession or use of alcohol, intoxicants or drugs on company premises or job sites is prohibited. Employees may not report for work or perform duties while under the influence of alcohol, intoxicants or drugs.
- Use of some types of prescription drugs may affect a workers ability to perform certain types of work activities safely. Use of a prescription drug which bears warning labels concerning limitations of physical activities or who's documented side effects could affect job performance (e.g., drowsiness, reduced reaction time) must be reported to the employees' supervisor or direct manager. The SH&E Manager will initiate an evaluation, with guidance from the Earth Tech Medical Provider, to determine if any work restrictions are warranted.
- Walking under or working under a suspended load is not permitted.
- Personnel on site will use the "buddy" system (pairs), working alone on any job site is forbidden unless emergency procedures and communication with the client, PM, and/or Earth Tech office are established prior to initiating site operations. Communication or visual contact will be maintained between crew members at all times.

3.1 General Safe Work Practices

- Anyone known to be under the influence of alcohol, intoxicants, or drugs will not be allowed on the job while in that condition. Additionally, this event will be reported to the individual's supervisor and district human resource representative. The employee will not be permitted to return to work until authorized to do so by their supervisor and the human resource representative.
- Horseplay, scuffling, and other acts that tend to have an adverse influence on the safety or well-being of the employees are prohibited.

- Work will be pre-planned and supervised to prevent injuries while handling materials and working with equipment.
- Prior to performing any ground-intrusive work the project team must perform a subsurface utility clearance using appropriate methodologies (State Dig-Alert service – 811, review of site as-built drawings, geophysics testing, physical survey, etc.). If intrusive work is required inside of the clearance limits for any utility mark-outs (these vary by provider and methodology), a specific work procedure must be developed and reviewed by the SH&E Professional assigned to the project.
- No one will knowingly be permitted or required to work while the employee's ability or alertness is so impaired by fatigue, illness, or other causes that it might unnecessarily expose the employee or others to injury.
- Employees will not enter confined spaces unless in full compliance with the provisions of SH&E 118 – *Confined Space Entry Program*.
- No equipment will be operated unless all appropriate guards and safety devices are in place and properly adjusted.
- Crowding, pushing, or shoving when boarding or leaving any vehicle is prohibited.
- A lock-out or tag-out device installed in accordance with SH&E 119 - *Lock Out & Tag Out Program* will not be violated except under emergency conditions, and then only in accordance with the emergency provisions procedure in SH&E 119.
- To the extent practical, mechanical or powered equipment will be used to handle, lift, or move heavy objects. Manual handling of heavy objects will be kept to a minimum. When muscle power is used to handle heavy objects, the lifts will be planned and assistance obtained to minimize the risk of injury.
- Footwear worn onsite must comply with the current version of ANSI Z41.1, or ASTM Standard ASTM F 2413-05 (must be stamped in or on footwear). Footwear is to be 100% leather, equipped with a safety toe, and have a minimum ankle cuff of 6 inches in height.
- Materials, tools, or other objects will not be thrown from buildings or structures until proper precautions (such as materials chutes) are taken to protect others from the falling objects.
- Employees will wash thoroughly (using soap and water) before eating, drinking, smoking, or after leaving the jobsite. When hazardous materials or hazardous waste are involved, employees will go through appropriate decontamination.
- Workers will observe all safety precautions when using ladders in accordance with SH&E 501 – Ladders.
- Gasoline will not be used for cleaning purposes.
- All sources of ignition will be eliminated from the work area when using flammable solvents.
- No burning, welding, or other hot processes or source of ignition will be applied to any enclosed tank or vessel, even if there are some openings, until it has first been determined that no possibility of explosion exists, and authority for the work is obtained from the foreman or supervisor.

- Any damage to scaffolds, falsework, or other supporting structures will be immediately reported to the foreman or supervisor and repaired before use.
- Wear appropriate gloves when handling materials. Leather work gloves are usually sufficient when handling wood. Special gloves are available for handling broken glass and other especially sharp objects. If the materials are contaminated, wear gloves to protect against the contamination under the work gloves. Chemically-protective gloves must be protected against puncture just as your skin must be protected.

3.2 Use of Tools and Equipment

- All tools and equipment will be maintained in good condition
- Damaged tools or equipment will be removed from service and tagged "DEFECTIVE."
- Pipe or Stillson wrenches will not be used as substitutes for other wrenches.
- Files will be equipped with handles and not used to punch or pry.
- Screwdrivers will not be used as a chisel.
- Wheelbarrows will not be pushed with the handles in an upright position.
- Portable electric tools will not be lifted or lowered by means of the power cord. Ropes will be used.
- Electric cords will not be exposed to damage from vehicles.
- In locations where the use of a portable power tool is difficult, the tool will be supported by means of a rope or similar support of adequate strength.

3.3 Machinery and Vehicles

- Only authorized persons will operate machinery or equipment.
- Loose or frayed clothing, long hair, dangling ties, finger rings, etc., will not be worn around moving machinery or other sources of entanglement.
- Machinery will not be serviced, repaired, or adjusted while in operation, nor will oiling of moving parts be attempted, except on equipment that is designed or fitted with safeguards to protect the person performing the work. Machinery will be locked out and tagged out in accordance with SH&E 119 – *Lock Out & Tag Out Program*.
- Persons will not work under vehicles supported by jacks or chain hoists, without protective blocking that will prevent injury if the jacks or hoist should fail.
- Air hoses will not be disconnected until the pressure has been bled off the line.
- All excavations will be visually inspected before backfilling to ensure that it is safe to backfill.
- Prior to entry all excavations shall be inspected by a competent person
- Excavating equipment will not be operated near tops of cuts, banks, and cliffs if workers are at risk below.

- Tractors, bulldozers, scrapers, and carryalls will not operate where there is the possibility of overturning in dangerous areas such as edges of deep fills, cut banks, and steep slopes.
- When loading excavated soil/debris, the wheels or treads of loading equipment should be turned in the direction that will facilitate escape in case of dangerous slides or movement of material.

4.0 EMERGENCY PLANNING

- A sufficient number of fire extinguishers, with a minimum rating of 2A:10B:C, will be strategically located throughout the areas where active work is progressing so that travel distance to an extinguisher from any location is less than 75 linear feet. In high hazard areas, this distance may be reduced to ensure a timely response.
- Where work operations involve the on-site handling or use of corrosive materials (strong acids/bases, etc.) or materials which can cause significant eye irritation/damage, a fixed or portable eye wash unit will be located within 10 seconds of the work area. The eyewash unit will meet the latest requirements of American National Standards Institute (ANSI) Standard Z358.1, and be capable of supplying hands-free irrigation of both eyes for at least 15 minutes at a flow rate of at least 0.4-gallon per minute. At the discretion of the SH&E Department (Safety Manager), an emergency drench shower, meeting the requirements of ANSI Z358.1, will also be provided.

5.0 ADMINISTRATIVE REQUIREMENTS

5.1 OSHA POSTER

Each office and project site must have the appropriate OSHA poster (state or federal) posted prominently. A link to an online poster vendor (www.gneil.com) has been provided on the SH&E website at: http://etconnect.earthtech.com/sites/SHE_United_States/SHE_US_Resources/Shared%20Documents/US_Resources_Links.aspx.

5.2 Medical and Training Certificates

Project Managers will review records of each employee to be assigned work on projects involving hazardous substances and ensure that all requirements pertaining to health and safety (such as medical clearance certificates and training certificates) are in compliance.

6.0 BIOLOGICAL

6.1 Dangerous Animals

Snakes and venomous arthropods (e.g., insects, spiders, ticks, scorpions, centipedes, millipedes, and others) create a hazard when their habitats are disturbed. The best defense is to understand where these creatures may be found and either avoid them or kill them before they can cause harm. Should a bite or sting occur, immediately notify your supervisor. First aid should be applied immediately and medical treatment sought as indicated below. Also, personnel allergic to stinging insects are to notify their supervisor and ensure an on-site treatment kit is in place prior to starting work.

6.2 Ticks

Ticks are external parasites of reptiles, birds, and mammals. The bites of some soft-bodied ticks may cause mild paralysis in humans. Ticks transmit many diseases, including Rocky Mountain spotted fever and Lyme disease. Ticks attach themselves to the host only with their mouthparts, and feed on blood. In removing a tick, take care not to leave mouthparts behind. Ticks are best removed by pulling them off with steady, gentle pressure. The pull must be light enough to keep the tick intact. It may take more than 10 minutes of pulling to remove the tick. After the tick is removed, wash the area thoroughly with soap and water, gently scrubbing the area of the tick bite. Check for district specific procedure requirements.

6.3 Ants, Bees, Wasps, Hornets, and Yellow Jackets

Ants, bees, wasps, hornets, and yellow jackets occasionally cause death due to acute allergic reaction. In some cases, the stinging apparatus and venom sac remain at the site of the sting and must be removed. Some relief from the pain can be obtained by applying ice. Soothing lotions, such as calamine, may reduce itching.


If the victim has a history of allergic reactions to insect bites or is subject to attacks of hay fever or asthma, or if he is not promptly relieved of symptoms, call a physician or take the victim immediately to the nearest location where medical treatment is available. In a highly sensitive person, transport for medical treatment immediately, do not wait for symptoms to appear, a delay can be fatal.

6.4 Dangerous Plants

The most common adverse reactions to plants from occupational exposures are skin irritation/inflammation. The best prevention is avoiding contact with the plants and being aware of dangerous plants native to the area. However, if the skin does contact the plant, the dermatitis may be avoided by prompt removal of the allergen. About 10 minutes are required for the cutaneous penetration of the allergen. Washing with running water is recommended, but avoid the use of soap. Soap removes protective skin oils and may cause or hasten penetration of the allergen. Avoid non-polar solvents, such as alcohol, which may spread the allergen over a wider area. Early application of topical steroids minimizes the severity of the dermatitis. If the face or genitalia are involved, seek professional medical help immediately, within 6 hours of the exposure. Other objects, such as tools or clothing, may carry the allergen. Avoid touching the face or genitalia with unwashed hands. Protective clothing that prevents skin contact should be used when there is unavoidable contact or when working in areas where there is a high likelihood of contact.

7.0 REFERENCES

SH&E 203 – *Accident Prevention Program – Requirements*

 Safety, Health & Environmental Procedure	PROCEDURE NO. <u>SH&E 202</u>
	DATE <u>March 25, 2005</u>
Safety Meetings	REVISED <u>August 15, 2008</u>
	PREVIOUSLY <u>ENV 202</u>

This procedure applies to all U.S.-based personnel, projects, offices, business units and activities. Any exceptions to this procedure must be approved, in writing, by the responsible District/Business Unit Manager and Safety Manager.

1.0 PURPOSE/SCOPE

This procedure will provide general guidelines that are to implement when executing work in the field. Additionally, it provides references to other applicable procedures that are to be implemented.

2.0 PROJECT INITIATION/KICK-OFF

Where specified in the project-specific SH&E documentation (see SH&E 203 - *Accident Prevention Program*), a kick-off safety meeting will be conducted prior to the start of field operations, and will involve representatives of all organizations working on the job site. Topics for this meeting will include:

- Communication of all on site SH&E responsibilities and authority.
- Communication of organizational SH&E performance expectations.
- Identification of significant project SH&E issues/hazards and solutions.
- Coordination of organizational SH&E conflicts and interactions.

Refer to SH&E 204 – *Task Hazard Analysis* for additional information regarding implementation of Task Hazard Analysis (THA) and associated training requirements.

3.0 ON-SITE MEETINGS

Safety meetings will be conducted at all job sites for the following operational milestones:

1. Project Start-up: On the first day of field operations for a new project or a new phase of work.
2. Periodic: On a regular, recurring frequency of not less than once per week (daily meetings are required for HAZWOPER activities).
3. Significant Personnel Turn-over: The start of any workday where a new organization begins work on site or more than 25 percent of the day's work force is new to the site.
4. Accident Recovery: The start of the work day following any accident which results in more than \$1000 dollars in property damage or where an injury to one or more personnel requires medical treatment (discuss the accident, its causes and preventive measures).

The meetings will be documented on the *Tailgate Safety Briefing Form Sign-In Log* (Attachment 1).

4.0 SUPPLEMENTAL SAFETY TRAINING

The Project Manager (PM), Site Supervisor (SS) or Site Safety Officer (SSO) will implement worker training on general safety topics as part of routine on-site training activities. Where such training is conducted it will be documented on the *Safety Training Log* (Attachment 3).

5.0 SITE ORIENTATION

1. All project employees will receive a safety orientation and training prior to the start of any project and/or task.
2. The PM, SS or SSO will perform the orientation and training. The level of training and method for providing orientation and training will consist of the mandatory items listed in SH&E 114 – *Safety Training Programs*, and a site specific orientation that will be based on the project specifics, location of the project, and client requirements. The SH&E Department can provide examples of previous orientation material for reference.
3. The depth/level of training will be commensurate with the job function(s) to be performed. Site visitors will receive general orientation and task-specific training.
4. At a minimum, initial employee orientation and training will consist of the items listed below:
 - Identification of hazards associated with the individual's job function and responsibilities.
 - Specific safety procedural instruction needed to perform his or her required job function or task.
 - Content of the HASP and THAs.
 - Other ongoing safety training for specific job functions will be conducted on an "as-needed" basis and required by the Training Needs Assessment program
 - NOTE: In addition to the Project Safety Orientation all Earth Tech employees will receive the Earth Tech safety orientation as found on the Intranet.
 - http://etconnect.earthtech.com/sites/SHE_United_States/US_Training/Shared%20Documents/US_Training_Employee_Orientation.aspx

6.0 SAFETY MEETINGS

Safety meetings will occur on a daily basis prior to the start of field activities. Safety meetings will be conducted by the PM or SS and supplemented by the supervisors of various crafts (labor, equipment operation, foreman, safety).

1. The purpose of these meetings is to allow the project employees an opportunity to maintain a high degree of safety awareness through timely safety education. This training will be used to discuss specific safety topics and obtain employee feedback.
2. The PM and SSO will monitor safety meetings to ensure that subject matter is properly presented.
3. Topics to be discussed will include safety hazards noted during the week and explanation of job safety procedures unique to the project.

4. Other items open for discussion may include, but are not limited to:
 - Use of employee personal protective equipment
 - Project safety rules
 - Employee incident and near miss reviews
 - Review of applicable SOPs to job specific activities
 - Review of any Safety or Injury Alerts deemed necessary by the District Safety Manager
5. Safety Briefings will be developed by the PM, SS, or SSO. Meetings will be conducted by the PM, SS, or foreman with support from the SH&E Department. Subjects may be obtained from the SH&E Dept.
6. Records of attendance at all employee safety orientation and training provided as part of this procedure will be documented on the Tailgate Safety Briefing Form (attached).

7.0 ATTACHMENTS

Attachment 1 – Tailgate Safety Briefing Sign-In Log

Attachment 2 – Safety Training Log

8.0 REFERENCES

SH&E 114 – *Safety Training Programs*

SH&E 203 – *Accident Prevention Program*

SH&E 204 – *Task Hazard Analysis*

Earth Tech Tailgate Safety Briefing Sign-In Log

Briefing Conducted By:	Signature:	Date:	Time:
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<u>Project name:</u>	<u>Project Number:</u>
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This sign-in log documents the topics of the tailgate safety briefing and individual attendance at the briefing. Personnel who perform work operations onsite are required to attend each safety briefing and acknowledge receipt of such briefings daily. **Please provide a brief narrative of the following topics as applicable to the Project**

Scope of Work	
HASP / THA review	
SOP Review	
PPE Requirements	
Incident Review Safety Alerts	
Other:	

Personnel Sign-in List

Printed Name and Company	Signature	Printed Name and Company	Signature
1.		7.	
2.		8.	
3.		9.	
4.		10.	
5.		11.	
6.		12.	

Earth Tech Safety Training Log


Training Conducted By:	Signature:	Date:
Project name:	Project Number:	Time:

This sign-in log documents the safety training conducted in accordance with various Parts of 29 CFR 1910 and 29 CFR 1926 as well as other applicable regulatory requirements. Earth Tech personnel who perform work activities in field/facility environments are required to attend each safety training session and acknowledge receipt of such training prior to a change in site/facility-specific operations or conditions. Additional training topics and/or regulations can be added to address ongoing site/facility operations. The assigned Manager (i.e., project, construction, response, facility, etc.) is instructed to maintain the completed documents at the facility for review for the duration of the project.

Describe the elements of the training topic below. Use a separate form for separate training. This form should be used for specific training (PPE training, Respiratory Protection training, HAZCOM, etc.)

Personnel Sign-in List

Printed Name	Signature	Printed Name	Signature
1.		7.	
2.		8.	
3.		9.	
4.		10.	
5.		11.	
6.		12.	

 <p>Safety, Health & Environmental Procedure</p>	<p>PROCEDURE NO. <u>SH&E 206</u></p> <p>DATE <u>March 25, 2005</u></p> <p>REVISED <u>August 15, 2008</u></p>
<p>Stop Work Authority</p>	<p>PREVIOUSLY <u>CP 011</u></p>

This procedure applies to all U.S.-based personnel, projects, offices, business units and activities. Any exceptions to this procedure must be approved, in writing, by the responsible District/Business Unit Manager and Safety Manager.

1.0 PURPOSE

To establish the minimum requirements for Earth Tech personnel to stop work if they believe there is an imminent SH&E risk as described below that will affect them or their co-workers.

2.0 SCOPE

This procedure applies to all Earth Tech office, projects and operations and affiliated personnel.

3.0 DEFINITIONS

Discrepancy/Deficiency: An omission or commission, a condition, or a situation that is in conflict with the procedures, standards, and the requirements of safety and health standards.

Imminent Danger: An impending or threatening situation, which, if left uncorrected, is likely to result in serious injury/property damage.

Potentially Dangerous: Minor violations that present a low potential for serious injury/property damage.

Stop Work Order: A directive to cease work issued for failure to follow procedures, imminent danger situations/conditions, accumulation of safety violations, etc.

4.0 PROCEDURE

4.1 Authority

Earth Tech's stop-work authority applies to all work locations, employees and subcontractors. All Earth Tech personnel are authorized to stop work if there is an identified unsafe condition. If the responsible organization fails to provide resolution or if at any time their acts, or failure to act, cause substantial harm or imminent danger to health and safety of project employees, the public or the environment, Earth Tech may issue an order stopping work in whole or in part. Any stop work order issued by Earth Tech under this clause will be without prejudice to any other legal or contractual rights of Earth Tech. In the event that Earth Tech issues a stop work order, an order issued by Earth Tech authorizing the resumption of work must be in place prior to restarting work. The responsible

organization will not be entitled to an extension of time or additional fee or damages by reason of, or in connection with, any work stoppage ordered in accordance with this clause.

In most cases, a stop-work order affects only those areas immediately involved in the hazardous situation. Earth Tech may issue a stop-work order for a portion of the work area(s) or an entire work area when, in its opinion, the work area or work practices are not managed or maintained according to SH&E submittals reviewed and accepted by Earth Tech. The stop work order will remain in effect until the responsible organization resolves the problem(s) and brings the work area(s) to satisfactory conformance with established SH&E requirements. Work will not resume until appropriate corrective actions have been completed, ensuring that the condition has been corrected.

4.2 Severity of Hazards

4.2.1 Imminent Danger Situations

Any employee (not only members of SH&E organizations) may stop activities imminently dangerous to workers or the public. "Stopping work" includes stabilizing an imminent danger situation to the extent that it can be left unattended for a prolonged period of time until the issue is resolved. The person requesting the work stoppage will notify the organization responsible for the work. The responsible organization will notify Earth Tech immediately of any "stop work" action(s). Personnel performing the work who disagree with the work stoppage will not refuse to stop work, but are advised to contact their management. Failure to comply with any Stop Work Order, in whole or in part, will result in immediate dismissal from the project.

4.2.2 Potentially Dangerous Situations

Informal stop work interventions to correct minor conditions (e.g., to remind workers to put on their hard hats, safety glasses, etc.) do not require formal notification.

4.3 Documentation

The District Manager, Section Manager, PM, and/or SH&E Department or their authorized representative will issue a formal stop-work order in the following situations:

- Imminent danger exists involving the public or employees' safety and health, the environment, facilities, or property.
- Continuing work or equipment usage will result in significant repair, rework, or removal.
- A project, or any segment of the project, is executed improperly or is out of compliance.

Documentation of stop work actions will be provided to the affected organization.

4.4 Resuming Work

Work associated with the affected area or operation will not resume unless all corrective actions identified in the applicable stop work order or corrective action request (CAR) have been completed and closed.

In accordance with SH&E 202, *Safety Meetings*, all personnel affected by the stop work order and its associated CARs will be instructed on the corrective actions and preventative measures taken.

5.0 RECORDS

The completed stop work order and any CARs generated as a result of it will be maintained at the project site. Supporting documentation will be transmitted to and retained by the PM.


6.0 ATTACHMENTS

Attachment 1 – Stop Work Order

7.0 REFERENCES

SH&E 104, *Inspections, Audits, and Corrective Actions*

SH&E 202, *Safety Meetings*

 Safety, Health & Environmental Procedure	PROCEDURE NO. <u>SH&E 208</u>
	DATE <u>March 25, 2005</u>
General Housekeeping/Accountability	REVISED <u>August 15, 2008</u>
	PREVIOUSLY NEW

This procedure applies to all U.S.-based personnel, projects, offices, business units and activities. Any exceptions to this procedure must be approved, in writing, by the responsible District/Business Unit Manager and Safety Manager.

1.0 PURPOSE

This procedure outlines the personal hygiene, work site sanitation, and work site housekeeping requirements for Earth Tech's operations and projects.

2.0 SCOPE

This procedure applies in its entirety to all Earth Tech projects and operations unless a variance from its requirements is granted by the SH&E Department.

3.0 PROCEDURE

3.1 Personal Hygiene

3.1.1 Smoking, Eating and Drinking

Eating and drinking will be permitted only in designated areas at Earth Tech project sites. Smoking will be permitted only in areas designated by Field Supervision and situated in locations that are not in the immediate vicinity of activities associated with work site activities. Additionally, Field Supervision will designate each smoking area giving primary consideration to those personnel who do not smoke.

Personnel actively involved in the performance of certain activities will not be permitted to smoke, eat, drink, or use smokeless tobacco, except during breaks (e.g., HAZWOPER Controlled work areas).

Site personnel will first wash hands and face after completing work activities and prior to eating or drinking.

3.1.2 Water Supply

Water supplies will be available for use on site and will comply with the following requirements:

Potable Water

An adequate supply of drinking water will be available for site personnel consumption. Potable water can be provided in the form of approved well or city water, bottled, or drinking fountains. Where drinking fountains are not available, individual use cups will be provided as well as adequate disposal containers. Potable water containers will be properly identified in order to distinguish them from non-potable water sources.

Non-Potable Water

Non-potable water may be used for hand washing and cleaning activities. Non-potable water will not be used for drinking purposes. All containers/supplies of non-potable water used will be properly identified/labeled as such.

3.1.3 Toilet Facilities

Toilet facilities will be available for site personnel and visitors. Should subcontractor personnel be located on-site for extended periods, it may become necessary to obtain temporary toilet facilities. Exceptions to this requirement will apply to mobile crews where work activities and locations permit transportation to nearby toilet facilities.

A minimum of one toilet will be provided for every 20 site personnel, with separate toilets maintained for each sex, except where there are less than five total personnel on site. For mobile crews where work activities and locations permit transportation to nearby toilet facilities (e.g., gas station, or rest stop), on site facilities are not required

3.1.4 Washing Facilities

Hand and Face

Site personnel will wash hands and face after completing work activities and prior to breaks, lunch, or completion of workday.

Personal Cleaning Supplies

Cleaning supplies at Earth Tech project sites will consist of soap, water, and disposable paper towels or items of equal use/application (e.g., anti-bacterial gels, wipes, etc.).

3.1.5 Clothing and Personal Protective Equipment

All personal protective equipment will be kept clean at all times and maintained in accordance with the manufacturer's requirements.

3.2 Sanitation

3.2.1 General Work Areas

At all times work areas will be kept free of dirt and debris that may impact the safety of site personnel and visitors. All trash receptacles will be regularly emptied.

3.2.2 Break Areas and Lunchrooms

Site personnel will observe the following requirements when using break areas and lunchrooms at Earth Tech project sites:

- All food and drink items will be properly stored when not in use.
- Food items will not be stored in personal lockers for extended periods in order to prevent the potential for vermin infestation.
- Perishable foods will be refrigerated whenever possible.
- All waste food containers will be discarded in trash receptacles.

- All tables, chairs, counters, sinks, and similar surfaces will be kept clean and free of dirt, waste food, and food containers at all times.
- Refrigerators used to store food items will be maintained at 45 degrees Fahrenheit and emptied of all unclaimed food items weekly.
- Routine cleaning of refrigerators will also be performed on a regular basis.

3.3 Housekeeping

- All work areas shall be kept clean to the extent that the nature of the work allows.
- Every work area shall be maintained, so far as practicable, in a dry condition. Where wet processes are used, drainage shall be maintained and platforms, mats, or other dry standing places shall be provided, where practicable, or appropriate waterproof footwear shall be provided.
- Protruding objects or placement of materials on paths or foot traffic areas present a problem with regard to slips, trips, falls, and puncture wounds. Personnel will use a reasonable amount of effort to keep slip, trip and fall hazards to a minimum.
- Excess debris and trash will be collected and stored in an appropriate container (e.g., plastic trash bags, garbage can, roll-off bin) prior to disposal.
- At no time will debris or trash be intermingled with waste PPE or contaminated materials.

3.4 Additional Requirements

The PM will ensure that weekly evaluations of work area cleanliness and sanitation are performed and documented as part of their weekly self-inspections in accordance with the Earth Tech Weekly Housekeeping Checklist. Based on project-specific activities associated with the asset removal process, additional safety precautions may be required.

4.0 ATTACHMENTS

Attachment 1 - Weekly Housekeeping Checklist

5.0 REFERENCES


SH&E 201 – *General Safety Rules*

EARTH TECH WEEKLY HOUSEKEEPING, HYGIENE & SANITATION CHECKLIST

Inspector Name (please print): _____ Date: _____
 Inspector signature: _____
 Company name: _____
 Area Inspected: _____
 Supervisor signature: _____

Item	Inspection Question	Yes	No	NA	Correct By:
1.	Are there adequate toilet and washing facilities?				
2.	Is potable water provided for all employees?				
3.	Are non-potable water sources labeled?				
4.	Is smoking/eating/drinking permitted only in designated areas?				
5.	Is designated PPE worn while handling impacted materials?				
6.	Are decontamination washes and rinses changed out daily?				
7.	Is trash/PPE placed into appropriate receptacles				
8.	Are trash receptacles routinely emptied?				
9.	Is smoking prohibited in flammable storage areas?				
10.	Are proper receptacles available for storage of flammables?				
11.	Are flammables and combustibles stored in non-smoking areas?				
12.	Are oxygen and fuel gas cylinders stored upright and secured?				
13.	Are oxygen and fuel gas cylinders stored a minimum of 20 feet apart?				
14.	Are materials stacked and stored as to prevent sliding or collapsing?				
15.	Are materials and supplies stored outside of designated paths of travel?				
16.	Are areas of foot and vehicle traffic clear of debris?				
17.	Are tripping hazards labeled or marked?				
18.	Are electrical / extension cords kept out of wet areas?				
19.	Is trash picked up and placed into appropriate receptacles at the end of each shift?				
20.	Are area personnel using designated paths of travel?				
21.	Are aisles and walkways marked as appropriate?				
22.	Are holes in the floor, sidewalks, or other walking surface repaired properly, covered or otherwise made safe?				
23.	Are aisles or walkways that pass near moving or operating machinery, welding operations or similar operations arranged so employees will not be subjected to potential hazards?				
24.	Are work surfaces kept dry or is appropriate means taken to assure the surfaces are slip-resistant?				
25.	Are all spilled hazardous materials or liquids, including blood and other potentially infectious materials, cleaned up immediately and according to proper procedures?				

Additional Comments:

 Safety, Health & Environmental Procedure	PROCEDURE NO. <u>SH&E 210</u>
	DATE <u>March 25, 2005</u>
Walking-Working Surfaces Protection	REVISED <u>August 15, 2008</u>
	PREVIOUSLY <u>ENV 522</u>

This procedure applies to all U.S.-based personnel, projects, offices, business units and activities. Any exceptions to this procedure must be approved, in writing, by the responsible District/Business Unit Manager and Safety Manager.

1.0 PURPOSE

Employees are required to maintain a workplace free of hazards (e.g., hazards associated with tripping, falling, or overhead objects as a result of uneven walking surfaces, holes, or debris). This procedure addresses requirements for flooring, work platforms, and stairway safety.

2.0 SCOPE

This procedure applies in its entirety to all Earth Tech projects and operations unless a variance from its requirements is granted by the SH&E Department.

3.0 PROCEDURES

3.1 Standard Specifications

If guardrail or protective covers are required for tripping and falling hazards these devices will be installed in accordance with the specifications below.

3.1.1 Standard Protective Railings

- A standard railing will consist of top rail, intermediate rail, toe-board, and posts, and will have a vertical height of approximately 42 inches from upper surface of top rail to floor, platform runway, or ramp level. The top rail will be smooth-surfaced throughout the length of the railing. The intermediate rail will be halfway between the top rail and the floor, platform, runway, or ramp. The ends of the rail will not overhang the terminal posts except where such overhang does not constitute a projection hazard. Minimum requirements for standard railing under various types of construction are specified in the following paragraphs:
- For wood railings, the posts will be of at least 2-inch by 4-inch stock spaced not to exceed 8 feet; the top rail will be of at least 2-inch by 4-inch stock; the intermediate rail will be of at least 1-inch by 6-inch stock.
- For pipe railings, posts and top intermediate railings will be at least 1-1/2 inches nominal diameter with posts spaced not more than 8 feet on centers.
- For structural steel railings, posts and intermediate railings will be at least 1-1/2 inches nominal diameter with posts spaced not more than 8 feet on centers.

- The anchoring of posts and framing of members for railings of all types will be of such construction that the completed structure will be capable of withstanding a load of at least 200 pounds applied in any direction at any point on the top rail, with a minimum of deflection.
- Railings receiving heavy stresses from employees trucking or handling materials will be provided with additional strength by the use of heavier stock, closer spacing of posts, bracing, or by other means.
- Other types, sizes, and arrangements of railing construction are acceptable, provided they meet the following conditions:
 - A smooth-surfaced top rail at a height above floor, platform, runway, or ramp level of 42 inches to 45 inches.
 - Strength to withstand at least the minimum requirements of 200 pounds top rail pressure with a minimum of deflection.
 - Protection between top rail and floor, platform, runway, ramp, or stair treads, equivalent at least to that afforded by a standard intermediate rail.
 - Half-inch wire rope will be considered as meeting project requirements when installed to protect against the hazards of open-sided floors with the following additional requirements: (Note: wire rope railing will not be used as part of a fall arrest system unless so designed).
 - Cable must be maintained with a minimum deflection (3 inches or less) through the use of turnbuckles or other equally effective device.
 - Cable will be supported on 8-foot centers where maintenance of the minimum deflection requirements is not possible. Cable must still have 3 inches or less deflection.
 - On 5-foot centers, highly visible flagging such as surveyor's tape will be used to increase visibility of the cable.
 - The cable will be ½-inch nominally but can be reduced to the minimum of 3/8-inch diameter when necessary. Half-inch cable should be the standard due to the larger diameter affording a larger gripping surface to the hand.
 - Three clamps will be used at all connections. Proper installation of these clamps is required. ("Never saddle a dead horse.")

3.1.2 Stairways and Railings

A stair railing will be of construction similar to a standard railing, but the vertical height will be not more than 34 inches nor less than 30 inches from upper surface of top rail to surface of tread in line with face of riser at forward edge of tread.

- Stairways shall be equipped with a stair railing or handrail as follows:
 - A stairway not more than 44 inches wide and enclosed on both sides, shall have a handrail on the right descending side.
 - A stairway not more than 44 inches wide and open on one side, shall have a stair railing on the open side.
 - A stairway not more than 44 inches wide, which has two open sides, shall have a stair railing on each side.
 - A stairway that is more than 44 inches wide but less than 88 inches shall have 1 handrail on each enclosed side and 1 stair rail on each open side.
 - A stairway that is 88 inches or more in width shall have 1 handrail on each enclosed side, 1 stair rail on each open side, and 1 intermediate stair rail located in the middle of the stairway.

- Unprotected sides of stairway landings shall be provided with guardrail systems.
- Temporary stairways shall have a minimum width of 22 inches.
- A stairway shall have a minimum vertical clearance of 7 feet, unless the overhead object is padded and caution signs or paint is used to visibly demarcate the hazard.
- A standard handrail will be of construction similar to a standard railing except that it is mounted on a wall or partition, and does not include an intermediate rail. It will have a smooth surface along the top and both sides of the handrail. The handrail will have an adequate handhold for anyone grasping it to avoid falling.
- Ends of the handrail will be constructed so as not to constitute a projection hazard.
- The height of handrails will not be more than 34 inches or less than 30 inches from upper surface of handrail to surface of tread, in line with face of riser or to surface of ramp.
- All handrails and railings will be provided with a clearance of approximately 3 inches between the handrail or railing and any other object.

3.1.3 Standard Toeboards

- A standard toeboard will be 4 inches minimum in vertical height from its top edge to the level of the floor, platform, runway, or ramp. It will be securely fastened in place and have not more than 1/4-inch clearance above floor level. It may be made of any substantial material, either solid or with openings not over 1 inch in greatest dimension.
- Where material is piled to such height that a standard toeboard does not provide protection, paneling or screening from the edge of the standard toeboard to the intermediate rail or to the top rail will be provided.

3.1.4 Floor Opening Covers

Floor opening covers will be of any material that meets the following strength requirements:

- Conduits, trenches, and manhole covers and their supports, when located in roadways and vehicular aisles, will be designed to carry a truck rear-axle load of at least 20,000 pounds.
- The floor opening cover will be capable of supporting the maximum intended load and so installed as to prevent accidental displacement.
- All floor opening covers will be properly marked and secured.
- Floor or deck holes shall be guarded using a secure cover to prevent accidental passage of materials or tools.
- When a cover has been removed, the opening shall be protected by barricades installed a minimum of 6 feet from the opening.

3.1.5 Skylight Openings

Every skylight floor opening and hole shall be guarded by a standard skylight screen or a fixed standard railing on all exposed sides. Skylight screens shall be of such construction and mounting that they are capable of withstanding a load of at least 200 pounds applied perpendicularly at any one area on the screen. They shall also be of such construction and mounting that under ordinary loads or impacts, they will not deflect downward sufficiently to break the glass below them. The construction shall be of grillwork with openings not more than 4 inches long or of slatwork with openings not more than 2 inches wide with length unrestricted.

3.1.6 Wall Opening Protection

- Barriers will be of such construction and mounting that, when in place at the opening, the barrier is capable of withstanding a load of at least 200 pounds applied in any direction (except upward), with a minimum of deflection at any point on the top rail or corresponding member.
- Screens will be of such construction and mounting that they are capable of withstanding a load of at least 200 pounds applied horizontally at any point on the near side of the screen. They may be of solid construction, of grill work with openings not more than 8 inches long, or of slat work with openings not more than 4 inches wide with length unrestricted.

3.2 Flooring Requirements

3.2.1 Permanent Flooring

The permanent floors will be installed as the erection of structural members progresses, and there will be not more than eight stories between the erection floor and the uppermost permanent floor, except where the structural integrity is maintained as a result of the design.

3.2.2 Temporary Flooring

- The derrick or erection floor will be solidly planked or decked over its entire surface except for access openings. Planking or decking of equivalent strength will be of proper thickness to carry the working load. Planking will be not less than 2 inches thick, full-size and undressed, and will be laid tight and secured to prevent movement.
- On buildings or structures not adaptable to temporary floors, and where scaffolds are not used, safety nets will be installed and maintained whenever the potential fall distance exceeds two stories or 25 feet. The nets will be hung with sufficient clearance to prevent contacts with surface of structures below.
- Floor periphery - safety railing. A safety railing of ½-inch wire rope or equal will be installed approximately 42 inches high around the periphery of all temporary planked or temporary metal-decked floors of tier buildings and other multi-floored structures during structural steel assembly. On each floor, immediately after structural steel assembly, an intermediate railing must be installed, with toeboards where needed.
- Where skeleton steel erection is being done, a tightly planked and substantial floor must be maintained within two stories or 30 feet, whichever is less, below and directly under that portion of each tier of beams on which any work is being performed, except when gathering and stacking temporary floor planks on a lower floor, in preparation for transferring such planks for use on an upper floor. Where such a floor is not practicable, subsection 2 of this section applies.
- When gathering and stacking temporary floor planks, the planks must be removed successively, working toward the last panel of the temporary floor so that the work is always done from the planked floor.
- When gathering and stacking temporary floor planks from the last panel, the employees assigned to such work will be protected by a full body harness with safety lines attached to a substantial anchorage.

3.3 Flooring - Other Construction

- In the erection of a building having double wood floor construction, the rough flooring will be completed as the building progresses, including the tier below the one on which floor joists are being installed.

- For single wood floor or other flooring systems, the floor immediately below the story where the floor joists are being installed will be kept planked or decked over.

3.4 Guarding of Floor Openings and Floor Holes

- Floor openings will be guarded by standard railings with standard toeboards or cover, as specified in this section. In general, a railing will be provided on all exposed sides, except at entrances to stairways.
- Ladderway floor openings or platforms will be guarded by standard railings with standard toeboards on all exposed sides, except at entrance to 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.
- Hatchways and chute floor openings will be guarded by one of the following:
 - Hinged covers of standard strength and construction and a standard railing with only one exposed side. When the opening is not in use, the cover will be closed or the exposed side will be guarded at both top and intermediate positions by removable standard railings.
 - A removable standard railing with toeboard or not more than two sides of the opening and fixed standard railings with toeboards on all other exposed sides. The removable railing will be kept in place when the opening is not in use and should preferably be hinged or otherwise mounted so as to be conveniently replaceable.
- Pits and trap-door floor openings will be guarded by floor opening covers of standard strength and construction. While the cover is not in place, the pit or trap openings will be protected on all exposed sides by removable standard railings.
- Manhole floor openings will be guarded by standard covers which need not be hinged in place. While the cover is not in place, the manhole opening will be protected by standard railings.
- Temporary floor openings will have standard railings or covers installed.
- Floor holes, into which persons can accidentally walk, will be guarded by either a standard railing with standard toeboard on all exposed sides, or a floor hole cover of standard strength and construction that is secured against accidental displacement. While the cover is not in place, the floor hole will be protected by a standard railing.
- Where doors or gates open directly on a stairway, a platform will be provided, and the swing of the door will not reduce the effective width of the platform to less than 20 inches.
- Floor openings that are 4 feet or more above adjacent floor or ground level shall be guarded either by:
 - A secure cover.
 - A guardrail and toeboards installed on all exposed sides.
 - Perimeter cable installed on all exposed sides. (Note: if the perimeter cable is not 18 inches or more away from the opening, then a mid-height cable shall also be installed.)
- Openings in decks through which personnel or materials may fall shall be guarded as follows:
 - Openings greater than or equal to 18 square feet must be protected using standard railing and toeboards. The railing shall be constructed so rail supports do not exceed 10 feet off center spacing, and rails (both top and midrail) shall be constructed of 2" by 4" lumber, or taut wire rope. Toeboards shall be a minimum of 4 inches in height.
 - Openings less than 18 square feet shall be protected as above, with the exception of tank tops or inner bottoms. Tank tops or inner bottoms shall be protected using a rail system, constructed of iron or steel, where the rail is between 30 to 31 inches in

height, with a top rail only. These guards shall be constructed such that they do not require removal for entry.

- A wall opening or floor opening being used to lower equipment (a chute used for equipment/debris) shall have a barricade or barrier, or a worker assigned to prevent personnel from entering the area where the equipment is descending.

3.4.1 Guarding of Wall Openings

Wall openings, from which there is a drop of more than 4 feet, and whose bottom is less than 3 feet above the working surface, will be guarded as follows:

- When the height and placement of the opening in relation to the working surface is such that either a standard rail or intermediate rail will effectively reduce the danger of falling, one or both will be provided.
- The bottom of a wall opening, which is less than 4 inches above the working surface, regardless of width, will be protected by a standard toeboard or an enclosing screen solid construction.
- An extension platform outside a wall opening onto which materials can be hoisted will have side rails or equivalent guards of standard specifications. One side of an extension platform may have removable railings in order to facilitate handling materials.

3.4.2 Guarding of Open-sided Floors, Platforms and Runways

- Every open-sided floor or platform 4 feet or more above adjacent floor or ground level will be guarded by a standard railing or the equivalent on all open sides, except where there is an entrance to a ramp, stairway, or fixed ladder. The railing will be provided with a standard toeboard to facilitate the passage of persons beneath the open sides or wherever there is moving machinery, or equipment producing hazardous falling materials.
- Runways will be guarded by standard railings or the equivalent on all sides 4 feet or more above floor or ground level. Wherever tools, machine parts, or materials are likely to be used on runways, toeboards will also be provided on all exposed sides.
- Where any person entering runways is exposed to machinery, electrical equipment, or other danger from a falling hazard, additional guarding will be provided. Employees are asked to notify their supervisor of the need for the additional guards.
- Regardless of height, open-sided floors, walkways, platforms, or runways above or adjacent to dangerous equipment (e.g., pickling or galvanizing tanks, degreasing units, and similar hazards) will be guarded with standard railings and toeboards.

3.5 Barrier Identification Tape

Barrier identification tape is strictly prohibited from being used for any form of personnel fall protection. Barricade tape around an excavation can be used for short term (24 hours); after this period physical barriers are required.

- Yellow barricade tape will be used for "caution/warning."
- Red barricade tape will be used for "danger-- do not enter."

Once the barricaded area is free of the hazard(s), the tape will be removed and properly discarded.

3.6 Other (Environmental)

- A means of access (e.g., ladder, stairway, ramp) shall be provided for all personnel points of access where a break of elevation of 16 inches or more exists.


- Means of access shall be kept clear to allow free passage for employees.
- When the top of an open tank or vat that contains a hazardous substance is less than 36 inches above the floor or platform, then a barrier (e.g., guard rails) shall be erected to at least 36 inches in height.
- Workers will be aware of uneven ground surfaces and site terrain, and every effort should be made to ensure excavated areas are leveled to reduce slip / trip / fall hazards.
- Debris should be managed in such a way to reduce tripping hazards.
- Good housekeeping practices should be observed at all times. Trash, debris and construction materials should be kept in a neat and orderly fashion at all times.
- Hazards that cannot be abated should be identified (large rocks, sumps, pits, voids, etc.) and demarcated to alert personnel to the specific tripping hazard.

4.0 Fall Protection

- All areas that are 4 feet or more above an adjacent floor or ground level shall be protected with a guardrail or perimeter cable, unless it is not feasible. In such circumstances the use of fall protection is mandatory.
- Refer to SH&E 120 – *Fall Protection* for additional guidance

5.0 REFERENCES

SH&E 120 – *Fall Protection*
SH&E 402 – *Excavation and Trenching*

 Safety, Health & Environmental Procedure	PROCEDURE NO. <u>SH&E 404</u>
	DATE <u>March 11, 2005</u>
Manual Lifting	REVISED <u>August 15, 2008</u>
	PREVIOUSLY <u>ENV 501</u>

This procedure applies to all U.S.-based personnel, projects, offices, business units and activities. Any exceptions to this procedure must be approved, in writing, by the responsible District/Business Unit Manager and Safety Manager.

1.0 PURPOSE

Earth Tech personnel will observe the procedures below when performing manual handling in excess of 10 pounds. No person shall lift more than 49 pounds without the use of mechanical aid or assistance from other personnel.

2.0 INTRODUCTION

Manual materials handling (MMH) means moving or handling things by lifting, lowering, pushing, pulling, carrying, holding, or restraining. Improper MMH can result in cuts, pinches, crushing, and serious back, abdomen, arm, and leg muscle and joint injury. Even “light” objects, lifted improperly, can contribute to injury, causing cuts and muscle injuries.

The level of hazard associated with MMH work depends on what is being handled, what the task is, and what the conditions are at the workplace. Specific considerations include:

- Is the load too heavy for the task that you are doing?
- Is the load located too high or low for a safe lift?
- Is the load too big or may have a shape that makes it difficult to handle?
- Is the load wet, slippery, or have sharp edges that make it difficult to grasp?
- Is the load unstable or can shift its center of gravity because contains items that can move or flow (e.g., a partially filled drum or concrete in a wheelbarrow)?
- Is the load too big to let you see where you are putting your feet?

The task can make MMH hazardous if a worker:

- Uses poor lifting techniques (lifting too fast, too often or too long; lifting with back bent or while twisting or reaching too far; lifting while sitting or kneeling, etc.),
- Has to move material over long distances,
- Performs the work at too fast of a pace.
- Does not take appropriate rest breaks; insufficient recovery time, and
- Performs a combination of different handling tasks together (e.g. lifting, carrying and lowering).

The site conditions can also contribute to hazards of MMH if:

- Walking surfaces are uneven, sloping, wet, icy, slippery, unsteady, etc.
- There are differences in floor levels or walking surfaces.
- There is poor housekeeping that causes slip, trip and fall hazards.
- There is inadequate lighting.
- Movement is restricted because of clothing or personal protective equipment, or because the space is small or posture is constrained.

3.0 GENERAL REQUIREMENTS

Mechanical equipment or assistance such as dollies, carts, come-alongs, or rollers are to be used whenever possible. Mechanical assistance must be of proper size, have wheels sized for the terrain, and be designed to prevent pinching or undue stress on wrists. Objects to be moved must be secured to prevent falling and properly balanced to prevent tipping.

The following guidance will be observed:

- Before performing the lift:
 - Check to see if mechanical aids such as hoists, lift trucks dollies or wheelbarrows are available.
 - Be sure that you can lift the load without over-exertion, and get help with heavy or awkward loads. All loads in excess of 49 pounds require use of mechanical aids or assistance from other personnel.
 - Be sure that the load is "free" to move.
 - Check that the planned location of the load is free of obstacles and debris.
 - Be sure that the path to the planned location of the load is clear. Grease, oil, water, litter and debris can cause slips and falls.
 - Particular handling and lifting techniques are needed for different kinds of loads or materials being handled (for example, compact loads, small bags, large sacks, drums, barrels, cylinders, sheet materials like metal or glass). See Section 2.0 for additional guidance.
 - Do not lift if you are not sure that you can handle the load safely.
- General tips for lifting:
 - Prepare for the lift by warming up the muscles.
 - Stand close to the load and face the way you intend to move.
 - Use a wide stance to gain balance.
 - Be sure you have a good grip on the load.
 - Keep arms straight.
 - Tighten abdominal muscles.
 - Tuck chin into the chest.
 - Initiate the lift with body weight.
 - Lift the load as close to the body as possible.

- Lift smoothly without jerking.
- Avoid twisting and side bending while lifting.
- Engineering Controls:
 - Material handling tasks should be designed to minimize the weight, range of motion, and frequency of the activity.
 - Alter the task to eliminate the hazardous motion and/or change the position of the object in relation to the employee's body -- such as adjusting the height of a pallet or shelf.
 - Work methods and stations should be designed to minimize the distance between the person and the object being handled.
 - High-strength push-pull requirements are undesirable, but pushing is better than pulling. Material handling equipment should be easy to move, with handles that can be easily grasped in an upright posture.
 - Workbench or workstation configurations can force people to bend over. Corrections should emphasize adjustments necessary for the employee to remain in a relaxed upright stance or fully supported, seated posture. Bending the upper body and spine to reach into a bin or container is highly undesirable. The bins should be elevated, tilted or equipped with collapsible sides to improve access.
 - Repetitive or sustained twisting, stretching, or leaning to one side are undesirable. Corrections could include repositioning bins and moving employees closer to parts and conveyors.
 - Store heavy objects at waist level.
- Whenever possible, utilize hand holds or other lifting attachments on objects being handled:
 - Use the "hook grip" on loads with cut-out handholds.
 - Curl your fingers around the edge.
 - Do not hold the load with fingertips.
 - Use containers with handles located more than halfway up the side of the container.
 - Use the "ledge grip" to handle regularly shaped objects without handles.
 - Use vacuum lifters to handle sheet materials or plates.
 - Hold the object with hands placed diagonally.
 - Wear gloves where practical.
- When significant, sustained lifting work is required it is desirable to rotate employees to spread the work load among several people and avoid fatigue. Rotation is not simply performing a different job, but must be a job that utilizes a completely different muscle group from the ones that have been over-exerted.

4.0 SPECIFIC HANDLING TECHNIQUES

The following guidance will be used when performing MMH for various types of materials.

4.1 Square or Rectangular Objects

To lift square or rectangular objects:

- Place one foot slightly in front of the other.
- Squat as close to the object as possible.
- Grasp one of the top corners away from the body and the opposite bottom corner closest to the body.
- Tilt the object slightly away from the body, tilt forward at the hips, keep the back straight, and tuck in the chin.
- Test to be sure the object is loose from floor and shall lift without snagging.
- Straighten the legs, keeping the backbone straight, pull the object into the body, and stand up slowly and evenly without jerking or twisting.
- If turning or change of direction is required, turn with feet without twisting the torso and step in the direction to travel.
- To set an object down, reverse the sequence, being sure not to trap the bottom hand between the object and the surface on which the object is set.

4.2 Cylindrical Objects

When lifting/moving round or cylindrical objects, the objects should be rolled wherever possible. Rolling must be controlled by chute, tagline, or other means of limiting acceleration. Workers must not be positioned downhill from rolled objects. Use of the legs for pushing and tagline control of rolled objects must be stressed.

Cylindrical objects, such as drums that must remain upright, are to be handled manually by slightly tilting the object, using the legs for control, and balancing the object on the bottom edge. The handler then walks besides the object, with the object tilted toward the body, positioning the hands on the top edge away from the body and moving so they do not cross, thus, maintaining the balance and a steady controlled forward motion. Motion must be controlled so that stopping walking and moving the hands shall stop forward motion.

Use carts or tracks to transport cylinders. Make sure that two people transport a cylinder if carts cannot be used, use lifting straps to improve grip.

Technique for one person lifting a cylinder onto a platform:

- Roll the cylinder to within 3 feet of the platform.
- Position the forward foot around the cylinder, the back foot about 1 foot behind the cylinder.
- Bend knees slightly.
- Place one hand on the valve protective cap, the other hand underneath the cylinder about 1 foot from the ground.
- Tilt the cylinder onto the thigh of the back leg.
- Balance the cylinder on the thigh by pressing down with the back hand while lifting the cylinder with the forward hand.
- Extend both knees to initiate and forward movement of the cylinder and continue by pushing up and forward with the arms until the cylinder is located on the platform.

- Climb on the platform.
- Straddle the cylinder at the valve end.
- Grasp the valve protective cap of the cylinder with both hands between the thighs.
- Lean forward and straighten the knees to set the cylinder upright.

4.3 Bags and Sacks

The best way to handle a bag depends on its size, weight and how far it is to be carried. When lifting, remember to:

- Straddle the end of the bag.
- Bend the hips and knees.
- Keep the back straight.
- Grasp the bag with both hands under the closer end. Keep elbows inside the thighs.
- Lean forward, straightening the knees to set the bag upright.
- Readjust the straddle position moving feet closer to the bag.
- Readjust the grasp, with one hand clasping the bag against the body and the other under it.
- Stand up by thrusting off with the back leg and continuing in an upward and forward direction.
- Thrust the bag up with the knee while straightening the body.
- Put the bag on the shoulder opposite the knee used to thrust the bag up.
- Stabilize the bag on the shoulder.
- Move off without bending sideways.

Avoid unloading a bag from the shoulder directly to floor level. Use an intermediate platform or get help from a coworker.

1. Stand close to the platform.
2. Place one foot in front of the platform.
3. Bend hips and knees.
4. Keep the back straight.
5. Ease the bag off the shoulder and put it upright on the platform.
6. Pull the bag slightly over the edge of the platform.
7. Stand close to the platform with the bag touching the chest.
8. Clasp the bag against the body with one hand, the other hand holding bottom of the bag.
9. Step back.
10. Bend hips and knees, keeping back straight.
11. Ease the bag on the floor.

Bulkier sacks are easier to carry on your back. Lift the sack onto your back from a platform:

1. Move the sack to the edge of the platform.
2. Put your back against the sack.
3. Grasp with both hands on the upper corners of the sack.
4. Ease the sack onto the back, bending hips and knees before taking the weight.
5. Keep the back straight.
6. Stand up and straighten the hips and knees.
7. Stabilize the sack.
8. Move away without bending sideways.

Two-person handling of a sack:

1. Position one person on either side of the sack.
2. Squat with one foot balancing behind the sack.
3. Keep back straight.
4. Grasp with the outer and on the upper corner, the other holding the bottom of the sack.
5. On one person's command:
 - a. Stand up and straighten the hips and knees.
 - b. Move towards the stack.
 - c. Put the sack on the stack.

4.4 Sheet Materials

When lifting sheet materials:

1. Stand close to the pile of sheets in a walking stance.
2. Grasp sheet firmly at the mid-point of its long side with the closer hand.
3. Pull sheet up and toward the body.
4. Change grip using your other hand and put your fingers on top of the sheet.
5. Pull sheet up to the vertical position and to the side until one half is off the pile.
6. Grasp the lower edge of the sheet with the free hand and support the hand by placing it on your knee.
7. Stand up without bending and twisting body.

To carry sheets:

- Use drywall carts to carry sheet materials.
- Get help from another person where carts are not available.
- Apply carrying handles for manual carrying.
- Always use gloves and carrying handle for glass and other materials with sharp edges.

Team Handling - Team handling occurs when more than one person is involved during the lift.

Use team lifting and carrying where other solutions are inappropriate.

- Remember that the combined strength of the team is less than the sum of individual strength.
- Select team members of similar height and strength.
- Assign a leader to the team.
- Determine a set of commands to be used such as "lift", "walk", "stop", "down". Make sure that everyone knows what to do when they hear the command.
- Follow the commands given by the team leader.
- Practice team lifting and carrying together before attempting the task.

5.0 MATERIALS STORAGE


When storing materials on site

- Store materials at a convenient height.
- Leave the lowest shelf unused if necessary.
- Use vertically mobile shelves to avoid bending and overhead reaching.
- Use bin racks for storing small items.
- Store heavy and frequently used materials at waist height.
- Do not store materials at floor level.
- Use hand trucks with elevating devices in storage and loading areas.
- Use trucks with a tilting device to avoid bending.
- Use elevating platforms to avoid overhead reaching.

6.0 REFERENCES

SH&E 211 – *Walking - Working Surfaces Protection*

SH&E 405 – *Handling Drums and Large Containers*

 <p>Safety, Health & Environmental Procedure</p>	<p>PROCEDURE NO. <u>SH&E 501</u></p> <p>DATE <u>March 11, 2005</u></p> <p>REVISED <u>August 15, 2008</u></p>
<p>Ladders & Stairways</p>	<p>PREVIOUSLY <u>CSP 421</u></p>

This procedure applies to all U.S.-based personnel, projects, offices, business units and activities. Any exceptions to this procedure must be approved, in writing, by the responsible District/Business Unit Manager and Safety Manager.

1.0 PURPOSE

To establish the minimum requirements for Earth Tech to use, handle, and store ladders.

2.0 SCOPE

This procedure applies in its entirety to all Earth Tech related projects and operations unless a variance from its requirements is granted by the SH&E Department.

3.0 PROCEDURE

3.1 Stairways

- All parts of stairways, including the treads and landings, will be free of hazardous projections, such as protruding nails, etc.
- Slippery conditions on stairways will be eliminated.
- Handrails will be 30 to 34 inches above stairway treads and free from protruding nails and splinters.
- The uprights will be not less than 2 inches by 4 inches, spaced not more than 8 feet apart, and properly anchored.
- The rail cross section will be not less than 2 inches by 4 inches or equivalent.
- Railings and toe boards will be installed around stairwells.
- Sufficient illumination on all stairways, providing at least five (5) foot candles of light on the steps, will be maintained.
- All lamps providing stairway illumination will be substantially guarded either mechanically or by location.
- Stairways and landings will be kept clear of debris, loose material, and equipment not in use.
- Stairways, until permanently enclosed, will be guarded on all open sides with stair railings. Open sides of stairway landings, porches, balconies, and similar locations will be guarded with standard railings. (Vertical height of 42 inches nominal from upper surface of top rail to floor, platform, runway, or ramp level. The top rail shall be smooth-surfaced throughout the length of the railing. The intermediate rail shall be approximately halfway

between the top rail and the floor, platform, runway, or ramp. The ends of the rails shall not overhang the terminal posts except where such overhang does not constitute a projection hazard).

- Before permitting foot traffic, stairways on which treads and/or landings are to be filled in later with concrete or other material will be fitted with secured wooden pieces to cover the entire tread and/or landing area, and supported to prevent undue deflection.
- Temporary treads and/or landings will be replaced when worn below the level of the metal nosing.
- On all structures of two or more floors (20 feet or more) in height, stairways, ladders or ramps must be provided for employees during the construction periods. Stairways must meet the following requirements:
 - Rise height and tread width must be uniform throughout any flight of stairs including any foundation structures used as one or more treads of the stairs.
 - Temporary stairs must have a landing not less than 30 inches in the direction of travel at every 12 feet of vertical rise.
 - Metal landings must be secured in place before filling.
 - Debris and other loose materials will not be allowed on, under, or at approaches and landings to stairways.
 - Slippery conditions on stairways will be eliminated as soon as possible after they occur.
 - Spiral stairways will not be permitted except for special limited usage and secondary access situations where it is not practical to provide a conventional stairway.

3.2 Ladders

3.2.1 General Requirements

The following are minimum requirements for the use and care of ladders by ET personnel. Compliance with ANSI A14.1, ANSI A14.3, and applicable state regulations is also required.

- Ladders shall be inspected before use and if defective, removed from use.
- Ladders will be maintained in good condition at all times. Those that are defective in any way will be removed from service and tagged with an “unsafe equipment” tag until made safe for use or destroyed.
- Ladders purchased for use on ET sites will be appropriate for industrial applications (Class 1-A). Light-duty household ladders are not acceptable.
- Ladder safety climbing devices may be used in lieu of cage protection on fixed ladders of unbroken length of 20 feet in height.
- Landing platforms are not required in these cases except at regular step-off points. All ladder safety devices will be compatible with the ladders with which they are used.
- Fixed ladders will be installed wherever regular access by ladder is necessary.
- Metal ladders will not be used where potential electrical hazards exist.
- Ladders having metal parts (other than hardware) will not be used where potential electrical hazards exist unless they bear a manufacturer's label that indicates:
 - The ladder complies with ANSI 14.5.
 - It is approved for electrical use.

- Job-made ladders will be constructed in accordance with OSHA 1926.1053.
- All personnel involved in the use of ladders on the project will be instructed in the requirements of this procedure in accordance with SH&E 203 - Accident Prevention Program- Requirements for SH&E Documentation.

3.2.2 Use of Ladders


- Ladders will be inspected by the user before each use.
- Straight ladders will be tied, blocked, and equipped with safety shoes, or otherwise secured to prevent displacement.
- Straight ladders will be used at an angle of approximately 75 degrees from the horizontal. (This position may be readily established by placing the base of the ladder 1/4 of its working length from the vertical plane of the top support.)
- When working from a ladder, it will be secured at both top and bottom. Three-point contact should be maintained or fall protection used if reaching outside of ladder rails.
- No type of work requiring the use of both hands will be performed on a ladder over 6 feet from the ground or floor unless a safety harness is worn and the safety lanyard is secured to a substantial overhead anchorage point. Note: For General Industry, the height limit is reduced to 4 feet.
- No objects that restrict the use of both hands for climbing will be carried in the climber's hands; use tool lines.
- A ladder will not be placed in front of a door opening toward the ladder unless the door is blocked open, locked, or guarded.
- Ladders must be used only on firm, stable bases. Ladders will not be placed on boxes, barrels, or other unstable bases to form longer sections.
- Ladders will not be spliced together to form longer sections.
- Ladders used to gain access from one level to another will be long enough for the top to extend 3 feet above the landing or suitable grab rails, for safe moving to or from the point of access.
- The platform and top step of ordinary types of stepladders will not be used as steps.
- Stepladders will not be used as straight ladders, and will be used with legs fully extended.
- At no time will a worker stand or sit on the top two rungs of any ladder.

3.2.3 Care of Ladders

- Ladders will be handled with care and not be subjected to unnecessary abuse or misuse.
- Immediate inspection and appropriate maintenance is required of any ladder exposed to fire, subjected to damaging chemicals, involved in a fall or collision, or which has become coated with oil or grease.
- When not in use, ladders will be stored where they are protected from potential damage caused by collision, temperature, moisture, etc.
- Users will return ladders to the proper storage location when the job is completed.
- Ladders will not be painted.

4.0 REFERENCES

- SH&E 203 - *Accident Prevention Program- Requirements for SH&E Documentation*

 <p>Safety, Health & Environmental Procedure</p>	<p>PROCEDURE NO. <u>SH&E 506</u></p> <p>DATE <u>March 11, 2005</u></p> <p>REVISED <u>August 15, 2008</u></p>
<p>Manual Hand Tools</p>	<p>PREVIOUSLY <u>ENV 505</u></p>

This procedure applies to all U.S.-based personnel, projects, offices, business units and activities. Any exceptions to this procedure must be approved, in writing, by the responsible District/Business Unit Manager and Safety Manager.

1.0 PURPOSE

All manually operated hand tools and equipment shall be used, handled, and stored in accordance with the following requirements.

2.0 GENERAL REQUIREMENTS

- Use each tool only for the job it was designed to do.
- Discard damaged or abused tools promptly.
- Inspect for distortion, cracks, chips, wear or mushrooming.
- Keep all tools clean and in working order.
- Be sure handles are fixed firmly to a tool's working end.
- Be sure tools and work mate properly to avoid slippage.
- Handles are made for the tool; never use extensions.
- Confine impact forces to striking and struck tools.
- Hold work in a clamp or vise, not in your hand.
- Start off slowly when engaging the tool and the work.
- Shut current off before using a tool near electricity.
- Make sure the handle sits securely in your hand.
- Keep moving parts lightly lubed; avoid lube leakage.
- Wear approved safety goggles when using hand tools.
- Keep hands away from sharp edges.
- Pull, don't push, a wrench handle for more leverage.
- Position your body securely while working with the tool.
- Keep jaw teeth, cutters and blades sharp for better results.
- Keep tool's moving parts properly cleaned and tightened
- Use steady pressure on jaws and cutters; don't rock the tool.

- Support long, overhanging work in a vise at the far end.
- Use pads in the jaws to protect soft or crushable work.
- Use a tool close to the vise or clamp.
- Hold work in a clamp or vise with sufficient pressure.
- Keep clamped assemblies away from vibration and bumping.
- Discard a tool instead of repairing it by welding or brazing.
- Keep tools from excessive heat.
- For continuous work, use comfort grips or gloves.
- Follow instructions on the tool and/or package.

3.0 TOOL-SPECIFIC REQUIREMENTS

3.1 Cutting Tools

- Wear safety glasses and protective gloves when using cutters.
- Choose the proper cutter for the job. Cutters are designed for a specific type, hardness, and size of material.
- Cut materials straight across - keep the material being cut at right angles to the cutting edges of jaws.
- Prevent injury from flying metal by wrapping a burlap bag, cloth or rag around the cutting jaws. Metal can fly when cut. The harder the metal, the farther it will fly.
- Warn those in the area to take precautionary measures to avoid possible injury from flying metal pieces.
- Keep cutting tools in good repair.
- Adjust and lubricate cutter and moving parts daily if heavily used.
- Sharpen jaws according to manufacturers' instructions.
- Do not use a cutting tool until you are trained in its proper and safe use.
- Do not use cushion grip handles for jobs requiring electrically-insulated handles. Cushion grips are for comfort primarily and do not protect against electric shock.
- Do not use cutters which are cracked, broken or loose.
- Do not exceed the recommended capacity of a tool.
- Do not cut diagonally.
- Do not rock cutters from side to side when cutting wire.
- Do not pry or twist with tool when cutting.
- Do not hammer on cutting tools or extend the handle length to achieve greater cutting power.
- Do not expose cutters to excessive heat.

3.2 Hammers

- Hammers are designed according to the intended purpose. Select a hammer that is comfortable for you and that is the proper size and weight for the job. Misuse can cause the striking face to chip, possibly causing a serious injury.
- Choose a hammer with a striking face diameter approximately ½ inch larger than the face of the tool being struck (e.g., chisels, punches, wedges, etc.).
- Ensure that the head of the hammer is firmly attached to the handle.
- Replace loose, cracked or splintered handles.
- Discard any hammer with mushroomed or chipped face or with cracks in the claw or eye sections.
- Strike a hammer blow squarely with the striking face parallel to the surface being struck. Always avoid glancing blows and over and under strikes. (Hammers with beveled faces are less likely to chip or spall).
- Look behind and above you before swinging the hammer.
- Watch the object you are hitting.
- Hold the hammer with your wrist straight and your hand firmly wrapped around the handle.
- Do not use a hammer with a loose or damaged handle.
- Do not use handles that are rough, cracked, broken, splintered, sharp-edged or loosely attached to the head.
- Do not use any hammer head with dents, cracks, chips, mushrooming, or excessive wear.
- Do not use a hammer for any purpose for which it was not designed or intended.
- Do not use one hammer to strike another hammer, other hard metal objects, stones or concrete.
- Do not redress, grind, weld or reheat-treat a hammer head.
- Do not strike with the side or cheek of the hammer.

3.3 Saws

- Saws are made in various shapes and sizes and for many uses. Use the correct saw for the job.
- Wear safety glasses.
- Select a saw of proper shape and size for stock being used.
- Choose a saw handle that keeps your wrist in a natural position in the horizontal plane.
- Choose a saw with a handle opening of at least 5 inches long and 2.5 inches wide and slanted at a 15° angle.
- Check the stock being cut for nails, knots, and other objects that may damage or buckle the saw.
- Start the cut by placing your hand beside the cut mark with your thumb upright and pressing against blade. Start the cut carefully and slowly to prevent blade from jumping. Pull upward until blade bites. Start with a partial cut, then set the saw at the proper angle.

- Apply pressure on down stroke only.
- Hold stock being cut firmly in place.
- Use a helper, a supporting bench or vise to support long stock if required.
- Keep teeth and blades properly set.
- Protect teeth of saw when not in use.
- Keep saw blades clean.
- Hacksaws:
 - Select correct blade for material being cut.
 - Secure blade with the teeth pointing forward.
 - Keep blade rigid, and frame properly aligned.
 - Cut using strong, steady strokes, directed away from yourself.
 - Use entire length of blade in each cutting stroke.
 - Use light machine oil on the blade to keep it from overheating and breaking.
 - Cut harder materials more slowly than soft materials.
 - Clamp thin, flat pieces requiring edge cutting.

3.4 Pipe Tools (Wrenches, Cutters, Reamers, and Threaders)

- Pipe tools are made in various shapes and sizes and for many uses. Always use the correct tool for the job.
- Select a pipe wrench with sufficient capacity and leverage to do the job.
- Use a pipe wrench to turn or hold a pipe. Never use a pipe wrench to bend, raise or lift a pipe.
- Adjust the pipe wrench grip to maintain a gap between the back of the hook jaw and the pipe. This concentrates the pressure at the jaw teeth, producing the maximum gripping force. It also aids the ratcheting action.
- Inspect pipe wrenches periodically for worn or unsafe parts and replace them (e.g., check for worn threads on the adjustment ring and movable jaw).
- Keep pipe wrench teeth clean and sharp.
- Face a pipe wrench forward. Turn wrench so pressure is against heel jaw.
- Pull, rather than push on the pipe wrench handle. Maintain a proper stance with feet firmly placed to hold your balance.
- Do not use a pipe wrench as a hammer, or strike a pipe wrench with a hammer.
- Do not use pipe wrenches on nuts and bolts.
- Do not use a pipe extender for extra leverage. Get a larger pipe wrench.
- Replace pipe cutter wheels which are nicked or otherwise damaged.
- Use a 3- or 4-wheeled cutter, if there is not enough space to swing the single wheel pipe cutter completely around the pipe.
- Choose a cutting wheel suitable for cutting the type of pipe material required:
 - Thin wheel for cutting ordinary steel pipe.
 - Stout wheel for cutting cast iron.

- Other wheels for cutting stainless steel, plastic and other materials.
- Select the proper hole diameter and correct tap size to tap a hole. The hole should be sized so that the thread cut by the tap will be about 75% as deep as the thread on the tap.
- Use a proper tap wrench (with a "T" handle) for turning a tap.
- Use lubricant or machine cutting fluid with metals other than cast iron.
- Do not permit chips to clog flutes (grooves in the tap that allow metal chips to escape from the hole). The chips may prevent the tap from turning - this may result in the tap breaking if you continue to apply pressure.
- Do not use a conventional adjustable wrench for turning a tap - it will cause uneven pressure on the tap that may cause it to break.
- Do not attempt to thread hardened steel. This can chip or damage the die.
- Do not thread any rod or other cylindrical object that is larger in diameter than the major diameter of the die thread.
- Do not use a spiral reamer on a rotating pipe. The reamer may snag and cause serious injury.

3.5 Pliers and Wire Cutters

- Pliers are made in various shapes and sizes and for many uses. Use the correct pliers or wire cutters for the job.
- Choose pliers or wire cutters that have a grip span of 2½ - 3½ inches to prevent your palm or fingers from being pinched when the tools are closed.
- Use adjustable pliers that allow you to grip the work piece firmly while maintaining a comfortable handgrip (i.e., hand grasp is not too wide).
- Use tools only if they are in good condition.
- Make sure that the cutting edges are sharp. Dull and worn-down cutting edges require many times more force for cutting.
- Make sure that the toothed jaws are clean and sharp. Greasy or worn-down jaws can result in compromised safety. Such tools also require increased force to hold the work piece which, in turn, increases the risk of muscular fatigue and repetitive strain injuries.
- Oil pliers and wire cutters regularly. A drop of oil on the hinge will make the tools easier to use.
- Pull on the pliers; do not push away from you when applying pressure. If the tool slips unexpectedly, you may lose your balance or injure your hand.
- Cut at right angles. Never rock the cutting tool from side to side or bend wire back and forth against the cutting edges.
- Do not cut hardened wire unless the pliers or wire cutters are specifically manufactured for this purpose.
- Do not expose pliers or wire cutters to excessive heat.
- Do not bend stiff wire with light pliers. Needle-nose pliers can be damaged by using the tips to bend large wire. Use a sturdier tool.
- Do not use pliers as a hammer.

- Do not hammer on pliers or wire cutters to cut wires or bolts.
- Do not extend the length of handles to gain greater leverage. Use a larger pair of pliers for gripping or a bolt cutter for cutting.
- Do not use cushion grip handles for jobs requiring tools with electrically insulated handles. Cushion grips are for comfort primarily and do not protect against electric shock.
- Do not use pliers on nuts and bolts; use a wrench.

3.6 Screwdrivers

- Screwdrivers are made in various shapes and sizes and for many uses. Use the correct screwdriver for the job.
- Choose contoured handles that fit the shank tightly, with a flange to keep the hand from slipping off the tool.
- Use a slot screwdriver with a blade tip width that is the same as the width of the slotted screw head.
- For cross-head screws, use the correct size and type of screwdriver: a Phillips screwdriver may slip out of a screw head designed for use with the slightly flatter-tipped Pozi-driv screwdriver.
- Use a vise or clamp to hold the stock if the piece is small or moves easily.
- Keep the screwdriver handle clean. A greasy handle could cause an injury or damage from unexpected slippage.
- If work must be carried out on "live" electrical equipment, use screwdrivers that have insulated handles designed for electrical work and a non-conducting shaft. Remember, most plastic handles are designed for grip and comfort.
- Use non-magnetic tools when working near strong magnets (e.g., in some laboratories).
- Use a screw-holding screwdriver (with screw-holding clips or magnetic blades) to get screws started in awkward, hard-to-reach areas. Square-tipped screwdrivers (e.g., Robertson) that hold screws with recessed square holes are also useful in such situations.
- Use an offset screwdriver in close quarters where a conventional screwdriver cannot be used.
- Use a screwdriver that incorporates the following features when continuous work is needed:
 - A pistol grip to provide for a straighter wrist and better leverage.
 - A "Yankee drill" mechanism (spiral ratchet screwdriver or push screwdriver) which rotates the blade when the tool is pushed forward.
 - A ratchet device to drive hard-to-move screws efficiently, or use a powered screwdriver.
- File a rounded tip square making sure the edges are straight. A dull or rounded tip can slip out of the slot and cause hand injury or damage to materials.
- Store screwdrivers in a rack or partitioned pouch so that the proper screwdriver can be selected quickly.
- Do not lean or push on a screwdriver with any more force than necessary to keep contact with the screw. A screw properly piloted and fitted will draw itself into the right position when turned. Keep the shank directly over the screw being driven.

- Do not hold the stock in one hand while using the screwdriver with the other. If the screwdriver slips out of the slot you may cut your hand.
- Do not hammer screws that cannot be turned.
- Do not grind the tip to fit another size screw head.
- Do not try to use screwdrivers on screw heads for which they are not designed (e.g., straight blade screwdrivers on Phillips, clutch head, Torx or multi-fluted spline screw heads).
- Do not use defective screwdrivers (e.g., ones with rounded or damaged edges or tips; split or broken handles; or bent shafts).
- Do not use a screwdriver for prying, punching, chiseling, scoring, scraping or stirring paint.
- Do not use pliers on the handle of a screwdriver for extra turning power. A wrench should be used only on the square screwdriver shank designed for that purpose.
- Do not expose a screwdriver blade to excessive heat. Heat can affect the temper of the metal and weaken the tool.
- Do not use a screwdriver to check if an electrical circuit is live. Use a suitable meter or other circuit testing device.
- Do not carry screwdrivers in your pockets.

3.7 Snips

- Wear safety glasses and protective gloves when working with snips. Small pieces of metal may go flying in the air and cut edges of metal are sharp.
- Snips are made in various shapes and sizes for various tasks. The handle can be like those on scissors with finger and thumb holes or like plier handles. Models are available for cutting in straight lines and in curves to the left or right.
- Universal snips can cut in both straight and wide curves.
- Straight snips and duckbill snips (flat blade, "perpendicular" to the handle, with pointed tips) are generally designed to cut in straight lines; some duckbill snips are designed for cutting curved lines.
- Hawk's bill snips (with crescent-shaped jaws) are used for cutting tight circles.
- Aviation snips have compound leverage that reduces the effort required for cutting.
- Offset snips have jaws that are set at an angle from the handle.
- Select the right size and type of snips for the job; check the manufacturer's specifications about the intended use of the snips (e.g., type of cut - straight, wide curve, tight curve, right or left, and maximum thickness and kind of metal or other material that can be cut).
- Use only snips that are sharp and in good condition.
- Use snips for cutting soft metal only. Hard or hardened metal should be cut with tools designed for that purpose.
- Use ordinary hand pressure for cutting. If extra force is needed, use a larger tool.
- Cut so that the waste is on the right if you are right-handed or on the left if you are left-handed.
- Avoid springing the blades. This results from trying to cut metal that is too thick or heavy for the snips you are using.

- Keep the nut and the pivot bolt properly adjusted at all times.
- Oil the pivot bolt on the snips occasionally.
- Do not try to cut sharp curves with straight cut snips.
- Do not cut sheet metal thicker than the manufacturer's recommended upper limit (e.g., cuts up to 16-gauge cold, rolled steel or 18-gauge stainless steel). Do not extend the length of handles to gain greater leverage.
- Do not hammer or use your foot to exert extra pressure on the cutting edges.
- Do not use cushion grip handles for tasks requiring insulated handles. They are for comfort primarily and not for protection against electric shocks.
- Do not attempt to re-sharpen snips in a sharpening device designed for scissors, garden tools, or cutlery.

3.8 Wood Chisels

- Wear safety glasses.
- Wood chisels are made in various shapes and sizes and for many uses. Use the correct chisel for the job.
- Use the right size of chisel for the job.
- Choose smooth, rectangular handles that have no sharp edges and are attached firmly to the chisel.
- Ensure that the cutting edge is sharp. Dull chisels can be difficult to control and require more effort to do the job.
- Check stock thoroughly for knots, staples, nails, screws, or other foreign objects before chiseling.
- Clamp stock so it cannot move.
- Adjust your stance so that you do not lose your balance if the tool slips.
- Chip or cut away from yourself.
- Keep your hands and body behind the cutting edge.
- Use a wooden or plastic mallet with a large striking face on all chisels. Only heavy-duty or framing chisels are made of a solid or molded handle that can be struck with a steel hammer.
- Make finishing or paring cuts with hand pressure alone.
- Place chisels safely within the plastic protective caps to cover cutting edges when not in use.
- Replace any chisel that is bent or shows dents, cracks, chips, or excessive wear.
- Store chisels in a "storage roll," a cloth or plastic bag with slots for each chisel, and keep them in a drawer or tray.
- Replace broken or splintered handles.
- Sharpen cutting edges as often as necessary.
- Do not use a wood chisel as a pry or a wedge.
- Do not use a wood chisel on metal.

- Do not use an all-steel chisel with a mushroomed face or a chipped edge. Redress with a file or whetstone.
- Do not use a grinder to redress heat-treated tools. Use a whetstone.
- Do not use a dull chisel.

3.9 Wrenches

- Use the correct wrench for the job - pipe wrenches for pipes and plumbing fittings, and general-use wrenches for nuts and bolts.
- Discard any damaged wrenches (e.g., open-ended wrenches with spread jaws or box wrenches with broken or damaged points).
- Select the correct jaw size to avoid slippage.
- Position your body in a way that will prevent you from losing balance and hurting yourself if the wrench slips or something (e.g., a bolt) suddenly breaks.
- Use a box or socket wrench with a straight handle, rather than an off-set handle, when possible.
- Ensure that the jaw of an open-ended wrench is in full contact (fully seated, "flat," not tilted) with the nut or bolt before applying pressure.
- Face an adjustable wrench "forward," adjust tightly, and turn the wrench so pressure is against the permanent or fixed jaw.
- Ensure that the teeth of a pipe wrench are sharp and free of oil and debris and that the pipe or fitting is clean to prevent unexpected slippage and possible injuries.
- Apply a small amount of pressure to a ratchet wrench initially to ensure that the ratchet wheel (or gear) is engaged with the pawl (a catch fitting in the gear) for the direction you are applying pressure.
- Support the head of the ratchet wrench when socket extensions are used.
- Pull on a wrench using a slow, steady pull; do not use fast, jerky movements.
- Stand aside when work is done with wrenches overhead.
- Make sure adjustable wrenches do not "slide" open during use.
- Keep tools well maintained (cleaned and oiled).
- Clean and place tools and wrenches in a tool box, rack or tool belt after use.
- Do not push on a wrench - losing your balance is more likely if the wrench slips.
- Do not use a wrench that is bent or damaged.
- Do not use worn adjustable wrenches. Inspect the knurl, jaw and pin for wear.
- Do not pull on an adjustable wrench that is loosely adjusted.
- Do not use pipe wrenches on nuts or bolts.
- Do not use pipe wrenches for lifting or bending pipes.
- Do not use a wrench on moving machinery.
- Do not use the wrong tools for the job. For example, never use pliers instead of a wrench or a wrench as a hammer.
- Do not use a makeshift wrench.

- Do not insert a shim in a wrench for better fit.
- Do not strike a wrench (except a "strike face" wrench) with a hammer or similar object to gain more force.
- Do not increase the leverage by adding sleeved additions (e.g., a pipe) to increase tool handle length.
- Do not expose a wrench to excessive heat (like from a blow torch) that could affect the temper of the metal and ruin the tool.
- Files/Rasps
- Personnel will not use a file as a pry bar, hammer, screwdriver, or chisel.
- When using a file or a rasp, grasp the handle in one hand and the toe of the file in the other.
- Personnel will not hammer on a file.

3.10 Chisels

- Personnel will not use a chisel that has a dull cutting edge.
- Personnel will not use chisels that have "mushroomed" striking heads.
- Hold a chisel by using a tool holder if possible.
- Clamp small work pieces in the vise and chip towards the stationary jaw when working with a chisel.

3.11 Vises

- When clamping a long work piece in a vise, support the far end of the work piece by using an adjustable pipe stand, saw horse or box.
- Position the work piece in the vise so that the entire face of the jaw supports the work piece.
- Personnel will not use a vise that has worn or broken jaw inserts, or has cracks or fractures in the body of the vise.
- Personnel will not slip a pipe over the handle of a vise to gain extra leverage.

3.12 Clamps

- Personnel will not use the C-clamp for hoisting materials.
- Personnel will not use the C-clamp as a permanent fastening device.

3.13 Jacks


- Personnel will not exceed the jack's rated lifting capacity as noted on the label of the jack.
- Clear all tools, equipment and any other obstructions from under the vehicle before lowering the jack.

3.14 Tool Boxes/Chests/Cabinets

- Use the handle when opening and closing a drawer or door of a tool box, chest, or cabinet.
- Tape over or file off sharp edges on toolboxes, chests or cabinets.
- Personnel will not stand on toolboxes, chests or cabinets to gain extra height.
- Lock the wheels on large toolboxes, chests or cabinets to prevent them from rolling.
- Push large chests, cabinets and toolboxes rather than pulling them.
- Personnel will not open more than one drawer of a toolbox at a time.
- Close and lock all drawers and doors before moving the tool chest to a new location.
- Personnel will not move a toolbox, chest or cabinet if it has loose tools or parts on the top.

4.0 REFERENCES

None

 <p>Safety, Health & Environmental Procedure</p>	<p>PROCEDURE NO. <u>SH&E 510</u></p> <p>DATE <u>March 11, 2005</u></p> <p>REVISED <u>August 15, 2008</u></p>
<p>High Pressure Washers</p>	<p>PREVIOUSLY <u>ENV 526</u></p>

This procedure applies to all U.S.-based personnel, projects, offices, business units and activities. Any exceptions to this procedure must be approved, in writing, by the responsible District/Business Unit Manager and Safety Manager.

1.0 PURPOSE

All uses of high pressure washing equipment (steam cleaners, spray guns, etc.) by Earth Tech personnel or by subcontractors on Earth Tech-controlled project sites will meet the requirements below.

2.0 OPERATIONAL REQUIREMENTS

- Read and follow the operator’s manual and all operating instructions prior to use.
- High pressure washers shall be used to clean or decontaminate equipment, surfaces or structures only.
- High pressure washers WILL NOT be used to clean or decontaminate workers or personal protective equipment while it is being worn.
- All users must be trained in emergency shutdown procedures and general equipment maintenance and operation.
- Only trained, authorized personnel will operate the high-pressure washer.
- The lance must always be pointed at the work area.
- The operator must maintain good footing.
- An assistant will be provided to aid in moving the hose to different areas and backing up the operator. The assistant must remain behind the operator and should stand near the pressure generator to shut off the equipment.
- Non-operators must remain a minimum of 25 feet from the operator.
- The operating pressure should never exceed that which is necessary to complete the job.
- No unauthorized attachment may be made to the unit (e.g., the trigger should never be tied down.)
- Operators should be changed at frequent intervals to avoid fatigue (at least hourly).

High pressure washing equipment should be cleaned often to avoid dirt buildup, especially around the trigger and guard area.

3.0 PERSONAL PROTECTIVE EQUIPMENT

The following personal protective equipment will be worn by operators and assistants while performing pressure washing work:

- Safety shoes or boots;
- Metal foot and shin guards;
- Hearing protection;
- Eye protection (safety glasses/goggles and face shield);
- Hard hat with face shield;
- PVC rain suit or PVC acid suit;
- Heavy gloves.

In addition, chemical protective equipment will be used as required based on site conditions.

4.0 TRAINING


High pressure washing equipment shall be operated only by persons who have been trained in the inspection, safe work procedures and maintenance of the particular pressure wash to be operated. Training of employees in the operation and inspection of the pressure wash shall be done by a competent person. All employees who operate pressure washers shall be trained in the following:

- Inspection and operation in accordance with manufacturer's requirements
- Recognition of, and preventive measures for, the safety hazards associated with their individual work tasks.
- General recognition and prevention of safety hazards associated with the use of pressure washers. Training is to be specific to the pressure washer used.
- Work procedures for the task that will be performed during the operation of the pressure washer.

Training will be documented in accordance with SH&E 114, Training Programs.

5.0 REFERENCES

Equipment Safety Cards – Pressure Washers

	PROCEDURE NO. <u>SH&E 514</u>
	DATE <u>March 11, 2005</u>
Safety, Health & Environmental Procedure	REVISED <u>August 15, 2008</u>
Manlifts	PREVIOUSLY <u>ENV 523</u>

This procedure applies to all U.S.-based personnel, projects, offices, business units and activities. Any exceptions to this procedure must be approved, in writing, by the responsible District/Business Unit Manager and Safety Manager.

1.0 PURPOSE

All use of manlifts shall conform to the requirements below.

2.0 GENERAL REQUIREMENTS

- All aerial lifts shall be operated and maintained in accordance with manufacturer's specifications.
- All aerial lifts used by Earth Tech must be certified by the manufacturer to meet requirements of the American National Standards Institute (ANSI) standard applicable to the device:
 - For truck-mounted boom or scissor lifts – ANSI Standard 92.2.
 - For manually propelled boom or scissor lifts – ANSI Standard 92.3.
 - For self-propelled boom lifts – ANSI Standard 92.5.
 - For self-propelled scissor lifts – ANSI Standard 92.6.
- Lift controls on extensible and articulating boom platforms shall be clearly identified as to function.
- Aerial lifts designed as personnel carriers shall have both work platform (primary) and lift mount (secondary) controls. Primary controls shall be within easy reach of the operator. Secondary controls shall be capable of overriding the upper controls. All controls shall be plainly marked to identify their function.

3.0 INSPECTION AND MAINTENANCE

All aerial lifts operated by Earth Tech personnel will be inspected in accordance with the following requirements:

3.1 Pre-Operational Inspection

The operator of any aerial lift will perform a pre-operation inspection of the equipment prior to its first use during a work shift. During the inspection the operator will ensure that the equipment is free of visible defects or hazards, and that all operational controls are fully functional. Items to be performed during this inspection include:

- Check all welds between cylinders and booms for cracks or wear.

- Inspect all pivot pins for security of their locking devices.
- Check all exposed cables, sheaves and leveling devices for wear and secure attachment.
- Inspect hydraulic system for frayed hoses and leaks.
- Check lubrication and fluid levels.
- Inspect boom and basket for cracks or abrasions.
- Check for the load capacity posting.
- Operate boom from ground controls through one complete cycle. Check for unusual noises and uncontrolled movements.
- Any additional inspection criteria required by the aerial lift manufacturer are to be included in the pre-operational inspection.

If any problems are noted the aerial lift will be placed out of service and the Project Manager and onsite competent person will ensure and confirm (documentation of the repair is to be made via maintenance log or similar document) all repairs are made prior to the aerial lift returning to service.

3.2 Periodic Maintenance Inspection

At least once every 12 months, each aerial lift will be inspected by a manufacturer-certified mechanic to ensure that it is properly functioning and maintained. Records of the annual inspections will be maintained on each project on which an aerial lift is used. The inspection will indicate:

- The date the inspection was performed.
- The name of the service provider.
- Any items identified for corrective action.
- Dates corrective actions were completed and the aerial lift returned to service.

4.0 Operations Procedures

4.1 General Requirements

The following requirements pertain to ANY use of aerial lift equipment.

- Any person working in an aerial lift **MUST** wear a full-body harnesses and lanyard. The lanyard **MUST** be attached to an approved attachment point when the lift is in operation or maintained in an elevated position. Employees working from aerial lifts shall not tie off belts or harnesses to adjacent poles, structures, or equipment.
- The load in any boom/basket must not exceed the manufacturer's specified limits for the equipment.
- Employees working in baskets shall always stand on the floor of the basket, and may not sit or climb on the edge of the basket or use planks, ladders, or other devices for a work position. The use of ladders, planks, or other objects positioned in the aerial lift to gain greater height is **PROHIBITED**.
- Aerial lifts will be positioned on ground, which is stable, and provides a secure base for the equipment and anticipated load. Outriggers must be used and placed on pads or on solid surfaces.
- Brakes on aerial lifts shall be set when in use. When using aerial lifts on inclined surfaces, wheel chocks shall be used if they can be safely installed.
- Lift mount (secondary) level controls **SHALL NOT** be operated without permission from the operator in the aerial lift, unless the operator is incapacitated.

- Aerial lifts shall not be moved along the ground with employees in an elevated basket unless the equipment is specifically designed for this operation. Before moving an aerial lift for travel, the boom must be properly cradled and the outriggers stowed. Aerial ladders on ladder trucks and tower trucks shall be secured in the lower traveling position by the locking device on top of the truck cab, and the manually operated device at the base of the ladder before the truck is moved for highway travel.
- Do not work above other workers. Clear the area below using cones or other visible indicators; in moving traffic situations utilize signs placed at least 50 feet away from the work zone in either direction to warn drivers.
- Secure all tools or other items to prevent drops. Do not throw tools to or from an elevated work platform.
- Workers shall not exit from an elevated work platform onto any other elevated surface.
- Work on aerial lifts will be stopped and the platforms lowered and secured if:
 - Wind speeds exceed 25 miles per hour.
 - Lightning is occurring within 3 miles of the work area.
- If electric welding operations will occur, ensure that the aerial lift has been prepared by disconnecting the positive and negative terminals of the battery before initiating the weld. Do NOT use any part of the aerial lift as a ground for electric welding operations.
- Aerial lifts WILL NOT be operated over live electrical wiring. The following minimum separation distance will be maintained between any portion of an aerial lift and any energized electrical component, unless operated by a certified electrical worker for the express purpose of performing electrical work:

Nominal Voltage (Kilovolts)	Minimum Safe Working Distance
0 - 50	10 feet
over 50 - 75	11 feet
over 75 – 125	13 feet
over 125 – 175	15 feet
over 175 - 250	17 feet
over 250 - 370	21 feet
over 370 – 550	27 feet
over 550 – 1000	42 feet

4.2 Boom Lifts

In addition to the general requirements in Section 1.0, the following requirements apply specifically to operation of boom lifts.

- Do not enter or leave a bucket by walking on the boom.
- Boom lifts SHALL NOT be used as a crane or for lifting/handling loads.
- Operate all controls slowly to ensure smooth platform movement.
- Elevated baskets SHALL NOT be attached to or suspended from any other object.

4.3 Scissor Lifts

In addition to the general requirements in Section 4.1, the following requirements apply specifically to operation of scissor lifts.

- Scissor lifts and other platform-type man lifts shall be used only with proper railings and toe boards installed.
- When moving a self-propelled scissor lift, the operator must first position themselves on board the work platform.
- “Towering” (movement of the lift with the platform elevated) is PROHIBITED.

5.0 TRAINING

Aerial lifts shall be operated only by persons who are proficient in the operation, safe use and inspection of the particular aerial lift to be operated. Training of employees in the operation and inspection of working platforms shall be done by a competent person. All employees who operate working platforms shall be trained in the following:

- Inspection and operation of the aerial lift in accordance with manufacturer’s requirements
- Recognition of, and preventive measures for, the safety hazards associated with their individual work tasks.
- General recognition and prevention of safety hazards associated with the use of working aerial lifts. Training is to be specific to the aerial lift used.
- Emergency action plan procedures.
- Work procedures for the task the will be performed during the operation of the aerial lift.
- Use of personal fall arrest system including:
 - Inspection
 - Maintenance
 - Use
 - Operational criteria and limitations.

Training will be documented in accordance with SH&E 114, Training Programs.

6.0 REFERENCES

SH&E 120 - *Fall Protection*

SH&E 210 – *Walking-Working Surfaces Protection*