Project Health and Safety Plan for Solid Wood Inc. Site (West Bay Park) RI/FS and Interim Action

City of Olympia Parks, Arts and Recreation Department

City of OLYMPIA

May 2008

Parametrix

Project Health and Safety Plan for Solid Wood Inc. Site (West Bay Park) RI/FS and Interim Action

Prepared for

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CITATION

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CERTIFICATION

The technical material and data contained in this document were prepared under the supervision and direction of the undersigned.

Prepared by Lara Linde

FOR
Checked by Aaron S. Vernik, L.G.

5/14/08
Approved by David Dinkuhn, P.E.

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ACRONYMS

CPR	cardiopulmonary resuscitation
HASP	Health and Safety Plan
HAZWOPER	Hazardous Waste Operation
MTCA	Model Toxics Control Act
NIOSH	National Institute of Occupational Safety and Health
OPARD	Olympia Parks, Arts & Recreation Department
OSHA	Occupational Saftey and Health Administration
PAHs	polycyclic aromatic hydrocarbon
PEL	permissible exposure limit
PID	photoionization detector
PPE	personal protective equipment
SOP	standard operating procedure
REL	recommended exposure limit
ROW	right-of-way

1. INTRODUCTION

The City of Olympia Parks, Arts & Recreation Department (OPARD) has retained Parametrix to provide remedial investigation and interim action support, for the clean up of the Solid Wood Inc. Site (West Bay Park) located in Olympia. Goals of this project include:

- Performance of a remedial investigation to further to delineate soil, sediment, and groundwater contamination
- Provide additional surface investigation for park development.
- Provide construction and excavation oversight assistance with interim action activities.

This Project Health and Safety Plan (HASP) presents project-specific health and safety requirements for the investigation to be conducted along the western shoreline of West Bay. (Figure 1-1). Work for this site is expected to take place between May 2008 and December 2009. This project HASP is designed for use in conjunction with the Parametrix Health and Safety Manual (Parametrix, 2003).

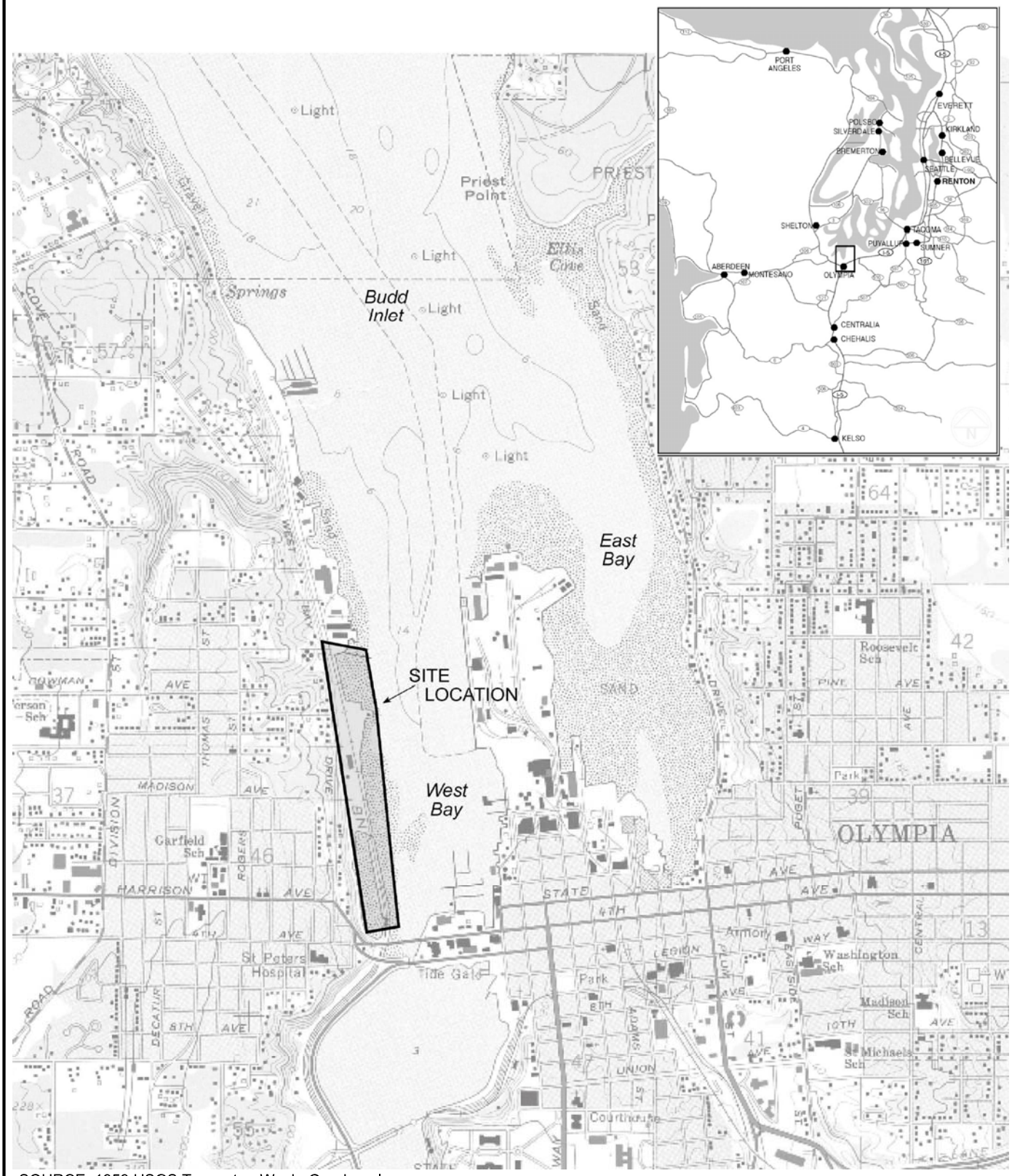
The health and safety requirements presented in this document are applicable to Parametrix employees and Parametrix subcontractors working on the project or persons visiting the job site during remediation activities. Any modification or additions to this project HASP will be completed as addenda in the form of technical memoranda.

1.1 SCOPE OF WORK

Parametrix' primary role is to perform a subsurface and surface investigation where the proposed activities include:

- Subsurface drilling;
- Extensive surface and subsurface environmental sampling for contamination delineation;
- Construction and excavation oversight.

The overall hazard level associated with the above activities is expected to be low. An analysis of potential hazards associated with the sampling and inspection activities is presented in Section 2.



SOURCE: 1959 USGS Tumwater, Wash. Quadrangle

Parametrix DATE: Aug 21, 2007 FILE: BR1577024P01T01F-06

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NO SCALE

Figure 1-1
West Bay Property
Olympia, Washington
Site Location Map

2. HAZARD ANALYSIS

A hazard analysis was conducted for the subsurface and surface sampling to identify potential health and safety concerns. The results of the hazard analysis for the proposed site activities are presented in Table 2-1. The hazard analysis will be updated if additional project-related hazards are identified during remedial action.

Table 2-1. Hazard Analysis for Project Activities

Activity	Hazard	Mitigation
Drilling	Slip/Trips/Falls	• Keep work areas free of debris, etc. • Clean up work areas following completion of activities. • Watch for debris and other hazards that may be present from past site operations. • Follow required safety procedures. • Use proper illumination.
	Flying Debris/Soil and Splashing Liquids	• Wear safety glasses or other applicable eye protection.
	Overhead	• Wear hardhat and steel toed footwear. • Know the location of drill emergency stop switch. • Maintain eye contact with driller. • Don't move drill rig with mast up.
	Pinch Points	• Identify pinch points prior to drilling. • Be aware of equipment location and body placement. • Know the location of drill emergency stop switch. • Maintain eye contact with driller.
	Noise	• Wear earplugs during drilling.
	Falling Objects	• Wear hardhat and steel toed footwear.
	Utility Contact	• Perform a utility locate prior to drilling. • Keep at least three feet from utility markings.
	Heat or Cold Stress	• Wear several layers of clothing during cold weather • Dress in cotton clothing. • Take frequent breaks to warm up in running vehicles during cold weather. • Take frequent breaks to cool down in the shade during warm weather. • Watch other workers on site for signs of heat or cold stress during the workday.
Environmental Sampling (soil, sediment, and groundwater) and Investigation Derived Waste (IDW) Sampling	Slip/Trips/Falls	• Keep work areas free of debris, etc. • Clean up work areas following completion of activities. • Watch for debris and other hazards that may be present from past site operations. • Follow required safety procedures.
	Flying Debris/Soil and Splashing Liquids	• Wear safety glasses or other applicable eye protection.

Table 2-1. Hazard Analysis for Project Activities

Activity	Hazard	Mitigation
	Working Around Water	• Use buddy system. • Wear shaded safety glasses to reduce glare from water. • Do not enter or work over water unless wearing a personal floatation device.
	Contact with Contaminated Media and Preservatives	• Collect and handle samples wearing appropriate PPE. • Employ proper shipping and packing procedures.
	Cuts/Abrasions	• Use proper cutting tools. • Be careful with sharp objects. • Do not cut towards yourself. • Conduct sampling using proper operation of the sampling equipment.
	Overhead	• Wear hardhat and steel toed footwear. • Maintain eye contact with driller and other heavy equipment operators.
	Lifting	• Use proper lifting equipment and techniques when moving equipment, tools, drums, etc.
Construction Oversight and Management	Slip/Trips/Falls	• Keep work areas free of debris, etc. • Clean up work areas following completion of activities. • Watch for debris and other hazards that may be present from past site operations. • Follow required safety procedures. • Use proper illumination.
	Flying Debris/Soil	• Wear safety glasses or other applicable eye protection.
	Overhead	• Wear hardhat and steel toed footwear. • Maintain eye contact with heavy equipment operators.
	Heavy Equipment Traffic	• Use eye contact with equipment operators. • Use spotters and the buddy system.
	Pinch Points and Swing Radius	• Identify pinch points and equipment swing radius prior to construction. • Be aware of heavy equipment location and body placement. • Maintain eye contact with equipment operator.
	Noise	• Wear earplugs during construction.
	Falling Objects	• Wear hardhat and steel toed footwear.
	Working Around Water	• Use buddy system. • Wear shaded safety glasses to reduce glare from water. • Do not enter or work on water unless wearing a personal floatation device.
	Utility Contact	• Perform a utility locate prior to excavation. • Keep at least three feet from utility markings.

Table 2-1. Hazard Analysis for Project Activities

Activity	Hazard	Mitigation
	Excavation Protection and Sidewall Failure	• Do not walk or stand close to the excavation edge. • Use proper excavation techniques including sloping, shoring, or benching to prevent sidewall failure. • Use fencing and barricades or other signaling to identify excavation to workers and the general public. • Pile spoils at least two feet from edge of excavation. • Do not enter unstable excavations or excavations with no access or egress. • Sample from equipment bucket whenever possible.

Parametrix has conducted several investigations at this site. The most recent investigations describe subsurface contamination at several locations along the railroad right-of-way (ROW) and surface contamination of the shoreline. This project involves further investigation of the subsurface contamination to delineate the extent and excavation of multiple point sources. Parametrix personnel will be observing subsurface boring installation, collecting surface and subsurface soil, sediment, and groundwater samples at several locations, and providing excavation oversight during construction. Precautions will be taken by all persons conducting activities at the site to minimize exposure to potential chemicals of concern. Information on reducing contact with potential chemicals of concern is presented in Section 3.

3. AIR MONITORING

The following sections describe the air monitoring protocols for soil, sediment, and groundwater sampling. All air monitoring and instrumentation calibration data will be recorded in daily field logs. Air monitoring instruments will be calibrated and maintained in accordance with the manufacturer's specifications.

3.1 SOIL, SEDIMENT, AND GROUNDWATER SAMPLING

Air monitoring with a photoionization detector (PID) will be conducted when sampling media suspected of containing hydrocarbons to determine potential personnel exposure to hazardous airborne contaminants (Table 3-1). Air monitoring with a portable dust monitoring device will be conducted when sampling sediment or soil in the former wood burner area.

Available exposure limits for potential contaminants of concern are shown in Table 3-2.

If a change in conditions (i.e., odor, etc.) indicates a need to upgrade personal protective equipment (PPE), the Parametrix Corporate Health and Safety Officer will be notified immediately. The situation will be reviewed and evaluated by the Project Manager, with input as needed from the Corporate Health and Safety Manager, Sheila McConnell.

Only those employees working in direct contact with contaminants will be monitored for potential exposure. The potential contaminants will be moist to wet and are unlikely to present an airborne hazard. If any conditions or monitoring shows those employees having potential exposure, the monitoring plan will be re-evaluated, and other employees may be added for monitoring. The Project Manager will be notified with questions or adjustments to air monitoring procedures.

Table 3-1. Air Monitoring and Action Levels

Exposure	Method	Monitoring Description	Action Level	Action
Screening for organic and inorganic vapors	PID	A PID will be used to assess potential exposures to organic vapors.	• >10 ppm sustained for 5 minutes	• Terminate operation and move upwind • Ventilate area, as needed • Investigate cause • Upgrade to Level C Respirator with organic vapor/HEPA cartridge • Wet area and screen with PID prior to resuming work
Airborne Particulates	Real Time Dust Monitor	Exposure to airborne particulates will be assessed using a portable real time dust monitor.	• 5 mg/m^3 sustained for 5 minutes	• Control with water spray

Notes: HEPA = high efficiency particulate air
PID = Photoionization Detector.
ppm = parts per million.
mg/m^3 = milligrams per cubic meter.

Table 3-2. Exposure Concentrations for Potential Chemicals of Concern

Analyte	Threshold Limit Value / Permissible Exposure Limit	Immediately Dangerous to Life and Health
Benzene	0.1 ppm	500 ppm
Ethylbenzene	100 ppm	800 ppm
Toluene	100 ppm	500 ppm
Xylene	100 ppm	900 ppm
Lead	0.050 mg/m^3	100 mg/m^3
Benzo(a)pyrene	0.2 mg/m^3	80 mg/m^3
Dioxin	None Available	None Available

Source: EPA, 2005 (www.epa.gov)
Notes: mg/m^3 = micrograms per cubic meter
ppm = parts per million

4. PERSONAL PROTECTIVE EQUIPMENT

Based on available chemical information for the project sites, Level C or D PPE will be required while conducting sampling activities. This level of protection generally includes:

Level C

- Steel-toe/shank leather or rubber boots.
- Tyvek, Saranex, poly coated Tyvek, or equivalent coveralls, as needed for working with contaminated soil and water.
- Nitrile surgical weight gloves to be used as inner gloves.
- Work gloves, nitrile gloves, or equivalent, to use as outer gloves, as needed.
- Hardhat.
- Safety glasses or goggles for general site work and with shading to control glare when working around water.
- Hearing protection for all activities in areas where it is necessary to shout to communicate or when working around heavy equipment.
- Full face air-purifying respirator if action level for dust is sustained for 5 minutes or greater.

Level D

- Steel-toe/shank leather or rubber boots.
- Polycoated Tyvek suit, or equivalent, will be required when sampling or working with dioxin contaminated soil or sediment in Area D.
- Nitrile surgical weight gloves to be used as inner gloves, as needed.
- Work gloves, nitrile gloves, or equivalent, to use as outer gloves, as needed.
- Hardhat.
- Safety glasses or goggles for general site work and with shading to control glare when working around water.
- Hearing protection for all activities in areas where it is necessary to shout to communicate or when working around heavy equipment.

Additional information on PPE is presented the Parametrix Health and Safety Manual (Parametrix, 2003) and Standard Operating Procedures located in Appendix C of this document.

At least one first aid kit and cellular phone will be available on-site in the company vehicle during onsite activities.

5. SITE CONTROL AND DECONTAMINATION

Worksite controls will be established whenever soil disturbance may take place. Inspections and other similar activities do not need hazardous waste site controls; however, there may be other crews with site zones established, and these shall be respected and maintained. It is anticipated that cones with tape barriers will be set up around areas of contaminated soil prior to and during excavation activities.

The object of site control is to assure that only qualified personnel enter potentially hazardous locations and to effectively control the spread of contamination. As a minimum, a "hot" zone, extending approximately 10 feet from the work, should be established. If the sampling personnel are reasonably certain that untrained, unprotected people will not enter the "hot" zone, then demarcation may not be necessary.

Barrier tape and cones will be used to demarcate contaminated soil prior to and during excavation activities. Only personnel with a current 40-hour Hazardous Waste Operation (HAZWOPER) certification and up-to-date refresher course will be allowed inside the restricted areas.

Upon sampling, personnel involved in the sampling operation will verbally notify any workers or other individuals in the direct working area where sampling will be taking place.

The following items should be remembered when establishing site control:

- Site control measures shall be established prior to beginning any work that disturbs potentially contaminants soils.
- Personnel will not get into vehicles with dirty boots, boot covers, or in dirty coveralls. Set the job up to keep the sediments in their original location on the site.
- The work area shall be protected from public intrusion and will include fencing, barricades, and signage.
- It is up to each sampling crew to establish site control based on potential hazards and on the crew's planned activities. Make it practical and useful.
- All tools used for sampling will be properly decontaminated after each use.

Any potentially contaminated personnel will decontaminate prior to getting into vehicles, vessels, eating lunch, or leaving the site.

For all personnel working within a "hot" zone, decontamination will be conducted to remove gross contamination that may have accumulated on workers, equipment, and sampling supplies during site activities and to prevent the migration of contaminants from the site. Decontamination may consist of brushing with a stiff brush to remove dry particles and, if necessary, washing with household soap or an Alconox solution and rinsing with clean water. Additional information on decontamination procedures can be found in the Parametrix Health and Safety Manual (Parametrix, 2003) and Standard Operating Procedure HS-007, Appendix C of this document.

All water used for decontamination by personnel should be containerized and disposed of following site waste handling procedures or as described in the Parametrix Health and Safety Manual (Parametrix, 2003) and Standard Operating Procedure HS-006, Appendix C of this document.

6. TRAINING AND SAFETY AUDITS

All personnel conducting sampling activities on the project site must be HAZWOPER trained per the federal requirement 29 CFR 1910.120 and be current with their annual 8 hour refresher course. All personnel should have proof of HAZWOPER training available on the project site.

All personnel working at the project site will be briefed on potential site hazards, health and safety procedures, site construction rules and requirements, and sampling procedures. Following completion of this training, all personnel will be required to sign an acknowledgement form verifying that they have completed the project-specific health and safety training. A copy of the Project-Specific Training Acknowledgement Form is included in Appendix A.

A tailgate safety meeting will be conducted each morning prior to the start of daily field activities. Each employee and, as appropriate, subcontractor personnel will attend the tailgate safety meeting and sign the daily tailgate meeting log. A Daily Tailgate Meeting Log is included in Appendix A.

A job site inspection and safety assessment will be conducted at least once during field activities to ensure compliance with corporate health and safety requirements and all applicable local, state, and federal health and safety requirements. The results of job site inspections and safety audits will be documented and submitted to the project file. Corrective action will be completed, as necessary, and documented.

Site inspections and audits will not only be completed for all Parametrix operations, but also for all subcontractor operations to ensure compliance with applicable site health and safety requirements. Observed health and safety deficiencies will be reported to the Parametrix Project Manager and the subcontractor Project Manager, as needed.

7. PROJECT/EMERGENCY CONTACTS AND PROCEDURES

The project and emergency contacts for the Solid Wood Inc. (West Bay Park) project are shown in Table 7-1.

Table 7-1. Project and Emergency Contacts

Name	Role	Phone Number
Julie McQuary	Project Manager, OPARD	(360) 709-2700
Dave Hanna	Associate Director, OPARD	(360) 753-8020
Brandon Ball	Senior Project Manager	(360) 850-5346 (360) 307-1612 (cell)
Dave Dinkuhn	Project Manager	(360) 850-5319 (360) 471-3917 (cell)
Lara Linde	Field Sampler and Field Health and Safety Officer	(360) 850-5332 (360) 710-2054 (cell)
Lily Isenhart	Field Sampler	(360) 850-5333 (360) 535-4797 (cell)
Sheila McConnell	Corporate Health and Safety Officer	(425) 452-8655 (425) 681-7516 (cell)
Emergency (fire, accident, etc.)	–	911
Providence St. Peter Hospital Olympia	–	(360) 491-9480 (888) 492-9480

7.1 EMERGENCY ASSISTANCE

Table 7-1 provides a list of emergency telephone numbers. This list is to be conspicuously posted near the telephone or other communication network set up at the site to summon outside emergency assistance.

In case of emergency, at least one cell phone will be available onsite at all times during sampling activities. A map and directions to the nearest hospital (Providence St. Peter Hospital) is contained in Appendix B.

7.2 POTENTIAL INCIDENTS

Although considered unlikely, the following situations could occur and would require an emergency response action:

- Sudden release of hazardous vapors/combustible gases
- Problems due to contacting utility lines (gas, electric, water)
- Fire
- Medical emergency
- Overt exposure (skin contact, inhalation, ingestion)

7.2.1 Release of Hazardous Vapors/Combustible Gases

7.2.1 Release of Hazardous Vapors/Combustible Gases

In the event of a sudden release of hazardous vapors or gases constituting a potentially hazardous situation (e.g., adequate respiratory protection is unavailable, atmospheres are immediately dangerous to life or health or explosive, there is an imminent public health and safety hazard), the Field Health and Safety Officer will suspend operations and evacuate the site. All personnel will be required to evacuate to a pre-designated safe area upwind of the release.

The Field Health and Safety Officer, in consultation with the emergency response agencies, fire department, and facility or system owner/operator, will attempt to control or secure the spread of contamination whenever possible.

7.2.2 Utilities

If aboveground or underground utilities are damaged or contacted, notify the local fire department. If injury occurs, see Medical Emergency section below.

7.2.3 Fire

In the event of a fire, notify the site or system owner/operator and summon the fire department.

7.2.4 Medical Emergency

At least one Parametrix employee or onsite worker will have current certification in first aid and cardiopulmonary resuscitation (CPR). In the event of a serious injury or illness, paramedics (i.e., fire department) must be summoned immediately. Workers with suspected back or neck injuries are not to be moved until professional emergency assistance arrives. If there is evidence of serious trauma or unknown chemical exposure, the employee should be stabilized by the Field Health and Safety Officer or designee while the paramedics or an ambulance is immediately summoned.

For non life threatening injuries that do not impair driving ability, site personnel will drive to Providence St. Peter Hospital. Appendix B illustrates the route to the hospital.

A first aid kit will be available at the site for use in case of minor injuries. First aid responders should protect themselves from contact with blood and other human body fluids by wearing latex gloves or establishing an equivalent barrier. Any contact with blood should be reported to the Field Health and Safety Officer.

4.2.5 Exposure

In the event of respiratory exposure, dermal or eye contact, or ingestion, the following procedures will be followed:

- Respiratory Exposure (Inhalation). Move to fresh air. Summon paramedics and notify facility or system owner/operator. Any loss of consciousness or exposure to elevated levels of known toxic contaminants, even if the individual appears to have fully recovered, will require immediate treatment and/or surveillance by a qualified physician.
- Dermal Contact. Flush area with copious amounts of soap and water. Wash/rinse affected area for at least 15 minutes. Decontaminate and provide medical attention.
- Eye Contact. Flush eye(s) for a period of 15 minutes and transport worker to the nearest emergency medical facility. Treatment and/or surveillance by a qualified physician is required.

- Ingestion. Notify the National or local Poison Control Center and/or emergency medical facility and immediately transport to the facility.

7.3 ADVERSE WEATHER CONDITIONS

In the event of adverse weather conditions, the Field Health and Safety Officer will determine if sampling activities can continue without endangering field personnel. Some of the conditions to be considered prior to determining if activities should continue are as follows:

- Potential for thermal stress (e.g., heat or cold stress) and related injuries.
- Dangerous weather related working conditions that would preclude working from a boat (e.g., high winds, rain, snow, fog, lightning, etc.).
- Limited visibility.
- Potential for electrical storms. No outside activities will be permitted during electrical storms.

8. STANDARD OPERATING PROCEDURES

The following project-related standard operating procedures (SOPs) are included in Appendix C:

- Personal Protective Equipment (SOP HS-002).
- Respiratory Protection (SOP HS-003).
- Handling of Investigation Derived Waste (SOP HS-006).
- Decontamination (SOP HS-007).
- Excavation and Trenching (SOP HS-009).
- Heat Stress (SOP HS-010)
- Cold Stress (SOP HS-011)

Note: Soils may be very oily making decontamination more difficult, and it is not appropriate to release soap (a dispersant) into the water. Decontamination will be attempted with soap and water wash and careful containment of the wash solution and rinsate. If this is not sufficient, a small squeeze bottle of hexane may be used to decontaminate sampling equipment and other impervious surfaces. Gloves and other PPE that cannot be cleaned will be properly disposed. Packaged wipes may also be used in lieu of soap and water if they provide sufficient cleaning.

9. REFERENCES

EPA. 2005. Air Toxics Website. www.epa.gov/ttn/atw.

Parametrix, 2003. Parametrix Health and Safety Manual. Prepared for EPA Region X. March.

APPENDIX A

Forms

PROJECT-SPECIFIC TRAINING ACKNOWLEDGEMENT FORM
FOR HAZARDOUS WASTE OPERATIONS

Prior to the initiation of field activities, I attended a site-specific training for the Palermo Groundwater Long-term Monitoring Project. The training included topics that are covered in the Parametrix Health and Safety Manual and the project-specific Health and Safety Plan (HASP). Additionally, I have been given an opportunity to read and questions the contents of these documents.

By signature, I certify that I have read, understood, and agree to comply with the information and directions set forth in the aforementioned documents and site-specific training. I further certify that I am in full compliance with OSHA 29 CFR 1910.120 in regards to training and medical monitoring requirements, as well as all other federal, state, and local regulations in regards to training and medical requirements.

SITE SPECIFIC OPERATIONS, POTENTIAL HAZARDS, AND CONTROL		
PRINTED NAME	**SIGNATURE**	**TRAINING DATE**

DATE:	**MEETING LOCATION:**
TRAINER:	**TITLE:**
COMMENTS/EXCEPTIONS/EXEMPTIONS:	
TRAINER SIGNATURE:	

PARAMETRIX
DAILY HEALTH AND SAFETY TAILGATE
MEETING LOG

DATE/TIME	NAME (PRINT)	NAME (SIGNATURE)	TOPIC

APPENDIX B

Map and Directions to Hospital

MAPQUEST

A: 700 W Bay Dr NW, Olympia, WA 98502

START	**1:** Start out going SOUTH on W BAY DR NW toward GARFIELD AVE NW.	0.4 mi
→	**2:** Enter next roundabout and take 2nd exit onto OLYMPIC WAY NW.	0.1 mi
→	**3:** Enter next roundabout and take 3rd exit onto 4TH AVE W.	2.3 mi
↑	**4:** 4TH AVE W becomes MARTIN WAY E.	0.5 mi
←	**5:** Turn LEFT onto ENSIGN RD NE.	0.3 mi
←	**6:** Turn LEFT onto PROVIDENCE LN NE.	0.1 mi
END	**7:** End at 410 Providence Ln NE # 2 Olympia, WA 98506	

Estimated Time: 10 minutes Estimated Distance: 3.72 miles

B: Providence St Peter Hospital: 410 Providence Ln NE # 2, Olympia, WA 98506

Total Time: 10 minutes Total Distance: 3.72 miles

APPENDIX C

Standard Operating Procedures

Standard Operating Procedures

PERSONAL PROTECTIVE EQUIPMENT

Prepared By: Jerry A Bukowski — Date: 3-10-03
Health and Safety Committee Chair

Reviewed By: J M McConnell — Date: 3/11/03
Corporate Health and Safety Officer

Approved By: [signature] — Date: 3/11/03
Chief Operating Officer

1.0 Purpose

This Standard Operating Procedure (SOP) establishes guidelines for selection and use of Personal Protective Equipment (PPE) used to protect Parametrix employees from the risk of injury by creating a barrier against workplace hazards.

2.0 Scope

29 CFR 1910, Subpart I requires the use of PPE to reduce employees' exposures to hazards when engineering and administrative controls are not feasible or effective in reducing these exposures to acceptable levels. Employers are required to determine all exposures to hazards in their workplace and determine if PPE should be used to protect their workers. OSHA requires employers to conduct inspections of all workplaces to determine the need for PPE and to help in selecting the proper PPE for each task performed.

This SOP addresses eye, face, head, foot, hand, and body protection. Respiratory protection is discussed in SOP HS-003.

3.0 Responsibilities

There are specific responsibilities for Parametrix personnel in the care and use of PPE, depending on an individual's role within the company or on a given project. These responsibilities are outlined below:

- **Corporate Health and Safety Officer (CHSO):** The Corporate Health and Safety Officer is responsible for developing the PPE Program and updating PPE procedures, as necessary.
- **Project Manager:** The Project Manager is responsible for field implementation of the PPE Program. This includes assurance that all personnel on site comply with the policy and that all on-site personnel have had proper training in using PPE.
- **Site-specific Health and Safety Officer (SHSO):** The Site-specific Health and Safety Officer is responsible for initial on-site coordination of the cold stress. The SHSO assures that all personal potentially exposed to potential environmental hazards have proper PPE.
- **Team Member:** Each Team Member is responsible for understanding and complying with all site requirements.

4.0 Requirements

Eye and Face Protection

Eye and face protection shall be used when employees are exposed to potential hazards from flying particles, molten metal, acids or caustic liquids, chemicals, or gases. Eye and face protection requirements include:

- Appropriate eye and face protection devices in hazardous environments for personnel who wear contact lenses.
- Side protectors when there is a hazard from flying objects.
- Goggles and face shields when there is a hazard from chemical splash.
- Face shields worn only over primary eye protection (safety glasses or goggles).
- Eye protectors that incorporate an employee's corrective eye prescription in the design or that fit properly over the prescription lenses.

Emergency eyewash facilities meeting the requirements of ANSI Z358.1 will be provided in all areas where the eyes of any employee may be exposed to corrosive materials. All such emergency facilities will be located where they are easily accessible in an emergency.

Protective eye and face devices purchased after July 5, 1994 shall comply with ANSI Z87.1-1989, "American National Standard Practice for Occupational and Educational Eye and Face Protection."

Head Protection

Head protection (hard hat) must be worn by all employees when overhead hazards from falling or fixed objects are present. Also, when an employee is near exposed electrical conductors that could come in contact with the head, the employee must wear a protective helmet designed to reduce electrical shock hazard.

Protective headgear shall comply with ANSI Z89.1-1986, "American National Standard for Personnel Protection-Protective Headwear for Industrial Workers-Requirements."

Foot Protection

Steel-toed boots or shoes must be worn in work areas where carrying or handling materials such as packages, objects, parts, or heavy tools could be dropped or fall onto the feet. Safety shoes or boots with puncture protection are required where sharp objects such as nails, wire, tacks, screws, large staples, scrap metal, etc., could be stepped on by employees and cause foot injury.

When working with hazardous chemicals or waste, chemical-resistant, steel-toed boots may be required.

All safety footwear shall comply with ANSI Z41-1991, "American National Standard for Personal Protection – Protective Footwear."

Hand Protection

Suitable gloves shall be worn when hazards from chemicals, cuts, lacerations, abrasions, punctures, burns, and other hazards to the hands are present. Glove selection shall be based on performance characteristics of the gloves, conditions, durations of use, and hazards present.

The first consideration in the selection of gloves for use against chemicals is to determine, if possible, the nature of the substances to be encountered. Employees must read instructions and warnings on chemical container labels and MSDSs before working with any chemical.

Body Protection

Suitable body protection (torso and legs) must be worn while completing job tasks. Depending on the hazards present, body protection may include coveralls, Tyvek or Saranex suits, totally encapsulating suits, etc. The type of body protection required to perform a specific task will be determined by the Corporate or Site-specific Health and Safety Officer, as necessary.

5.0 Training

Any worker required to wear PPE shall receive training in the proper use and care of PPE. The training shall include, but not necessarily be limited to, the following subjects:

- Determining when wearing PPE is necessary.
- Determining the appropriate and necessary PPE.
- Learning how to properly wear, adjust, and remove PPE.
- Understanding the limitations of PPE.
- Understanding the proper care, maintenance, and disposal of PPE.

6.0 References

U.S. Department of Labor, OSHA Standard 29 CFR 1910, Subpart I.

Standard Operating Procedures

RESPIRATORY PROTECTION PROGRAM

Prepared By: Jerry A Bukowski — Health and Safety Committee Chair — Date: 3-10-03

Reviewed By: L M McConnell — Corporate Health and Safety Officer — Date: 3/11/03

Approved By: M L — Chief Operating Officer — Date: 3/11/03

1.0 Purpose

To establish the minimum requirements for Parametrix, Inc. employees to use respiratory protection.

2.0 Scope

This Standard Operating Procedure (SOP) applies in its entirety to all Parametrix projects unless the Corporate Health and Safety Officer (CHSO) grants a variance.

3.0 Responsibilities

There are specific responsibilities for Parametrix personnel in complying with the Respiratory Protection Program, depending on an individual's role within the company or on a given project. These responsibilities are outlined below:

- **Project Manager:** Overall responsible for establishing and ensuring compliance with this procedure.
- **Field Health and Safety Staff:** Responsible for implementing and/or monitoring activities associated with this procedure.
- **Managers and Supervisory Personnel:** Responsible for enforcing this procedure and ensuring that each employee is properly following the procedure.

4.0 General Requirements

Respirator wearers cannot be afforded protection from hazardous airborne contaminants when conditions prevent a complete gas-tight face seat. Facial hair, head hair, and eyeglasses are among these physical obstructions. While eyeglasses are in the category of obstructions that prevent a gas-tight face seal, primarily in the case of full-face supplied-air respirators, this problem is correctable by using mounting devices to hold the eyeglass frames inside the respirator face piece. The criteria state that there can be no obstruction of contact between the wearer's skin and the mask. Beard stubble constitutes a physical obstruction. Affected employees shall be required to be clean-shaven, as a condition of employment.

Candidates for employment who object to this policy shall be made aware that their versatility on work assignments may be limited and that this factor can affect their job assignments.

Parametrix shall provide respirators whenever a qualified person determines that such equipment is necessary to protect the health of the employee from significant inhalation exposure.

Only respirator equipment that has been jointly approved by the Mine Safety and Health Administration (MSHA) and the National Institute for Occupational Safety and Health (NIOSH) shall be provided.

Employees shall be instructed and trained in the need, use, sanitary care, and limitations of such respiratory equipment prior to being assigned to activities that require respiratory protection.

Parametrix shall provide, repair, or replace respiratory protective equipment as may be required due to wear and deterioration.

Means of cleaning all respiratory protective equipment shall be provided.

Only those employees who are trained and medically qualified to wear respirators shall be assigned to work requiring use of respirators.

5.0 Implementation

Respiratory Selection

When respirator use is required, only properly cleaned and maintained NIOSH/MSHA-approved respirators shall be used. Single-use respirators (dust masks) may only be used with specific approval by the Corporate Health and Safety Officer.

Employees shall be allowed to pick the most comfortable respirator from a selection, including respirators of various sizes from different manufacturers.

Selection of respirators shall be approved by the Field Health and Safety Staff in all cases, and shall be based on the following considerations:

- Nature of the Hazard – The chemical and physical properties, toxicity, and concentration of hazardous material or mixture of materials.
- Oxygen-deficient Atmospheres – Entry into oxygen-deficient atmospheres is prohibited without prior approval of the Corporate Health and Safety Officer.
- Immediate Dangerous to Life and Health (IDLH) Atmospheres – Entry into any IDLH atmosphere is prohibited without prior approval of the Corporate Health and Safety Officer.
- Irritant or Corrosive Atmospheres – Respirators selected must provide adequate face and eye protection. The contaminant or mixture of contaminants must have adequate warning properties (odor, irritation, or taste) to indicate respirator breakthrough if an air-purifying device is used.

- Regulated Materials – In all cases where OSHA has required that a specific respirator is used (carcinogen standards, etc.), the specified respirator, or one providing equal or better protection, shall be used.

- Air-purifying respirators shall NOT be used for protection against the materials listed below. Note that this is only a partial list; please contact the Field Health and Safety Staff for further information:

Acrolein	Methyl chloride
Aniline	Methylene chloride
Arsine	Nickel carbonyl
Bromine	Nitrobenzene
Carbon monoxide	Nitrogen oxides
Ollsocyanates	Nitroglycerine
Dimethylaniline	Nitromethane
Dimethyl sulfate	Ozone
Hydrogen cyanide	Phosgene
Hydrogen fluoride	Phosphine
Hydrogen selenide	Phosphorus trichloride
Hydrogen sulfide	Stibine
Methanol	Sulfur chloride
Methyl bromide	

Parametrix subcontracts most asbestos inspections and all asbestos abatement. Inspection personnel may use half-mask respirators in areas where asbestos is present if they are qualitatively-fit tested.

Full–facepiece, negative-pressure, air-purifying respirators are not acceptable for protection against asbestos exposure unless the wearer meets the quantitative fit testing requirement.

Use of Corrective Lens Eyewear with Respirators

The wearing of contact lenses in work environments that involve exposure to chemical fumes, vapors, splashes, intense heat, molten metals, or highly particulate-contaminated atmosphere is prohibited.

Management shall assess which employees in their operations wear eye glasses routinely, determine what respiratory protective masks (makes and models) are used, and assure that the appropriate frames or ophthalmic device hangers are obtained and provided at company expense.

Employee Training and Instruction

The basic respiratory training program shall include, as a minimum, the following:

- Instruction in the need for, use, sanitary care, and limitations of each respirator type.
- Opportunity for "hands-on" experience with respirators.
- Proper fitting, including demonstrations and practice in wearing, adjusting, and determining the fit of the respirator. A selection of respirators shall be available to determine the most comfortable respirator and the best fit.
- How to perform a positive and negative pressure test of the face piece to face seal.
- A familiarization period of wear in normal air.
- For negative pressure respirators, qualitative fit testing will be conducted by wearing the respirator in an irritant fume test atmosphere. A qualified person using the protocol found in Attachment A of this procedure shall perform all qualitative fit testing or other protocol, as designated by specific standards (e.g., asbestos, benzene). Powered air-purifying respirators (PAPRs) shall be worn in a test atmosphere with the power supply disconnected to evaluate fit in the negative pressure modes.
- Qualitative fit testing shall be performed annually, or more frequently as required by law. Quantitative fit testing may be required for some respirator or contaminants. The Field Health and Safety Staff will determine fit test requirements. Fit testing procedures are presented in Attachment A.
- Instruction in the nature of the respiratory hazards, whether acute, chronic, or both, and a description of potential health effects if the respirators are not used.
- Classroom and field training to recognize and cope with emergency situations (including respirator failure).

Training provided as part of this procedure shall be performed in accordance with applicable regulations.

Respirator Inspection, Cleaning, Maintenance, and Storage

General: The Field Health and Safety Staff will define and provide a program to area/facility management regarding maintenance and care of respirators, and which shall be adjusted to the type of facility, working conditions, and hazards involved. This program shall include the following basic elements:

- Inspection for defects and/or deterioration.
- Cleaning and disinfecting in accordance with manufacturers' instruction.
- Repair, as necessary.

- Establishment and maintenance of a record-keeping system to document respiratory inspection, repair, and maintenance.

- Proper storage.

Inspection, Maintenance, and Storage

Users shall inspect all respirators routinely before, during, and after each use. Any defects shall be reported to the supervisor. No defective respirators shall be issued or worn. Defective respirators shall be tagged and returned for repair.

Respirators maintained for emergency use (such as SCBA) shall be inspected and sanitized after each use and inspected at least monthly. A record of the most recent inspection shall be maintained on the respirator or the storage container and shall include the inspector's identification, the date, and a respirator identification number.

An individual who is qualified by experience or training shall regularly clean, inspect, and sanitize routinely-used respiratory equipment.

Other types of respiratory equipment shall be maintained according to the manufacturers' instructions.

Where respirators are assigned to individual employees, area management shall ensure compliance with cleaning and maintenance requirements by periodically inspecting respiratory equipment and conducting field audits.

Respiratory equipment shall not be passed from one person to another until it has been cleaned and sanitized.

When not in use, respirators shall be stored to protect against dust, sunlight, extreme temperatures, excessive moisture, damaging chemicals, and physical damage.

Air Purifying Respirators (APR)

Fit testing shall be accomplished In accordance with Attachment A of this procedure.

When APRs are worn, employees shall change the filter-cartridge elements daily, in the case of cartridges used for non-particulate contaminants, or sooner if "breakthrough" is occurring. For other filter cartridges, the filter-cartridge should be replaced whenever an increase in breathing resistance is detected.

Powered Air Purifying Respirators (PAPR)

When PAPRs are worn, employees shall change filter/cartridge elements dally, in the case of cartridges used for non-particulate contaminants, or sooner if "breakthrough" is occurring. For other filter cartridges, the filter-cartridge should be replaced if any of the following scenarios occur:

- Whenever an increase in breathing resistance is detected, or
- When airflow through filter elements decreases to an unacceptable level, as indicated by the manufacturer's test device.

Compressed Air Systems

- Air Quality
  - ➢ Compressed air used for respiration shall be of high purity, and shall meet, as a minimum, the requirements for the specification for Grade D or better breathing air as described in Compressed Gas Association Specification G-7.1 (ANSI Z86.1-1973). The supplier shall certify compliance with these requirements for each lot of breathing air supplied.
  - ➢ Breathing air shall be free from harmful dusts, fumes, mists, vapors, gases, or odors.
  - ➢ Oxygen shall NOT be used at any time in open-circuit SCBAs or in air-line respirators.
  - ➢ Mixed or blended air shall not be used for breathing purposes.

Compressed Air Cylinder Systems (Cascade)

Breathing air cylinders shall be legibly identified with the word AIR, by means of stenciling, stamping, or labeling as near to the valve end as practical.

Cascade systems shall be equipped with low-pressure warning bells or similar warning devices to indicate air pressure in the manifold below 500 psi.

When a cascade system is used to supply breathing air, one employee shall be assigned as a safety standby within audible range of the low- pressure alarm.

When a cascade system is used to recharge SCBA air cylinders, it shall be equipped with a high-pressure supply hose and a coupling rated at a capacity of at least 3,000 psi.

Air-line couplings shall be incompatible with outlets for other gas systems to prevent inadvertently supplying air-line respirators with non-respirable gases or oxygen.

The air pressure at the hose connection to positive pressure respiratory equipment shall be within the range specified in the approval of the equipment by the manufacturer.

Cylinders shall be stored and handled to prevent damage to the cylinder or valve. Cylinders shall be stored upright with the protective valve cover in place and, in such a way (e.g., supported with substantial rope or chain in the upper one-third of the cylinder, or in racks designed for this purpose) as to prevent the cylinder from falling. Cylinders shall not be dropped, dragged, rolled, or allowed to strike each other or to be struck violently. Cylinders shall never be exposed to temperatures exceeding 125°F. Cylinders with visible external damage, evidence of corrosion damage, or exposure to fire shall not be accepted or used.

Only cylinders within current hydrostatic test periods shall be used.

Compressor Supplied Breathing Air

All compressors used for supplying breathing air shall be equipped with the following safety and standby devices:

- Compressor intakes that are located to ensure that only respirable (uncontaminated) air is admitted. This requires attention to the location of the compressor intake with respect to compressor engine exhaust, chemical storage or use areas, and suitable intake screening or filtration.
- Alarms to indicate compressor failure (such as low-pressure air horns, etc.) shall be installed in the system.
- A receiver of sufficient capacity to enable the respirator wearer to exit from a contaminated atmosphere upon compressor failure shall be provided.
- Oil Lubricated Compressors – If an oil-lubricated compressor is used to supply breathing air, it shall be equipped with both of the following devices:
  - A continuous-reading carbon monoxide monitoring system that is set to alarm should the carbon monoxide concentration exceed 10 ppm.
  - A high-temperature alarm which will activate when the discharge air exceeds 110% of the normal operating temperature in degrees Fahrenheit,
- A designated employee shall be assigned as a safety standby and shall remain continuously within audible range of the alarms.
- An inline purifying filter assembly to remove oil, condensed water, particulate, odors, and organic vapors shall be used in conjunction with the air compressor.

Routine inspection and maintenance of the air compressor shall be performed in accordance with manufacturer's specifications.

Escape/Egress Units

These respirators are intended for use in areas where escape with a short-term (5-10 minute) air supply is necessary. They may be used as adjuncts to airline pressure demand respirators as a backup air supply; or as independent emergency devices in areas where respiratory protection is not normally required.

Appropriate training shall be accomplished and documented prior to assigning employees to tasks or locations subject to the use of these respirators.

Escape/egress units shall never be used as primary standby respirators for confined space entry.

Medical Screening

All potential candidates shall complete a medical questionnaire prior to respiratory use and once every three years. A more comprehensive medical evaluation may be required based on the results of the questionnaire.

No employee shall be assigned to a task that requires the use of a respirator unless it has been determined that the employee is physically able to perform the work while using the required respirator.

If an employee demonstrates difficulty in breathing during the fitting test or during use, the employee shall be re-examined by a physician to determine whether the employee can wear a respirator while performing the required duty.

Once a medical determination has been made to physical ability to wear a respirator, a review of the employee's health status shall be conducted annually, at a minimum.

ATTACHMENT A

PARAMETRIX MANDATORY QUALITATIVE RESPIRATOR FIT TEST PROTOCOL

NOTE: This protocol does not satisfy the fit test requirements for certain materials, including asbestos and benzene. Contact the Field Health and Safety Staff for assistance.

Respirator Selection

Respirators shall be selected as described in this procedure. The respirator shall be equipped with HEPA filters.

Fit Test

The test conductor shall review this protocol with the test subject before testing.

The test subject shall perform the following conventional positive and negative pressure fit checks:

- Negative Pressure Test – Cover the cartridge filter inlets with your palm and gently inhale, the face piece should collapse against the face.
- Positive Pressure Test – Cover the exhalation valve cover with your palm and gently exhale. The face piece should expand away from the face.
- If either test fails, loosen and readjust the respirator straps and check for obstructions to the sealing surface. Repeat both tests. If the test fails again, select an alternate respirator.

A test atmosphere shall be generated with irritant smoke.

The test subject shall be advised that the smoke can be irritating to the eyes and instructed to keep the eyes closed while the test is being conducted (applies to half-mask respirators).

While wearing the selected respirator, the test subject shall enter the test atmosphere and perform the following exercises:

- Breathe normally.
- Breathe deeply. Be certain breaths are deep and regular.
- Turn head all the way from one side to the other. Be certain movement is complete. Inhale on each side. Do not bump the respirator against the shoulders.
- Nod head up and down. Be certain motions are complete and made every second. Inhale on each side. Do not bump the respirator against the shoulders.
- Nod head up and down. Be certain motions are complete and made every second. Inhale when head is in the full, up position (looking toward coiling). Do not bump the respirator against the chest.

- Talk aloud and slowly in a fashion that will generate a wide range of facial movements.
- Breathe normally.

The test subject shall indicate to the test conductor if the irritant smoke is detected. If smoke is detected, the test conductor shall stop the test. In this case, the tested respirator is rejected and another respirator shall be selected.

Each test subject passing the smoke test (i.e., without detecting the smoke) shall be given a sensitivity check of smoke from the same tube to determine if the test subject reacts to the smoke. This may be performed by cracking the mask and gently inhaling while inside the test atmosphere. Failure to evoke a response shall void the fit test. This may trigger an asthmatic response; verify before beginning.

The test shall not be conducted if there is any hair growth between the skin and the face-piece sealing surface.

If hair growth or apparel interferes with a satisfactory fit, then the obstruction(s) shall be altered or removed to eliminate interference and allow a satisfactory fit. If a satisfactory fit is still not attained, the test subject must use a positive-pressure respirator, such as a powered, air-purifying respirator, supplied air respirator, or self-contained breathing apparatus.

If a test subject exhibits difficulty in breathing during the tests, the subject shall be referred to a physician trained in respiratory diseases or pulmonary medicine to determine whether the test subject can wear a respirator while performing required duties.

Qualitative fit testing shall be repeated at least every year, or more often, as required by law. In addition, because the sealing of the respirator may be affected, qualitative fit testing shall be repeated immediately when the last subject has experienced:

- A weight change of 20 pounds or more.
- Significant facial scarring in the area of the face-piece seal.
- Significant dental changes (i.e., multiple extractions without prosthesis, or acquisition of dentures).
- Reconstructive or cosmetic surgery.
- Any other conditions that may interfere with face-piece sealing.

Record Keeping

The following fit test forms shall be maintained in each office for three years. The Corporate Health and Safety Officer shall maintain permanent records. The summary shall include:

- Name of test subject.
- Date of testing.
- Name of test conductor.
- Respirator selected (indicate manufacturer, model, size, and approval number).
- Testing agent.

Standard Operating Procedures

HANDLING OF INVESTIGATION-DERIVED WASTE

Prepared By: Jerry A. Bikowski — Health and Safety Committee Chair — Date: 3-10-03

Reviewed By: G McConnell — Corporate Health and Safety Officer — Date: 3/11/03

Approved By: [signature] — Chief Operating Officer — Date: 3/11/03

1.0 Purpose

Management of investigation-derived waste (IDW) minimizes the potential for the spread of hazardous waste on site or off site through investigation activities. The purpose of this Standard Operating Procedure (SOP) is to provide instructions for the proper management of contaminated materials derived from field investigations.

2.0 Scope

The procedures outlined are to be followed by all personnel who participate in site activities in areas where IDW is generated.

Materials that are known or suspected to be contaminated with hazardous substances through the actions of sample collection or personnel and equipment decontamination were said to be investigation-derived wastes. These wastes include decontamination solutions, disposable equipment, drill cuttings and fluids, and groundwater monitoring well development and purge waters. To the extent possible, the Site Manager will attempt to minimize the generation of these wastes through careful design of decontamination schemes and groundwater sampling programs. Testing conducted on soil and water investigation-derived wastes will show if they were also hazardous wastes as defined by RCRA. This will determine the proper handling and ultimate disposal requirements.

The criteria for designating a substance as a hazardous waste, according to RCRA, is provided in 40 CFR 261.3 if investigation-derived wastes meet these criteria, RCRA requirements must be followed for packaging, labeling, transporting, storing and record keeping as described in 40 CFR 262 34. Those wastes judged to potentially meet the criteria for hazardous wastes, shall be stored in Department of Transportation-approved, 55-gallon steel drums.

Wastes that can be shown not to be RCRA-designated hazardous wastes may be handled and disposed on site or off site to municipal wastewater and/or solid waste systems at the direction of the EPA RPM. Investigation-derived waste is assumed to be RCRA-designated hazardous waste unless analytical evidence indicates otherwise.

3.0 Investigation-Derived Waste Management

Procedures that minimize the potential for the spread of hazardous waste include minimizing the volume of waste generated, waste segregation, appropriate storage, and disposal, according to RCRA requirements.

Waste Minimization

Within the absolute constraints demanded by worker health and safety and project quality assurance/quality control, the generation of investigation-derived wastes is to be limited. In the development of the investigation work plan, each aspect of the investigation is to be reviewed to identify areas where excess waste generation can be eliminated. General procedures that will eliminate waste include avoidance of unnecessary exposure of materials to hazardous waste, and coordination of sampling schedules to avoid repetitious purging of wells and use of sampling equipment.

Waste Segregation

Waste storage and handling procedures to be used depend on the type of generated waste. For this reason, investigation-derived hazardous wastes described below are segregated into separate, 55-gallon storage drums. Waste materials that are known to be free of hazardous waste contamination (such as broken sample bottles or equipment containers and wrappings), must be collected separately for disposal to municipal systems. Large plastic garbage or lawn and leaf bags are useful for collecting this trash.

Decontamination Solutions

Decontamination solutions are generated from washing and rinsing of personal protective equipment (PPE) and sampling equipment. Solutions considered investigation-derived wastes range from detergents, organic solvents, and acids used to decontaminate small hand samplers to steam cleaning rinsate used to wash drill rigs and other large equipment. These solutions are to be stored in 55-gallon drums with bolt-sealed lids.

Soil Cuttings and Drilling Mud

Soil cuttings are solid to semisolid soils generated during trenching activities, drilling for the collection of subsurface soil samples, or the installation of monitoring wells. Depending on the type of drilling, drilling fluids known as "muds" may be used to remove soil cuttings. Drilling fluids flushed from boreholes must be directed into a settling section of a mud pit. This allows reuse of the decanted fluids after removal of the settled sediments. Drill cuttings, whether generated with or without drilling fluids, are to be removed with a flat-bottomed shovel and stored in 55-gallon drums with bolt-sealed lids.

Well Development and Purge Water

Well development and purge waters consists of groundwater removed from monitoring wells to repair damage to the aquifer following well installation, obtain characteristic aquifer groundwater samples, or measure aquifer hydraulic properties. The volume of groundwater to be generated will determine the appropriate storage procedure. These activities can generate significant volumes of groundwater depending on the well yield and the duration of the test or activity. Use of drums or large–volume, portable tanks such "Baker Tanks" should be considered for temporary storage of purge water.

Disposable Equipment

Disposable equipment includes used personal protective equipment such as Tyvek coveralls, gloves, booties and APR cartridges, and some inexpensive sampling equipment such as trowels or disposable bailers. This equipment is assumed to be contaminated if it was used at a hazardous waste site because it is impractical to submit these items for analysis. These materials should be stored on site in 55-gallon drums, pending final disposal.

Waste Storage

The wastes that accumulate through investigations must be stored on site prior to disposal. An on-site waste staging area should be designated to provide secure and controlled storage for the drums. Per RCRA requirements, storage cannot exceed 90 days for materials presumed or shown to be RCRA-designated hazardous wastes. Waste that is known not to be RCRA–designated, should be promptly disposed to municipal waste systems.

Storage Containers

Containers shall be DOT-approved (DOT 17H 18/16GA OH unlined), open top, steel drums. The lids should lift completely off the drum, and be secured by a bolt ring. Enough drums should be ordered to store all anticipated waste, including extra drums for solid waste and decontamination water. Solid and liquid wastes are not to be mixed in the drums.

Pallets are often required to allow transport of filled drums to the staging area with a forklift. Normal pallets are 3′ x 4′ and will hold two to three, 55-gallon drums, depending on the filled weight. If pallets are required for drum transport or storage, Parametrix field personnel are responsible for ensuring that the empty drums are placed on pallets before they are filled and that the lids are sealed on the drums with the bolt tighten ring after the drums are filled. Because the weight of one drum can exceed 500 pounds, under no circumstances should Parametrix personnel attempt to move the drums by hand. In addition, Parametrix personnel should not operate forklifts as part of their regular field activities. Removal of drums to the staging area is normally the responsibility of the client, unless other arrangements have been made.

Drum Labeling

Each drum that is used will be assigned a unique number that will remain with that drum for the life of the drum. This number will be written in permanent marker on the drum itself. Do not label drum lids. Drum labels shall contain the following information:

- Waste accumulation start date.
- Well number or boring number, if applicable.
- Drum number.
- Contents matrix (soil, water. slurry, etc.).

- Generation location.
- Project name.

4.0 Waste Disposal

Responsibility for the final disposal of investigation-derived waste will be determined before field activities are begun and shall be described in the investigation work plan. Disposal or long-term storage (over 90 days) of RCRA-designated hazardous wastes requires procedures that are beyond the scope of this SOP. The Parametrix Hazardous Waste Management Program is presented in SOP HS-005.

Standard Operating Procedures

DECONTAMINATION

Prepared By: _____ Date: 3-10-03
Health and Safety Committee Chair

Reviewed By: _____ Date: 3/11/03
Corporate Health and Safety Officer

Approved By: _____ Date: 3/11/03
Chief Operating Officer

1.0 Purpose

This Standard Operating Procedures (SOP) provides instructions for personnel and equipment decontamination that are to be followed during field operations.

2.0 Scope

Decontamination is the process of removing or neutralizing contaminants that have accumulated on personnel and/or equipment at hazardous waste sites. Decontamination is required to protect personnel from the potential effects of hazardous substances and to minimize the spread of those substances. Decontamination methods include physical removal of contaminants, detoxification, and disinfection/ sterilization.

This SOP describes decontamination responsibilities and procedures to be implemented at hazardous waste sites. The procedures outlined are to be followed by all personnel who participate in site activities in areas that may contain hazardous substances. The scenarios of decontamination procedures presented here will not necessarily all be appropriate for a given site. Project procedures may be prepared as part of the Site-specific Health and Safety Plan (HSP) that focus on site-specific conditions and incorporate the appropriate procedures presented in this SOP.

This procedure applies in its entirety to all Parametrix projects unless the Corporate Health and Safety Manager (CHSO) grants a variance. Modifications to these procedures may be appropriate on a project-specific basis.

3.0 Responsibilities

There are specific responsibilities for Parametrix personnel in complying with the required decontamination procedures, depending on an individual's role within the company or on a given project. These responsibilities are outlined below:

- **Site-specific Health and Safety Officer:** The Site-specific Health and Safety Officer (SHSO) is responsible for maintaining and enforcing the project decontamination program. HSP decontamination procedures for all projects shall be reviewed and authorized by the

CHSO. All modifications and/or changes must be noted in the field logbook, documented as HSP revisions, and initialed by all field personnel.

- **Site Manager:** The Site Manager is responsible for assuring that all site personnel become familiar with and follow the decontamination procedures described in this SOP or in the Site-specific HSP.

4.0 Personnel Decontamination Procedures

Contamination avoidance is the best way to prevent the spread of contaminants. Direct contact with contaminants should be minimized by not leaning against objects, and not kneeling or sitting on the ground; through the use of remote sample-handling and container-opening techniques, wherever appropriate; and through the use of disposable equipment, wherever appropriate.

Decontamination Program Planning

The SHSO shall research the background information on a particular site when planning decontamination procedures for the fieldwork at that site. The physical, chemical, toxicological, and pathogenic properties (if any), as well as the amounts and concentrations of each contaminant present at the site, are the determining factors in selecting the levels of protection for personnel and the extent of decontamination required. Sources of information for the characterization of hazardous waste sites include site records, state and federal agency files, and interviews with knowledgeable people. Hazardous and toxicological references, industrial process references, and manufacturers' handbooks are also good sources of information. Topography, local meteorological conditions (most probable wind direction, rainfall, etc.), and other site-specific features, are factors to consider in defining decontamination measures.

Decontamination Station Layout

When site conditions require, a dedicated area shall be established as a decontamination station. The decontamination station shall be located upwind of the Exclusion Zone. This is especially important when airborne contaminants are detected at above-background levels, or when such a potential exists. This is to prevent the airborne contamination of the Contamination Reduction Zone (CRZ) and the Support Zone. Exclusion, CRZ, and Support Zones are depicted in Figure I and defined as follows:

- **Exclusion Zone:** The zone encompassing the contaminated area that must be large enough to prevent the spread of contaminants beyond its boundaries. The extent of the Exclusion Zone will depend on:
  - Toxicity of the contaminants.
  - Physical form of the contaminants (solid, liquid, or gas).
  - Amounts and concentrations of the contaminants.
  - Fire and explosive potential of contamination.
  - Site-specific conditions such as topography and meteorology, and potential and active migration pathways to air, water, and soil.

- **Contamination Reduction Zone (CRZ):** The area between the Exclusion and Support Zones where contamination is controlled and/or removed. A contamination reduction corridor is an area within the CRZ that is the point of entry and exit for personnel to and from the Exclusion Zone.

- **Support Area:** The Support Area is separated from the CRZ by the contamination control line (CCL). The Support Area must be free from all contamination at all times.

The boundaries of the decontamination station should be clearly visible to all field personnel. The decontamination line should be set up along a straight line to facilitate identifying each station in the decontamination process. Movements to and from the exclusion zone will only be via the decontamination corridor.

Site-specific conditions to consider when locating the decontamination station are the location(s) of field investigation activities, accessibility to site personnel, and site terrain and safety. The decontamination station should be moved if site investigation activities are moved significantly.

The SHSO will determine if gross contamination has spread beyond the Exclusion Zone if wind direction changes (when airborne contaminants are suspected), inclement weather develops, or other site-specific factors arise.

Multiple decontamination stations may be deemed necessary by the SHSO, depending on the particular project.

Decontamination equipment materials and supplies are generally selected on the basis of availability and compatibility with contaminants encountered. Other considerations include ease of equipment decontamination, disposability, and site-specific requirements. Recommended equipment for a decontamination station includes the following:

- Plastic sheeting, or other suitable materials, on which the decontamination tubs, clean equipment, and contaminated equipment can be set down.

- Long-handled, soft-bristled wire or other scrub brushes to help scrub off contaminants.

- Large plastic or steel tubs or other suitable tubs. These should be large enough for a worker to step in.

- Paper towels for drying protective clothing and equipment.

- DOT-approved drums with lids for contaminated wash and rinse solutions, for contaminated disposal items and for trash cans.

- Washcloths, soap, and towels for hand rinse.

- Pressurized spray cans for deionized/distilled water.

- Portable shower facilities for full-body wash (it needed).

- Folding chairs and tables.

- Pocket knife.
- Stakes and rope for marking the hot zone limits.
- First Aid kit.
- Decontamination solutions and detergents.
- Distilled and deionized water. Potable tap water for decontamination.

Personnel Decontamination Solutions

Personnel will generally use household soap and water. The detergents Alconox or Liquinox and water are the preferred surfactants for most decontamination procedures relating to equipment. Selection of specific solvents and decontamination solutions are to be defined in the site work plan.

The effectiveness of decontamination solutions will be continuously verified. Visual observations of discoloration, stains, and arid substances adhering to objects, are indications that the decontamination solution is not effective in removing contamination. Decontamination solutions must be replenished frequently with use, to ensure their continued effectiveness.

The quality of rinse water used in the decontamination process shall be verified. A distilled/deionized rinse is the final step in the decontamination of equipment and in removing all traces of contaminants.

Personnel Decontamination

Personnel decontamination procedures depend on the level of personal protection worn by the field crew, as required by the Site-specific Health and Safety Plan, and upon the degree of contamination the crewmembers experience. The objective of personal decontamination is to protect the health of all crewmembers and to prevent the spread of contamination from the site. Therefore, the following procedures should be extended and modified by the SHSO until all field personnel are satisfied that complete decontamination has been accomplished. In the event of an emergency, the SHSO may judge it necessary to curtail these decontamination procedures to evacuate the site or initiate First Aid.

- **Level B Decontamination:** Level B personal protection equipment (PPE) includes chemical-resistant disposable coveralls, SCBA, hardhat, steel-toe/shank boots, boot covers, and inner and outer gloves. Level B decontamination procedures also can be divided into four sublevels: (1) highly-contaminated personnel exiting the Exclusion Zone, (2) minimally-contaminated personnel exiting the Exclusion Zone, (3) highly-contaminated personnel crossing the hot line to exchange SCBA tank, and (4) minimally-contaminated personnel crossing the hot line to exchange SCBA tank. These distinctions are noted in the decontamination station descriptions below.

  - Station 1 – Segregated Equipment Drop (All Sublevels): Before crossing the hot line, personnel returning from the field must deposit all equipment and/or sample bottles in segregated areas on plastic sheeting. Highly-contaminated equipment, such as samplers and sample containers, are kept separate from minimally-contaminated and difficult-to-clean equipment, such as air monitoring equipment.

- Station 2 – Boot Cover and Outer Glove Wash, Rinse, and Removal: Personnel must step into a washtub containing a detergent solution. Boot covers and outer gloves are scrubbed with a long-handled, soft-bristled brush. All surfaces of the boots and gloves are washed, including boot soles and duct tape used to seal covers and gloves to coverall. Boot covers, including soles and outer gloves, are rinsed with a long-handled, soft-bristled brush. Tape is removed from boat covers and outer gloves and deposited into a plastic-lined disposal drum. Boot covers, and outer gloves are removed and deposited into a plastic-lined disposal drum. A knife may be used to aid in the removal of tight-fitting boot covers.

- Station 3 – Coverall, SCBA, and Safety Boot Wash and Rinse: At this station, all exposed surfaces of PPE are washed with the detergent solution. Personnel must step into a washtub containing a detergent solution. All gear is scrubbed with a long-handled, soft-bristled brush. All surfaces of gear should be scrubbed, including boot soles, until visible contamination is removed. All exposed surfaces of PPE are rinsed to remove detergent.

  Personnel must step into a washtub containing tap water. All gear is rinsed with a long-handled, soft-bristled brush. Pressure sprayers containing tap water may be used to aid in rinsing.

- Station 4 – Safety Boot, SCBA Backpack, and Chemically-Resistant Overall Removal: Boots must be removed and set on plastic sheeting. While still wearing the face-piece, the SCBA backpack is removed and set on a chair or table. The air supply hose is disconnected from the regulator valve. Chemically-resistant overalls are removed and disposed to a plastic-lined disposal drum.

- Station 5 – Inner Glove Wash and Rinse and SCBA Face Piece Removal: Inner gloves are scrubbed by rubbing hands together with a detergent solution then rinsed in tap water. The SCBA face piece is removed without touching inner gloves to face. Deposit face piece on plastic sheeting.

- Station 6 – Inner Glove Removal: Inner gloves are removed and disposed to a plastic-lined disposal drum.

- Station 7 – Field Wash/Field Shower: Hands and face are washed with hand soap, then rinsed and dried with paper towels. If highly–toxic, skin-corrosive, or skin-absorbable materials are at the site, shower entire body.

- **Level C Decontamination:** Level C personal protection includes chemical-resistant disposable coverall, APR, hardhat, steel-toe/shank boots, boot covers, and inner and outer gloves. Depending on exposure hazards, boot covers and outer gloves may not be required, and Tyvek coveralls may be substituted for chemical-resistant coveralls. Station decontamination activities include the following:

  - Station 1 – Segregated Equipment Drop: Before crossing the hot line, personnel returning from the field must deposit all equipment and/or sample bottles in segregated areas on plastic sheeting. Highly-contaminated equipment, such as samplers and sample containers, are kept separate from minimally-contaminated and difficult-to-clean equipment, such as air monitoring equipment.

- Station 2 – Boot Covers and Outer Glove Wash, Rinse, and Removal: Personnel must step into a wash tub containing a detergent solution. Boot covers and outer gloves are scrubbed with a long-handled, soft-bristled brush. All surfaces of the boots and gloves are washed including boot soles and duct tape used to seal covers and gloves to coveralls.

  Personnel must step into a washtub containing tap water. Boot covers, including bottoms and outer gloves, are rinsed with a long-handled, soft-bristled brush. Tape that seals boot covers and outer gloves is removed and deposited into a plastic-lined disposal drum. Boot covers and outer gloves are removed and deposited into a plastic-lined disposal drum. A knife may be used to aid in the removal of tight-fitting boot covers.

- Station 3 – Safety Boots and Coveralls Wash, Rinse, and Removal: Personnel must step into a wash tub containing a detergent solution. Boots are scrubbed with a long-handled, oft-bristled brush. If leather safety boots are worn, the soles are scrubbed and the upper surfaces are wiped with a paper towel dipped in detergent solution. If waterproof coveralls are worn, they are scrubbed also. All surfaces of gear, including boot soles, are scrubbed until visible contamination is removed.

  Personnel must step into a washtub containing a tap water. Boots and coveralls are rinsed with a long-handled, soft-bristled brush. Boots are removed and set on plastic sheeting. Coveralls are removed and disposed to a plastic-lined disposal drum.

- Station 4 – Inner Glove Wash and Rinse: Inner gloves are scrubbed by rubbing hands together with a detergent solution. Finish with a rinse in tap water.

- Station 5 – APR and Inner Glove Removal: The APR is removed without touching inner gloves to face, and then deposited on plastic sheeting. Inner gloves are removed and disposed to a plastic-lined disposal drum.

- **Level D Decontamination:** Level D is the lowest level of personal protection and is worn when exposure to contaminants is not expected. Level D personal protection includes hardhat and steel-toe/shank leather boots. Depending on the anticipated activities, Level D may also include Tyvek coveralls and gloves. Station decontamination activities include the following:

  - Station 1 – Segregated Equipment Drop: Personnel returning from the field must deposit all equipment and/or sample bottles in segregated areas on plastic sheeting. Highly-contaminated equipment, such as samplers and sample containers, are kept separate from minimally-contaminated and difficult-to-clean equipment, such as air-monitoring meters.

  - Station 2 – Safety Boot Wash, Rinse, and Removal: Boot soles must be scrubbed with a long-handled, soft-bristled brush. All surfaces of gear, including boot soles, must be scrubbed until visible contamination is removed. Boot soles are rinsed with tap water using a long-handled, soft-bristled brush. Boots are removed and set on plastic sheeting.

- Station 3 – Coveralls Removal (if needed): If worn, remove coveralls and dispose to a plastic-lined disposal drum.

- Station 4 – Glove Wash, Rinse, and Removal (if needed): If worn, inner gloves are scrubbed by rubbing hands together with a detergent solution. Finish with a rinse in tap water. Gloves are removed and disposed to a plastic-lined disposal drum.

Priorities for Worker Decontamination

The following members of the work team returning from the Exclusion Zone shall have priority over others when being decontaminated.

- A worker who is in need of First Aid, or is in physical discomfort.
- A worker who is low on air or whose SCBA is malfunctioning.
- A worker who has been highly contaminated.
- A worker who did the major part of physical activity required on site.

It is the responsibility of the SHSO to decide which workers receive priority.

Emergency Decontamination

In an emergency, the primary concern shall be to prevent the loss of life or severe injury to personnel. If immediate administration of medical treatment is required to prevent further deterioration of health, then decontamination may be eliminated, modified, or performed later when the condition has stabilized. The SHSO and the team leader must weigh the consequences of delaying, modifying, or eliminating decontamination against the consequences of delaying treatment, before making a decision on a case-by-case basis.

First Aid equipment shall be readily available in the Support Area and, as specified in the Site-specific HSP. At least one response team member shall be trained in First Aid and CPR.

Arrangements shall be made to advise medical personnel on the nature of contaminants to which the patient was exposed and the extent of decontamination. In some cases, the SHSO will need to contact nearby emergency response medical facilities in advance to alert them of the possibility of a problem. This will help the medical facility to prepare for the specific sort of health care that may be required in an emergency.

Cold Weather Decontamination

In freezing temperatures, a small quantity of ethanol can be added to the washtubs containing decontamination and tap water to prevent freezing. Deionized water and distilled water containers shall be kept warm in the heated van or car for use when needed. Orchard sprayers shall also be kept in a warm place when not in use.

5.0 Decontamination of Equipment

Protection of Monitoring Instruments

All equipment and monitoring instruments shall be protected from contamination while in use by wrapping them in clean plastic bags and sealing them with tape.

Heavy Equipment

Heavy equipment like bulldozers, trucks and drilling equipment are difficult to decontaminate. Decontamination shall consist of either steam cleaning or washing with suitable detergent solutions and then water under high pressure. Decontamination equipment that may be needed include long-handled brushes, pressurized sprayers, curtains and enclosures to contain splashes from pressurized sprayers, and wire brushes. A decontamination pad lined with heavy-duty plastic sheeting may be needed for the decontamination of heavy equipment.

Tools/Sampling Equipment

Disposable tools shall be used wherever possible. Typically, decontamination of tools will include brushing with decontamination solution followed by tap water. This procedure shall be followed by spraying with distilled water and then deionized water. The tools shall be segregated and wrapped in clean plastic bags and taped securely.

Decontamination of sampling equipment such as split spoons, stainless steel buckets, and filtration transfer vessels shall be in accordance with the following steps:

- Set up clean tubs or buckets to collect wash and rinse solutions.
- Scrub item with Alconox or Liquinox and water until visually clean. Use Liquinox when phosphate is an analytical parameter.
- Rinse with tap water.
- Rinse with distilled or deionized water, the variety that can be found in any grocery store. A garden sprayer or squirt bottles may be used.

6.0 Level of Protection for Decontamination Team

Decontamination workers who initially come into contact with personnel and equipment returning from the Exclusion Zone shall be required to wear the same level of protection as the returning team, or one level lower. The level of protection for decontamination workers can be progressively decreased, without compromising worker safety, the further away the stations are located from the hot line. The SHSO shall determine the level of protection required for the decontamination team.

7.0 Investigation-Derived Waste

SOP HS-006 contains more detail on disposal of decontamination solutions and other decontaminated items such as paper towels and Tyvek. Typically, the wash tubs containing decontamination solution and

rinse water shall be emptied into DOT-approved drums. The wash tubs shall be sprayed with decontamination solution and tap water, and then also emptied into the drums. All solid waste shall be double-bagged and disposed of in drums. The drums shall be securely fastened and labeled as "decontamination water" or "solid waste." Include the name of the site, the date, the company name, and the level of fullness.

Standard Operating Procedures

EXCAVATION AND TRENCHING

Prepared By: _____ Date: 3-10-03
Health and Safety Committee Chair

Reviewed By: _____ Date: 3/11/03
Corporate Health and Safety Officer

Approved By: _____ Date: 3/11/03
Chief Operating Officer

1.0 Purpose

To establish the minimum requirements for Parametrix employees to conduct safe entry into excavations and trenches.

2.0 Scope

This Standard Operating Procedure (SOP) outlines the guidelines and procedures used for protection of employees in excavations against cave-ins. An exception to these routine procedures includes when the excavation is in stable rock or less than five-feet deep, and examination by a competent person provides no evidence that a cave-in should be expected against falling rock, soil, or material by use of an adequate system. The latter operation includes scaling to remove loose rock or soil, installation of protective barricades, and other equivalent protection. OSHA safety requirements relating to excavation and trenching are contained in 29 CFR 1926, Subpart P. Relevant sections include:

- Appendix A – Soil Classification.
- Appendix B – Sloping and Benching.
- Appendix C – Timber Shoring for Trenching.
- Appendix D – Aluminum Hydraulic Shoring for Trenches.
- Appendix E – Alternative to Timber Shoring.
- Appendix F – Selection of Protective Systems.
- 1926.650 – Scope, Application, and Definitions Applicable to this Subpart.
- 1926.651 – Specific Excavation Requirements.
- 1926.652 – Requirements for Protective Systems.

3.0 General Requirements

Surface Encumbrances

All surface hazards or obstructions shall be removed or supported. This includes the removal or neutralization of surface loads that may create a hazard, such as sidewall cave-ins and equipment that may fall into the trench or excavation.

Spoil material from the excavation and any equipment, etc. may not be stored closer than two feet from the trench edge.

Underground Utilities

The following steps should be taken prior to and during excavation activities:

- Obtain plans of as-builts to locate any underground pipes or utilities that would interfere with the trench.
- Locate utilities (phone, sewer, etc.) before excavation begins. Pinpoint actual locations as estimated locations are approached.
- Inform all regional notification centers and all utility operators of excavation operations at least two days prior to initiating operations.
- Determine exact locations of utilities by safe and acceptable means when excavating around approximated utility locations.
- Safeguard utilities to protect employees while excavation is open.

Access/Egress

- **General Requirements**
  - Ramps, runways, ladders, or stairs as means of access/egress must be within 25 feet of an employee work area if a trench or excavation is more than four feet deep.
  - Ladders should be in good condition, extend three feet over the trench top, and be secured in such a manner as to prevent movement while in use.
  - Walkways, runways, and sidewalks shall be kept clear of excavated material or other obstructions.
- **Structural Ramps**
  - Structural ramps shall be designed by a competent person.
  - Ramps consisting of multiple pieces shall be connected.

- Ramps shall be of uniform thickness.
- Ramps shall be designed to prevent slipping.

Warning Systems/Edge Protection

The edges of all open trenches must be protected. Warning systems must be used when heavy equipment is operated adjacent to excavations. Warning systems for mobile equipment may include barricades, hand or mechanical signals, or stop logs. If possible, bumpers should be provided to prevent equipment from falling into trenches, as well as barricades for public protection.

Workers should not walk close to edges; their weight may cause localized failures and they may fall into the excavation.

Hazardous Atmosphere

A "competent person" (see 4.0 below) must be responsible for testing and controls for hazardous atmospheres, including emergency rescue equipment and daily inspections for potentially hazardous conditions. Controls include respirators or additional ventilation, if needed, and individually-attended lifelines during descent into bell-bottom pier holes or similar excavations.

Testing must be conducted where the possibility of a hazardous atmosphere exists. When hazardous atmospheres are identified, control measures shall be taken. The following are general requirements for hazardous atmosphere testing and control:

- Excavations greater than four feet deep shall be tested before employees enter. Atmosphere must be tested for suspect toxic gases and oxygen deficiency (less than 19.5 percent).
- Adequate respiratory and ventilation equipment must be provided in hazardous atmospheres.
- Ventilation must be conducted in atmospheres greater than 10 percent LEL if employees shall occupy excavation.
- Periodic testing must be done to ensure levels are safe.
- Rescue equipment (i.e., breathing apparatus) shall be available when work is conducted in a hazardous atmosphere.
- Rescue equipment consisting of lifelines and harnesses shall be used when employees enter bell-shaped piers, shafts, or similar configured spaces. Rescue systems shall be attended at all times employees are present at the excavation.

Protective Systems

Support systems, such as shoring, bracing, or underpinning, must be in place to ensure the stability of adjacent structures (e.g., buildings, walls, or sidewalks).

Inspections

A competent person must perform daily inspections of excavations, adjacent areas, and protective systems and remove exposed employees if there is evidence of possible cave-ins, failure of protective systems, hazardous atmospheres, or other hazardous conditions, until necessary precautions have been taken.

Competent persons (see Section 4) must make daily inspections of excavations to identify potential hazards. Inspections shall be completed prior to each shift or after increasing hazard occurrences. Where hazardous conditions are identified, exposed employees shall be removed from the excavation until control measures can be completed.

4.0 OSHA-Competent Person

The OSHA definition of a "competent person" is one who is capable of identifying existing and predictable hazards in the surroundings or working conditions that are unsanitary, hazardous, or dangerous to employees, and who has authorization to take prompt, corrective measures to eliminate them.

A competent person must perform daily inspections of excavations, the adjacent areas, and protective systems for evidence of a situation that could result in possible cave-ins, indications of failure of protective systems, hazardous atmospheres, or other hazardous conditions.

A competent person must demonstrate:

- Knowledge of the new provisions pertaining to excavations, trenches, and earthwork.
- Knowledge of soil analysis, as required in the new provisions pertaining to excavations, trenches, and earthwork.
- Knowledge of the use of protective systems.
- Authority to take prompt, corrective action on the job as conditions warrant.
- Ability to recognize and test for hazardous atmospheres.

To be considered competent for purposes of enforcement, a person must have acquired training that is specific to the five elements listed above. Training may be a combination of formal, on-the-job, or work experience.

5.0 Requirements for Protective Systems

According to OSHA, all trenches more than 4 feet in depth must be shored, sloped, or have shields provided to protect workers. The depth of the excavation is to be measured at its greatest vertical dimension. For example, when the trench is in a hillside, the depth should be measured on the uphill side. Any protective system used must be designed or approved by a Registered Professional Engineer (RPE).

Excavations shallower than five feet must also be sloped or shored if in unstable soil.

- **Sloping and Benching Systems**
  - Sloping involves cutting back the trench walls to an appropriate angle of repose.
  - These angles vary from site to site, depending on soil classification, water conditions, previous soil disturbances, and other conditions.
  - The proper angle should be independently determined by a competent person for each site and each trench at the same site, if the conditions warrant such determinations.
  - The angle of repose shall be flattened when the excavation has water conditions, silty material, loose boulders, and areas where erosion, deep-frost action, and slide planes appear.
  - A slope must be 34 degrees or less, in lieu of soil classification. A slope of this gradation or less is considered safe for any type of soil.
  - Designs of sloping or benching shall be selected from and be in accordance with data provided in written form. The text is to identify criteria that affect the selection, the limits of use of data and sufficient explanation; and data, as necessary, to assist in making a correct choice of a protective system. At least one copy of the tabulated data identifying the RPE who approved the information shall be maintained at the project site during the time the work is being performed.
  - Excavations can be designed by an RPE, put in written form, and kept at the project site, but must include, at least, the magnitude and configuration of the slopes determined to be safe for the project and the name of the RPE who approved the plan.
- **Support and Other Protective Systems**
  - The function of trench shoring is to resist or replace the force on the excavation face.
  - The type of shoring is dependent upon soil type and conditions.
  - Supportive systems shall be used when excavations threaten adjoining structures.
  - The shoring of a trench can be accomplished with the use of wood timbers, screw jacks, hydraulic rams, or combinations of all of these methods.
  - Timbers should be in sound condition, free of major defects, and equal to the grade size specified. Structural timber normally gives some warning by splintering or indication that wood fibers are separating if failure is imminent. Workers should be alert to these warnings.

- Steel shoring components give little warning before failure. Workers should watch for bent or otherwise damaged members.
- Pressure gauges, cylinders, and rails must be in good condition if using hydraulic shoring. Signs of fluid leakage should be checked and corrected.
- Any shoring system used below 20 feet in depth must be designed by a Registered Professional Engineer.
- The placement of shores must be done promptly before anyone enters the trench.
- Backfilling should take place as soon as the shoring is removed.

6.0 References

U.S. Department of Labor, 1999. *OSHA Technical Manual* (TED 1-015A). January 20.

U.S. Department of Labor, OSHA website, www.OSHA.gov.

Standard Operating Procedures

HEAT STRESS

Prepared By: _____ Date: 3-10-03
Health and Safety Committee Chair

Reviewed By: _____ Date: 3/11/03
Corporate Health and Safety Officer

Approved By: _____ Date: 3/11/03
Chief Operating Officer

1.0 Purpose

This Standard Operating Procedure (SOP) establishes guidelines to protect all employees from the effects of heat stress (hyperthermia) when working in hot environments.

2.0 Scope

Adverse climatic conditions are important considerations in planning and conducting site operations. High ambient temperature can result in health effects ranging from transient heat fatigue, physical discomfort, reduced efficiency, personal injury, increased accident probability, and the like, to serious illness or death. Heat stress is of particular concern when chemical protective garments are worn, since these garments prevent evaporative body cooling. Wearing personal protective equipment (PPE) puts a worker at considerable risk of developing heat stress.

Heat stress is caused by a number of interacting factors, including environmental conditions, clothing, workload, and the individual characteristics of the worker. Because heat stress is probably one of the most common (and potentially serious) illnesses at sites, regular monitoring and other preventive precautions are vital.

Note

Chemical protective clothing is defined as, but not limited to:

- Uncoated Tyvek coveralls.
- Polyethylene-coated Tyvek coveralls.
- Saranex-coated Tyvek coveralls.
- Medium-weight polyvinyl chloride (PVC) coveralls.
- Sigel suits (heavyweight PVC) and fully-encapsulating suits.

3.0 Responsibilities

The responsibilities of various personnel on the project site for monitoring and responding to various types of heat stress are provided below:

- **Site-specific Health and Safety Officer:** The Site-specific Health and Safety Officer (SHSO) is responsible for initial on-site coordination of the heat stress policy. The SHSO establishes work/rest regimens from the Wet Bulb Globe Thermometer (WBGT) readings and conducts physiological monitoring when on site.

- **Project Manager:** The Project Manager is responsible for field implementation of the heat stress policy. This includes assurance that all personnel on site comply with the policy. The Project Manager shall be responsible for establishing and monitoring safe work practices. He/she will ensure that all personnel potentially exposed to heat have proper training and that the on-site Project Supervisor implements the program in his/her absence.

- **Project Supervisor:** The Project Supervisor is responsible for ensuring that work crews comply with all site requirements, including the heat stress policy. In the absence of the Site-specific Health and Safety Officer, the Project Supervisor is also responsible for physiological monitoring.

- **Team Member:** Team Members are responsible for understanding and complying with all site requirements, including the heat stress policy. Team members shall also observe their fellow workers for signs of heat stress.

Project Managers, Project Supervisors, and SSHOs will plan for heat by providing shaded break areas, time for acclimatization, and plenty of palatable beverages for personnel.

4.0 Procedures

Recommended Guidelines

Note that the guidelines discussed in this section are intended to be used only as a means of establishing an initial work/rest regimen. The Site-specific Health and Safety Officer is responsible for evaluating the conditions at a specific operation and making final determinations of the work/rest regimen. Physiological monitoring, as discussed in the following section, will be used to establish more stringent regimens.

Standard guidelines for physiological monitoring of specific types of project personnel are provided below:

- **Unacclimatized Workers:** The total heat exposure to unacclimatized workers not wearing protective clothing shall not exceed the guidelines given in Figure 1 (located at the end of this SOP). Note that it generally takes an employee 7 to 10 days to become acclimated to heat.

- **Acclimatized Workers:** The total heat exposure to acclimatized healthy workers not wearing protective clothing shall not exceed the guidelines given in Figure 2 (located at the end of this SOP).

- **Workers Not Wearing Chemical-protective Clothing:** The guidelines shown in Figures 1 and 2 are for workers who are not wearing chemical-protective clothing. In the event workers are wearing chemical-protective clothing, the guidelines in Figures 1 and 2 should be changed to 4°F. In other words, add 4°F to the WBGT reading and use this adjusted WBGT in Figures 1 and 2. The metabolic heat rate shall be estimated using Table 1 (located at the end of this SOP).

Physiological Monitoring

For operations at which workers are wearing chemical-protective clothing, physiological monitoring is necessary when the ambient temperature exceeds 78°F (25.5°C).

After the initial work/rest regimen is established, it is necessary to perform physiological monitoring to determine if the established work/rest regime should be adjusted. The following guidelines shall be used to adjust the regimen:

- **Baseline Information:** Determine a baseline heart rate and oral temperature for each employee prior to on-site activities by counting the radial pulse and using a clinical thermometer to measure oral temperature.

- **Increasing Work Rate:** If a worker's heart rate and oral temperature do not increase, or only increase slightly (10 percent or less for the heart rate and 0.5° or less for the oral temperature) from the baseline readings after the first work cycle, the work period (according to the established work/rest regimen) can be increased by 20 percent.

  The worker shall be monitored closely after the next work cycle period, and if there are still no significant increases in heart rate and oral temperature, the work period can be increased by an additional 10 percent, and the rest period remains the same.

  Increases in the work period can be made throughout the shift if there are no significant increases in the physiological monitoring indices.

  Note that the increases to the work period are made based on the work/rest regimen established from WBGT readings. These WBGT readings will change throughout the day as the temperature rises or falls.

- **Decreasing Work Rate**

  - Pulse:

    - Count the radial pulse as early as possible in the rest period.

    - If a worker's heart rate exceeds 110 beats per minute immediately after a work period, shorten the next work cycle by 30 percent and keep the rest period the same.

- If the heart rate still exceeds the 110 beats per minute after the next work period, shorten the following work cycle by 30 percent.
- Continue to shorten the employee's work cycle until the heartbeat is below 110 beats per minute.

➢ Temperature:

- Use a clinical thermometer or similar device to measure the oral temperature at the end of a work period (before drinking).
- If the oral temperature exceeds 99.6°F (37.6°C), shorten the next work cycle by 30 percent without changing the rest period.

➢ If the oral temperature still exceeds 99.6°F at the beginning of the next rest period, shorten the following work cycle by 30°percent.

➢ Do not permit a worker to return to a work area when the worker's oral temperature exceeds 100.6°F (38.1°C).

Prevention

Establish a work/rest regimen according to the guidelines presented in this policy.

Adequate liquids must be provided to replace lost body fluids. Employees must replace water and salt lost from sweating. Employees must be encouraged to drink more than the amount required to satisfy thirst. Thirst satisfaction is not an accurate indicator of adequate salt and fluid replacement.

Replacement fluids can be a commercial mix, such as Gatorade or similar, or a combination of these with fresh water.

The replacement fluid temperature should be kept cool.

Cooling devices, such as vortex tubes or cooling vests, can be worn beneath protective garments. If cooling is worn, only physiological monitoring will be used to determine work activity.

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

Employees shall open or remove chemical-protective garments during rest periods.

Employees shall not be assigned other tasks during rest periods.

All employees shall be informed of the importance of adequate rest and proper diet in the prevention of heat stress.

Employees shall be informed of the harmful effects of excessive alcohol consumption in the prevention of heat stress.

Training

Those personnel (including contractor employees) potentially exposed to heat stress conditions shall receive the following training:

- **Parametrix Employees**
  - Sources of heat stress, the influence of protective clothing, and the importance of acclimatization.
  - How the body handles heat.
  - Heat-related illnesses.
  - Preventive/corrective measures.
  - First Aid procedures.
- **Parametrix Supervisors**
  - Measurement methods and calculation of WBOT and physiological monitoring.

5.0 References

Threshold Limit Values and Biological Exposure indices for 1985/1986. American Conference of Governmental Industrial Hygienists.

Occupational Safety and Health Guidance Manual for Hazardous Waste Site Activities. NIOSH/OSHA/USCG/EPA, Health and Human Services, Public Health Service, Center for Disease Control, NIOSH.

Criteria for a Recommended Standard, Occupational Exposure to Hot Environments, Revised Criteria 1986, U.S. Department of Health and Human Services, Public Health Service, Center for Disease Control, NIOSH.

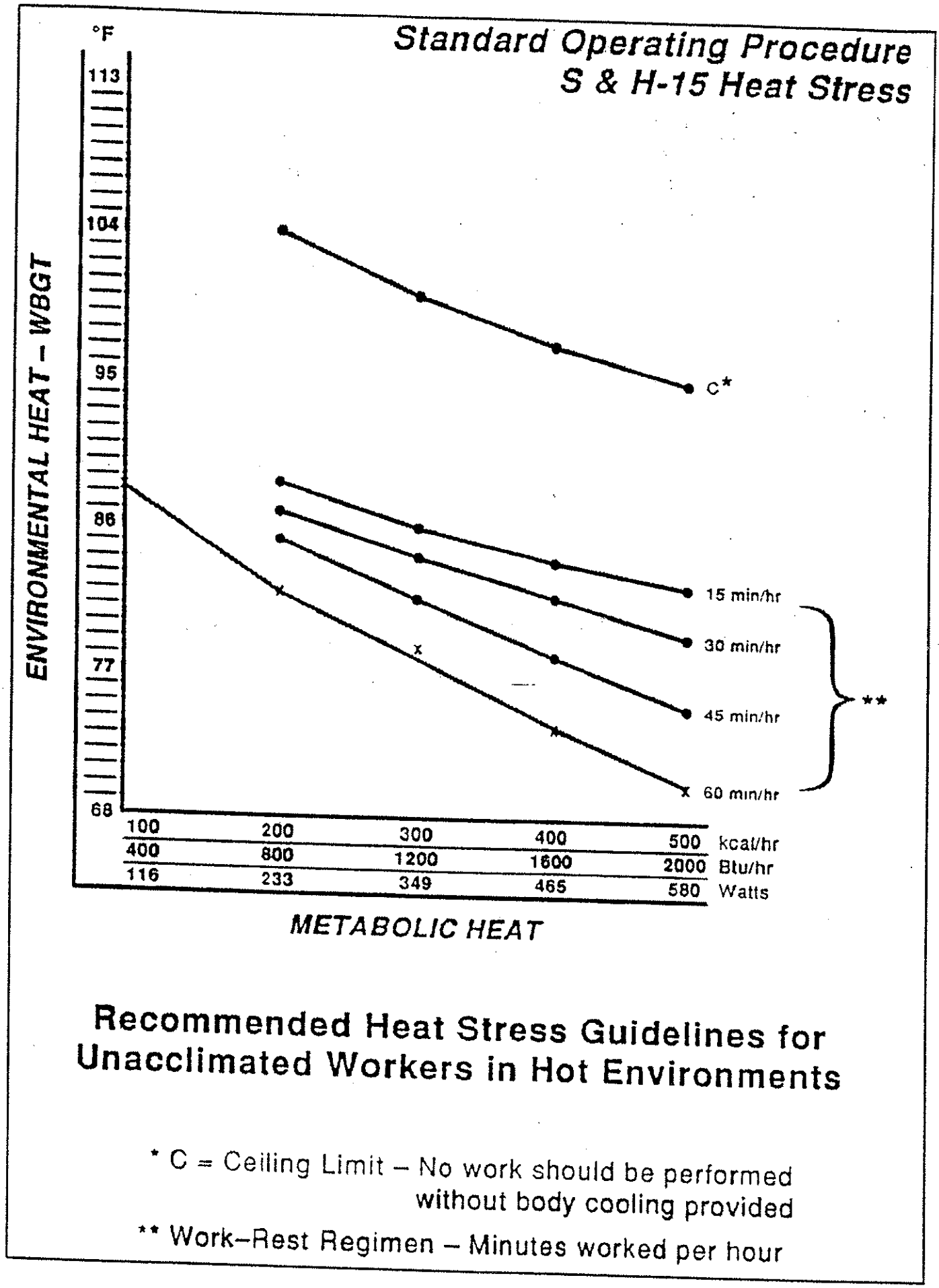

Figure 1: Recommended Heat Stress Guidelines for Unacclimatized Workers.

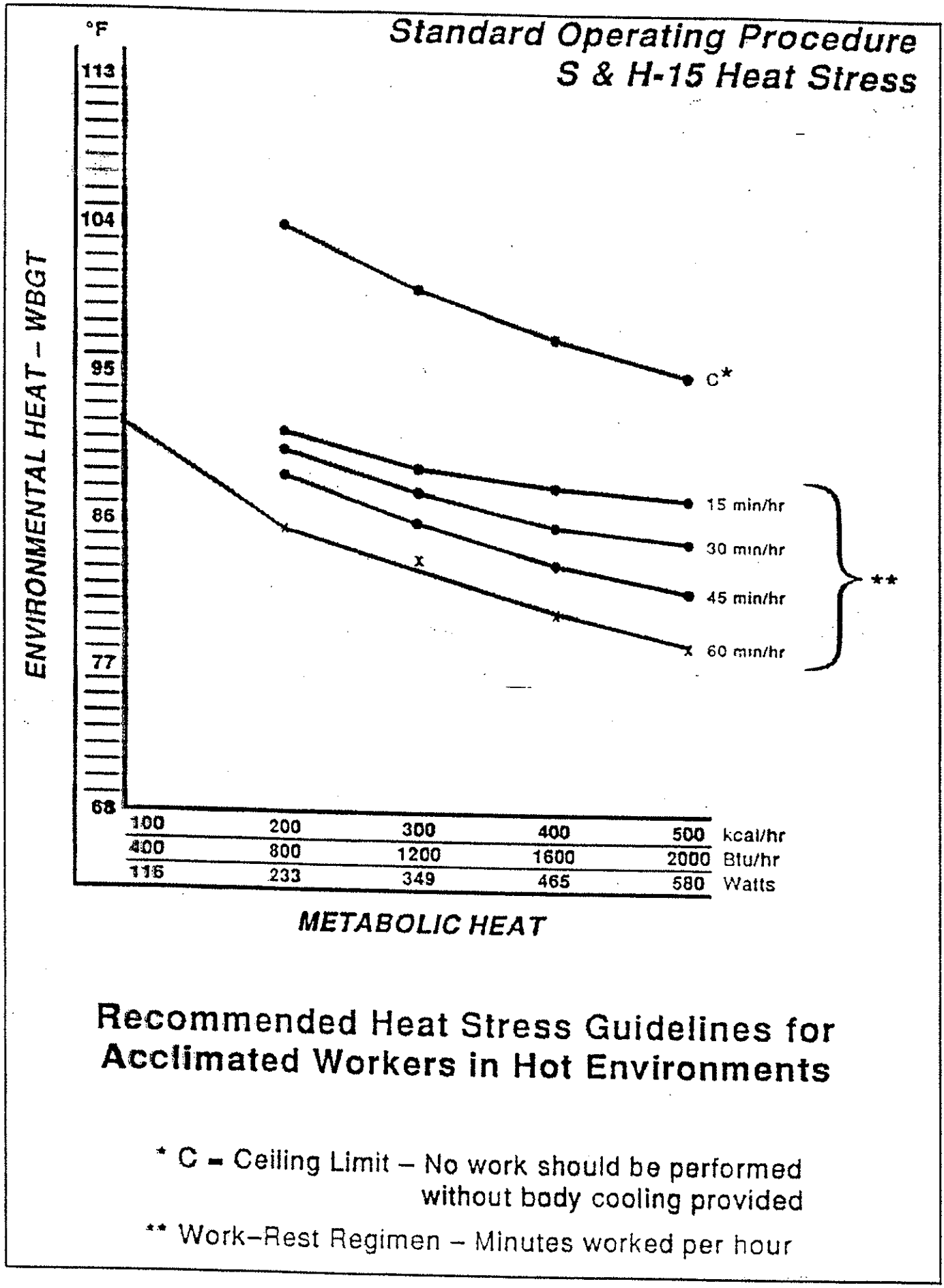

Figure 2: Recommended Heat Stress Guidelines for Acclimatized Workers.

Table 1. Assessment of Employee Work Load in Hot Environments

Body Position and Movement	kcal per hour
Sitting	18
Standing	36
Walking	120-180
Walking Uphill	Add 48 per meter rise

Type of Work	Average kcal per minute	Range kcal per hour
Hand Work		
• Light	24	12-72
• Heavy	54	
Work One Arm		
• Light	60	42-150
• Heavy	108	
Work Both Arms		
• Light	90	60-210
• Heavy	150	
Work Whole Body		
• Light	210	150-540
• Moderate	300	
• Heavy	420	
• Very Heavy	540	
Basal Metabolism	**60**	

Sample Calculation	Average kcal per minute
Assembling Work with Heavy Hand Tools	
• Standing	36
• Two-Arm Work	210
• Basal Metabolism	60
Total:	**306 kcal per hour**

Standard Operating Procedures

COLD STRESS

Prepared By: _____ Date: 3-10-03
Health and Safety Committee Chair

Reviewed By: _____ Date: 3/11/03
Corporate Health and Safety Officer

Approved By: _____ Date: 3/11/03
Chief Operating Officer

1.0 Purpose

This Standard Operating Procedure (SOP) establishes guidelines to protect workers from the effects of cold stress (hypothermia) and cold injury.

2.0 Scope

Most cold-related worker fatalities have resulted from failure to escape low environmental air temperatures or from immersion in low temperature water. The single most important aspect of life-threatening hypothermia is a fall in the deep core temperature of the body.

Hypothermia occurs when a person's body loses heat faster than it can be produced. The body's "normal" deep body temperature is 99.6°F. If your body temperature drops to 95°F, uncontrollable shivering occurs. If cooling continues, other symptoms, listed below, or even death may occur:

- Vague, slow, slurred speech.
- Forgetfulness, memory lapses.
- Inability to use hands.
- Frequent stumbling.
- Drowsiness.
- Unconsciousness.

Hypothermia can occur at temperatures above freezing. Cold, wet, windy conditions make prime hypothermia weather.

Hypothermia impairs judgment. A worker may not be able to make good decisions about his/her situation. Preventing hypothermia is the best way to avoid being a victim.

Frostbite is the freezing of some part of the body. Fingers, toes, and whole arms and legs can be lost as a result of frostbite.

Pain in the hands and feet is felt only when the temperature of the tissue is changing rapidly. There may be no pain with gradual freezing.

Loss of the sensations of touch, pressure, and pain may occur without awareness of any numbness or other sensation. Therefore, it is important to test these sensations often and to wear clothing that is loose and does not restrict the flow of blood to the limbs.

Exposed parts of the body should be inspected routinely. This is done best by a partner. Just before freezing, the skin, especially the face, becomes bright red. Then, small patches of white appear as freezing occurs.

At the same time, the skin also becomes less elastic. This is best noted in the finger pads, which remain pitted when touched or squeezed. Any further cooling will surely result in frostbite.

Serious freezing is most common in the feet because of less awareness of them, poor circulation and sensation, and inadequate foot gear. Hands are second to feet in order of serious injury. Exposed hands are less likely to become frostbitten than feet because they are conditioned to exposure and have a better blood supply.

Next to the extent of freezing, inadequate or improper treatment of a frozen part of the body is the most common cause of serious loss of tissue. If a worker experiences frostbite, the worker should seek medical attention immediately.

3.0 Responsibilities

Project Managers, Supervisors, and SHSOs shall prepare for work in cold environments by providing heated break areas, adequate protective clothing, the availability of warm beverages, and shelter or clothing to keep site personnel dry.

The responsibilities of various personnel on the project site for monitoring and responding to various types of cold stress are provided below:

- **Site-specific Health and Safety Officer:** The Site-specific Health and Safety Officer (SHSO) is responsible for initial on-site coordination of the cold stress. The SHSO ensures that all personnel potentially exposed to cold have had proper training, that suitable warm clothing is available, and that an on-site supervisor can implement the program in his/her absence.

- **Project Manager:** The Project Manager is responsible for field implementation of the cold stress policy. This includes assurance that all personnel on site comply with the policy. The Project Manager shall also be responsible for taking temperatures, selecting proper clothing, and establishing work practices in the absence of the Site-specific Health and Safety Officer.

- **Team Member:** Team Members are responsible for understanding and complying with all site requirements.

4.0 Requirements

Workers shall be provided with warm clothing, such as mittens, heavy socks, etc., when the air temperature is below 40–45°F. Chemical-protective clothing may be used to protect the employee from cold.

When the air temperature is below 30–40°F (depending on employee comfort), clothing for warmth, in addition to chemical-protective clothing, shall be provided. This will include:

- Insulated suits, such as whole-body thermal underwear.
- Wool or polypropylene socks to keep moisture off the feet if there is a potential for work activity that would cause sweating.
- Insulated gloves (when air temperatures are extremely low (less than 5–10°F), gloves with reflective surfaces, which reflect body heat back to the hand, should be used).
- Boots.
- Insulated head covers, such as knit caps (ski caps).
- At air temperatures below 35°F, the following work practices must be followed:
    - If the clothing of an employee becomes wet on a project site, the outer layer of the clothing must be impermeable to water.
    - If an employee's underclothing (socks, mittens, etc.) becomes wet in any way, the employee must change into dry clothing immediately. If the clothing becomes wet from sweating, the employee may finish the task that caused the sweating before changing into dry clothing.
    - Employees must be provided a warm area (65°F or above) to change from work clothing into street clothing.
    - Employees must be provided a warm break area (60°F or above).
    - If appropriate, space heaters may be provided in the work area to warm the hands, feet, etc. Necessary fire and electrical safety practices shall be observed when using space heaters. Space heaters shall be shut off when the site is not occupied.
    - Hot liquids, such as soups, warm, sweet drinks, and the like, shall be provided in the break area. The intake of caffeinated beverages shall be limited because of diuretic and circulatory effects.
    - The "buddy system" shall be practiced at all times. Any employee who is observed with severe shivering shall leave the cold area immediately.
    - Employees should layer their clothing (i.e., wear thinner, lighter clothing next to the body, with heavier clothing layered outside the inner clothing).

- Avoid overdressing when going into warm areas or when performing activities that are strenuous. This could lead to heat stress problems.
- Auxiliary-heated versions of hand wear, footwear, etc., can be used in lieu of mittens, insulated socks, and the like, if extremely cold conditions exist and if they are compatible with hazards in the work area.
- Employees handling evaporator liquids (gasoline, hexane. alcohol. etc.) shall take special precautions to avoid soaking clothing or gloves with the liquids because of the added danger of cold injury resulting from evaporative cooling.
- Work shall be arranged in such a way that sitting still or standing for long periods is minimized.

- All employees who may work in cold areas shall be trained in:
  - Proper First Aid treatment.
  - Proper clothing practices.
  - Proper eating and drinking habits.
  - Recognition of impending, adverse health effects.
  - Safe work practices.

Clothing for warmth, which is worn under chemical-protective clothing, can be laundered in a normal fashion, without the wash water being collected as contaminated water so long as the chemical-protective clothing remains intact. If there is a rip or tear in the chemical protective clothing in a contaminated area, the clothing for warmth must be handled as potentially contaminated, and the water in which it is washed must be collected as potentially-contaminated water. More rigorous steps may be required if materials handled are extremely toxic (e.g., dioxin).

5.0 Procedure – First Aid Treatment

Treatment of Hypothermia

Employees must be trained to adequately understand the symptoms and treatments for hypothermia, at least to include the following:

- Be able to recognize the symptoms of hypothermia in yourself and others. Victims may deny they are in trouble. Even mild symptoms demand attention.
- Get the victim out of wet and windy weather.
- Remove all wet clothing.

- If the person is only mildly affected:
  - Give warm drinks.
  - Place the victim into dry clothing and a warm sleeping bag.
- If more seriously affected (very clumsy, confused, unable to shiver):
  - Treat the person gently.
  - Place the victim naked into a warm sleeping bag.
  - Place a rescuer, also naked, into the same sleeping bag. If you have a double bag, place the victim between two naked rescuers. Warmth from skin-to-skin contact is the safest method of rewarming. Any warm objects, such as rocks, hot water bottles, or heat packs, should be wrapped in towels or clothing. Arrange for evacuation. Do not give warm drinks until the victim has regained a clear level of consciousness, the ability to swallow, and is already starting to warm up.

Early Treatment of Frostbite

Next to the extent of freezing, inadequate or improper treatment of a frozen part of the body is the most common cause of serious loss of tissue.

For proper rewarming, the following additional procedures should be considered:

- In many cases, rewarming cannot be accomplished without the part again becoming frozen. For example, removing clothing from other parts of the body to warm a frozen part may only result in the loss of more body heat, greater extent of injury, and the ultimate refreezing of the afflicted part. Thawing and refreezing should always be avoided. It is best to continue, even if it means walking on a frozen foot, until shelter is available and rewarming can be done satisfactorily.
- Limbs should be rewarmed in stirred water just above normal body temperature (about 100-105°F). Using a thermometer is the only accurate way to measure this temperature. Never try to thaw in cold water or snow. Since feeling is lost, fires, stoves, exhaust pipes, etc., should never be used. Serious damage to the tissue could result.
- If a major part of a limb is frozen when rewarming begins, deep-body temperature will fall as the cooled blood begins to flow throughout the body. To prevent such cooling, warm liquids by mouth should be given. Even total immersion of the body in a warm bath may be necessary.
- Rewarming is an acutely painful experience and medication to alleviate pain should be given, if available. After thawing, a deep aching pain may persist for several days, depending upon severity of the injury. Pain is actually a good sign, since it indicates that nerve function is still present.

- The afflicted part should be moved gently and voluntarily during rewarming.
- A dull, purple color indicates more serious injury and requires medical attention. Swelling or blisters also indicate more serious problems. Other means for improving circulation are available but must be administered by medical personnel.

6.0 References

Threshold Limit Values and Biological Exposure Indices for 1985 1986, American Conference of Governmental Industrial Hygienists.

Alaska Department of Labor, *Physical Agent Data Sheet Cold Stress*, December 1987.